### A GOALS ACCOUNTING SYSTEM\*

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#### I. INTRODUCTION

In this paper, I would like to give a brief summary of results of a study soon to be published by the National Planning Association under the title, Estimating the Possibilities for Improvements in the Quality of Life in the United States, 1973-1983, in which a goals accounting system is developed and a resulting set of estimates presented. Because the methodology of this work and its underlying rationale have already been described elsewhere and are again discussed in detail in the forthcoming book, I shall give only a brief summary of the results and the current set of estimates. I will then discuss some of the conceptual issues which bear on the design of the goals accounting system and on the meaning of the estimates provided by it. These are: the content of economic analysis as applied to production of particular social changes, the basis for selecting the goals concerns and indicators, the treatment of time, and the applicability of results to policy-making.

The purpose of this work was to provide a method of estimating the production possibilities of particular social changes seen as goods.

The present results are highly experimental. While quantitative estimates are always made with incomplete information, the present estimates entail a substantial degree of uncertainty regarding the proper specification of the system as a whole and its variables and uncertainty at the estimation level regarding the statistics and other information used.

The system entails many abstractions and a set of very complex relationships. In order to obtain an even approximate understanding of the system as a whole and its relationships, a complete elaboration of the entire analysis is first necessary. Only then can judgments be made about desirable changes in the design and content of the analysis.

The goals accounting analysis rests on a series of specific assumptions. Of these assumptions, two should be mentioned here since they may help to distinguish the goals accounting analysis from other lines of endeavor. One assumption is that the social and economic trends are not completely determined; there exist possibilities for departures from these trends and in particular for achievement of levels of social output above those given by the trends. These possibilities are first broadly defined by technical opportunities, comprising the set of what may be possible within the scope of technology, within the limits of the environmental, social and demographic feasibility, and within the given limits of time. The feasible changes are further specified by a set of economic constraints, i.e., by the amount of resources which may be available to achieve these technically feasible additional changes which represent improvements on the ongoing trends.

The second assumption is that at any point in time in addition to fixed modes of operation there exists a discretionary margin in the use of resources and in the types of activities undertaken by the individual decision units in the private and in the public sectors. The relative size of this margin can be defined as a function of time such that the amount of resources which can be allocated to the discretionary activities while initially very small increases with time.

The present study has drawn on a number of related analytical developments from which many elements of the goals accounting system were derived. These related developments are mentioned briefly here and are discussed in greater detail later on in this paper.

Thus, the present work draws on the earlier goals research at the National Planning Association which was aimed at relating a set of broadly defined national goals to the resources of the national economy. The critical element adopted from that line of analysis is the use of the resources base of the entire economy, and of activities of both public and private sectors. In all probability, at the level of output presently considered, a partial analysis confined to either the market economy or the households alone or only to public programs at the different levels of government, would be completely incapable of assessing the full set of production possibilities, because the inputs from the private sector and the public sector activities are highly complementary in production of improvements in the rates of social change.

The variables defining the goals outputs are in a large measure derived from the social indicator work, which in its modern embodiment was developed by social scientists in the late 1950s, and has continued since, finding expression in official governmental reports.<sup>3</sup>

Another component has been derived from new approaches to the analysis of public expenditure<sup>4</sup> and from the new theories and research in the field of consumer expenditures.<sup>5</sup> Both of these developments, in different ways, were concerned with the objectives for which the expenditures are made. These analyses helped in formulating the activity-output approach underlying the goals accounting system, and in selecting, from among the much wider range of social indicators, those that operationally could be considered to approximate most closely the objects of household and collective consumption. Current fiscal analysis also helped to define the concept of discretionary resources.

The goals accounting system is also related to work in economic projections and technological forecasting because it involves estimates of future resource supply and projections of the output coefficients, and to futurism in that it deals with contingent trends.

II. SUMMARY OF THE ESTIMATES FOR THE PERIOD 1973-83

1. <u>Components of the Goals Accounting System</u>. The analytical system for estimating the range of possibilities for producing discretionary social change consists of the following five elements: (a) Selection of areas of social concern such as health and public safety and identification of quantitative indicators such as the average life expectancy and the rate of violent crime to measure conditions that are the main objects of a given concern;

(b) Projection of ten-year trends in the indicators selected. These trends serve as the base from which discretionary changes may be produced in year ten;

(c) Identification of discretionary activities, their costs and their effects on the conditions measured by the indicators;

(d) Distinction between fixed and discretionary uses of economic resources on the part of individuals, private institutions and governments, and a ten-year projection of resources available for discretionary activities divided into two subperiods and into private and public sector components;

(e) Calculation of the maximum feasible output of combinations of discretionary activities that can be undertaken with the estimated resource supply.

The goals accounting system has been designed to be open-ended, so that it could readily accommodate changes in any of its components, such as addition or deletion of areas of concerns or of indicators, selection of activities and estimation of their possible effects and costs, and projections of resources. The estimates are tentative and preliminary.

As mentioned, the full rationale and discussion of this design and of the specific selection made is being provided in the forthcoming volume and cannot be described extensively here. Here I would like to summarize briefly the results obtained in the present round of estimates which were calculated for the period 1973-83 with the dollar magnitudes expressed in 1973 prices. These estimates supersede the quantitative results provided in the earlier articles.

Areas of Concern and Indicator Trends. In the present round of estimates, the set of social concerns selected for study and the indicators used to represent them were very similar to those used earlier. Table 1 lists the areas of concern and the indicators. It also shows the past, current and projected levels of the indicators used. (The present tabulation differs somewhat from those published earlier. The principal change from the past selection of goal categories is that the economic growth measured by GNP is no longer included as a goals category. This was done because economic growth requires different and a more complete analysis in its own right. But, the calculation of possible effects of the discretionary activities on economic growth is continued. An additional indicator is included for basic education representing dispersion of achievement of basic skills. Most indicators are now normalized for population size, and defined in terms of percentages or averages. In a few cases, however, it was too late to revise the entire set of estimates.)

The list of the areas of concern represents a set of domestic social concerns which require both individual and collective activity and resource expenditure for their support. The indicators are intended to represent the main dimensions of these concerns. The indicators represent a set of more basic and, therefore, probably also more stable variables than either quantities of goods and services purchased by the consumer units or the measures of volume of governmental programs and services, both of which serve the objectives represented by the indicator variables.

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	•	Table 1			
	A Summary List of Con	corns and Corresponding Indicators, 19	60, 197	's and 1983	
				ndicator L 1973	evels 1983
	Concerns	Principal Indicators	1960	Estimate	Projection
I.	Health and Safety				
	Health	Average life expectancy at birth years	60.7	71.3	72,7
		Percent of population with activity limiting disabilities	15.0	17.5	36,4
	Public safety	Number of violent crimes per 100,000 persons per year	265	668	668
u.	Education, Skills and Stan	dard of Living			
	Basic education	Index of performance in grade 12 based on standard tests1973-100	8,8.	100	305
		Percent of students 3 or more years behind 1973 average	2.4.	24	19
	Higher education	Number of persons completing college, thousands	392	957	1,542
••	Ability to earn	Number of workers not in the main- stream of labor force, millions	8.8.	11.1	8,8
	General level of earnings	Modian annual wage and salary earnings of individuals, thousands of 1973 dollars	4.8	5.9	7.8
ш.	Income				
	Adoquacy of income	Percent of population below the 1973 poverty standard	22.1	11.4	8.7
		Percent of population is near-powerty conditions based on 1973 definitions	8.1	4.8	3,5
	Continuity of income	Percent of population with living standard loss of over 30%	8.8.	8.6	8.7
IV.	Economic Equality				
	General economic equality	Income ratio: 20th as percent of 90th percentile	20	25	25
	Economic equality of races	Neen family income, Negroes as a percent of Whites	54	65	n
	Economic equality of sexes	Hourly earnings of women as percent of earnings of men	8.4.	60	60
٧.	Human Hebitat				
	Housing	Percent of persons living in adequate houses	n.s.	88	92
	Neighborhoods	Percent of persons living in satisfactory neighborhoods	<b>R.S.</b>	77	87
	Pollution control	Percent of population expessed to bothersome pollution	n.s.	62	46
	Outdoor recreation	Percent of persons 12 years and older taking part in outdoor recreation regularly	R.8.	21	54
	Preservation	Index of preservation of life and natural forms	R.8.	100	110
vi.	Art, Science, and Free Tim	<u>e</u>			
	Discretionary time	Discretionary timehours per person per year	8.8.	2,111	2,199
	Science	Number of scientists active in basic science, thousands	n.s.	81	139
	The arts	Number of active artists, thousands	206	265	323

Discretionary Activities, their Potential Output and Cost. The distinction between discretionary and nondiscretionary activities and the resulting use of resources is reflected in the identification of discretionary activities which have a potential to produce indicator output and which could be undertaken over the period 1974-83, and in the projection of supply of discretionary resources over this period. The discretionary activities were derived from a survey of existing policy proposals and of analytical studies in the respective fields of social concern. Their list is meant to include all the major possible activity innovations or extensions of existing activities which are technically and culturally feasible and which could have some positive effects on any one or more of the indicators chosen. Activities with negative effects are not included. The particular effects of the discretionary activities and their ten-year costs, specified by subperiod and fiscal source, were estimated at their judged

full capacity level beyond which they would not contribute productively. The estimates of activity effects and costs were arranged in two matrices which are shown as Tables 2 and 3, respectively.

Table 2 contains the activity-output matrix summarizing the effects of the 28 discretionary activities on the 22 indicators at full capacity. (GNP is an addendum item.) However, multiple activities sometimes may interfere with each other or one may be sufficient for achievement of a particular level of change. For these reasons the net effect of multiple activities on a given indicator may be less than the sum of the individual effects of the same activities. The maximum effect of all activities on each of the indicators is shown on the last line of Table 2.

The activity-cost matrix is shown in Table 3. The elements of this matrix are the private and public sector cost of the discretionary activities in each of the two subperiods. These distinctions are made in order to improve the realism of estimation because the resources clearly are not readily transferable between private and public sectors or between early and later periods. For many activities, substantial early resource uses are required in order to achieve the result at the end of the ten-year period. Two subperiods are defined to allow for these patterns.

The activity-output matrix and the activity cost matrix define the technical possibilities. The degree to which the technical possibilities are economically feasible is determined by the economic constraints which are estimated from a projection of discretionary resources.

The concept of cost of discretionary activities is based primarily on real resource costs. However, certain transfer amounts representing a 10 percent addition to the real GNP components are included because production of changes in certain goal indicators, such as reduction of the proportion of the population living in poverty conditions, may be accomplished by means of transfer of the economic output rather than its net production. The amount of these transfers included in the resource projection is constrained by the particular assumption made in the underlying economic projection.

Resource Projection. The first step in making the ten-year projection of resources which could be available for the discretionary activities was to identify within the national income accounts the portion of the economic totals which corresponds to expenditures in support of the goal categories included in the goals accounting system. The second step was to find the corresponding items within the current NPA economic projection. How this was done is described in full in the forthcoming volume. The third step consisted of identifying that portion of the total expenditures related to these goal categories which is necessary to support the projected base trends in the output indicators or which is in effect committed to ongoing activities and the residual which represents the discretionary margin. This residual is the estimated supply of resources available for performing the discretionary activities.

In the first step it was established that approximately 56 percent of the total economic resources (GNP plus the additional 10 percent of

transfers) represented expenditure for social goals. By analyzing elements of the ten-year economic projections made by the National Planning Association, the past growth trend of the share of social expenditures relative to GNP and to the GNP plus transfer components was identified and projected. The discretionary proportion of the total expenditure for social concerns was estimated by an extension of the fiscal dividend analysis. A mathematical formula was developed which describes the momentum of the ongoing commitment and its weakening over time. The critical parameter of the formula which describes the rate at which the committed resources become released with extension of the time horizon, was estimated by reference to existing official and private analyses of the federal government budget and private<sup>7</sup> analyses of state and local budgets. The public sector discretionary resources were estimated then from the formula. A further extrapolation was made for the private sector by reference to earlier and different studies of consumer expenditures for necessities and for service of fixed commitments.<sup>8</sup> The formula results are further constrained by a requirement that sufficient resources to support the base trends in the indicator levels remain nondiscretionary. The final estimates of discretionary resources and their composition by sector and subperiod are shown in Table 4.

In addition to this standard projection, alternative projections were made embodying various assumptions about the rate of economic growth and about shifts of resources between social and other objectives of spending. Neither seems to have any appreciable effect on the amount of discretionary resources available. However, changes in the rate which expresses the degree to which resource commitments are fixed could greatly affect the resource availability. The amount of <u>discretionary</u> resources is very small compared to <u>total</u> amount of resources available in the economy for the present group of objectives.

Estimating the Range of Feasible Changes. The final component of the analysis is calculation of the range of changes that are feasible both technically and economically. Technical feasibility is given by the coefficients in Table 2. The economic feasibility is limited by the resource availability which was estimated in Table 4.

In calculating the cost of simultaneous changes in diverse conditions represented by 21 different indicators, some rule is needed to select them systematically from the almost infinite variety of the possible combinations of changes. It is not possible given the present state of the art -- and probably would not even be desirable -- to collapse the distinct dimensions of the quality of life represented by the 22 indicators into a single index. The rule followed presently was to take uniform percentages of the technically feasible change, (shown in the last line of Table 2), and to calculate the least cost of that combination for different percentage levels of the technical potential first for all indicators and then for groups of indicators reflecting the more specialized concerns, such as with the environment or with education, skills and income.

The least cost was calculated for different levels of each combination until the cost of the the combination approximated the amount of resources available.

The least-cost estimates were made by an adaptation of linear programming which was developed in the present study to allow for the non-additivity of effects of individual activities on an indicator.<sup>9</sup> The method consists of using an expanded version of the activity-output matrix (not shown here) with different columns applicable to different levels of indicator output.

Under the strict assumption that each subperiod and fiscal component represents a distinct resource constraint on how much change can be achieved, it was calculated that only 16 percent of the technical potential would be possible

# Table 2

#### EFFECT OF ACTIVITIES ON GOAL OUTPUT INDICATORS, 1974-1983

						GOAL OUTPUT INDICATORS																		
			Health & Safety			Education, Skills, and Earnings				Adequacy and Continuity of Income			E.	Economic Equality			Human Habitat				Arts, Science, and Free Time			GNP
ACTIVITIES	Total Cost: 1974-1983 - 1973 dollars - billions	<ol> <li>Average life expectancy at birth</li> <li>years</li> </ol>	2. Percent of population with major disabilities	3. Number of violent crimes per 100,000 persons per year	4. Index of mean performance in grade 12 based on standard tests	5. Percent of students 3 or more years behind 1973 average	<ol> <li>Number of persons completing college - thousands</li> </ol>	7. Number of persons not in the mainstream of labor force - millions	8. Median earnings of individuals, 1973 dollars - thousands	9. Percent of population below poverty standard	<ol> <li>Percent of population in near- poverty conditions</li> </ol>	11. Percent of population with living standard loss of over 305	12. Family income ratio: 20th to 90th percentile	13. Nean family income, Negroes as a percent of Whites	14. Hourly earnings of women as percent of earnings of men	15. Percent of persons living in adequate housing	16. Percent of persons living in adequate neighborhoods	<pre>I7. Percent of population affected by bothersome pollution</pre>	18. Percent of persons regularly taking part in outdoor recreation	19. Index of preservation of life and natural forms	20. Number of scientists active in basic science - thousands	21. Number of active artists - thousands	22. Discretionary time - hours per person per year	23. GWP - 1973 dollars - billions
Base 1973 Base 1983		71.3 72.7	17.5	668 668	100 105	24 19	957 1342	11.1 8.8	5.9 7.8	11.4 8.7	4.8	8.6 8.7	25 25	65 70	60 60	88 92	77 87	62 46	21 54	100 110	81 139	265 323	2111 2199	1275 2033
1. Change in health-related habits and patterns	\$64	5.3	-3.3	-129								9							25				57	
2. Health services related to specific conditions	66	1.7	-3.1	-69								4											53	
3. Special health services for vulnerable population groups	91	2.5	-1.0																					·
4. Improvement of law enforcement systems	26			-180															Γ					
5. Employment and other opportunities for the young	51			-240	5	-4		-1.5		9	4			2										
6. Remodial and augmenting educational inputs	73		1	1	16	-11	50		.1				2	1										44
7. Improved educational technology and approaches	183			<u> </u>	21	-14	50		.2				1											60
8. General day care for children	126							-1.8		-1.7	-1.3		2		3				1				117	43
9. Universal access to higher education	273		1				1050		.2		4		1								20	32		29
10. Structural improvements in higher education	70		1				350		.1												50	11		10
11. Maintenance, updating and improvement of job skills	342				1		650	-3.4	.2	9	9		2	•	6						10	16		34
12. Specialized training for those outside mainstream of labor force	94							-5.0		-1.3	4	4		3					Ī					21
13. Private savings, insurance, pension plans	200									9	6	-4.3	1	1										
14. Old age pensions at 40% of current median earnings	30									-1.7	6	-2.6	ŗ	1										
15. Extended welfare program-tax and transfer to abolish poverty and near-poverty	76									-8.7	-3.5	-1.3		3										
16. Aid to depressed communities	171				1		1	-1.8	.2	9	9		1	2		4	5	-2	5					17
17. Construction and maintenance of houses	108						1			4	4			1		8	5	-2						
18. Design and testing of new neighborhood, city and regional environments	202								1							2	10	-9	3					
19. Innovations in cars, roads, and other transportation system components	155																	-4					71	
20. Pollution control	171																5	-29						
21. More basic environmental improvements	332																	-17	4					
22. Recreation facilities in neighborhoods	127	1.1	4														5		12					
23. Major parks and facilities	80																		5	10			Π	
24. Preservation of wilderness and scenery	26																			50			$\square$	
25. Pure science - institutions, education, communication	36																				51			
26. The arts - institutions, education, subsidies, new forms	28																					300		
27. Reduction in working time	107																						60	
28. Time-saving innovations	91								-4				1		2				ł				319	50
Total listed (output not additive)	( 3399)	(8.9)	(-6.8)	+448)	(27)	(-16)	(1300)	(-7.2)	(1.4)	(-8.7)	-3.5)	-6.9)	(9)	(12)	(11)	(8)	(13)	(-37)	(28)	(60)	(81.)	(315)	(677)	( 160)

### Table 3

# ESTIMATED COST OF DISCRETIONARY ACTIVITIES: 1974-1983 TOTAL

Distribution by Subperiod and Private and Public Financing Requirements

		r	T	Comp	As Percent			
			1		of Futal Cort			
				TOL		T	TOTAL	Coare
	ACTIVITIES	1974-1983 1973 dollars	1974-1977	₩ 1914-1917	rs 1 <i>9</i> 78-1963	we 1978-1983	1914-1917	st lays
		1.2	13	1 3	1	1 7		ø
		t a	ă	8	5	8	3	1
		124	4	1	4	1	đ	2
		123	1	1	Ten a	Í	13	3
1.	Change in health-related habits and patterns	64	17	16	15	16	52%	50%
2.	Health services related to specific conditions	66	ш	6	33	16	26	66
3.	Special health services for vulnerable population groups	91	30	0	61	0	33	100
4.	Improvement of law enforcement systems	26	10	1	15	0	41	96
5.	Employment and other opportunities for the young	51	7	2	34	8	17	80
6.	Remedial and augmenting educational inputs	73	n	1	55	6	17	90
7.	Improved educational technology and approaches	183	7	0	158	18	4	90
8.	General day care for children	126	17	4	84	21	17	80
9.	Universal access to higher education	273	5	0	268	0	2	100
10.	Structural improvements in higher education	70	п	2	53	4	18	91
<u>и</u> .	Maintenance, updating and improvement of job skills	342	46	22	183	91	20	67
12.	Specialized training for those outside mainstream of labor force	94	9	0	85	0	10	100
13.	Private savings, insurance, pension plans	200	. 16	64	24	96	40	20
14.	Old age pensions at 40% of current median earnings	30	0	0	30	0	o	100
15.	Extended welfare program-tax and transfer to abolish poverty and near-poverty	76	•	0	76	0	0	100
16.	Aid to depressed communities	171	18	3	136	14	12	90
17.	Construction and maintenance of houses	108	14	17	36	41	29	46
18.	Design and testing of new neighborhood, city and regional environments	202	16	16	85	85	16	50
19.	Innovation in cars, roads, and other transportation system components	155	1	7	27	120	5	18
20.	Pollution control	171	12	12	76	71	14	51
21.	More basic environmental improvements	332	75	8	224	25	25	90
22.	Recreation facilities in neighborhoods	127	15	10	61	41	20	60
23.	Major parks and facilities	80	13	3	51	13	20	80
24.	Preservation of wilderness and scenery	26	6	0	18	2	25	92
25.	Pure science - institutions, education, communication	36	4	1	24	7	15	79
26.	The arts - institutions, education, subsidies, new forms	28	3	1	16	8	15	69
27.	Reduction in working time	107	0	0	21	86	٥	20
28.	Time-saving innovations	91	1	6	17	67	8	20
lota	l listed (output not additive)	3,399	375	505	1,966	8%	17\$	69%

across the board in all the indicators. The limiting resource for all indicators together, as well as for the specialized groups of indicators, is the amount of discretionary resources available in the public sector in the first subperiod (defined to consist of the first four years). In order to obtain an appraisal of the maximum amount of change that might be available,

### Table 4

Resources Available for Discretionary Activities, <u>1974-1983</u>, by Subperiod and Sector (in billions of 1973 dollars)

Period	Available in the Private Sector	Available in the Public Sector	Total
1974-1977	\$82	\$19	\$101
1978-1983	1,208	399	1,607
Total for 1974-83	1,290	418	1,708

additional assumptions were made as to the extent to which the resources available in the public sector in the early subperiod could be augmented. After consideration of different possibilities, such as increases in taxation, borrowing or governmental productivity or development and substitution of private for public activity components, it was assumed that a total of \$40 billion could be used as a limit on the achievement of outputs in 10 years. With the \$40 billion in discretionary public sector resources as the effective constraint, 30 percent of the technically feasible improvement in each indicator was calculated as economically feasible. These 30 percent changes are shown in Table 5, together with the trend levels and the trend changes for the period. Because the activities have multiple output effects, more than 30 percent can be achieved for some indicators. But the table does not show such additional changes that would occur as a result of requiring achievement of a minimum 30 percent of the technical improvement potential in each of the indicators. The use of the matrix stage method to accommodate non-additivity of the effects in the least-cost calculation does not permit accurate calculation of these additional "slack variable" outputs.

But, even using only 30 percent, the amount of change that is both technically and economically feasible is quite substantial in relation to the trends. For 14 of the 22 indicators, it approximates or exceeds the amount of the autonomous trend improvements. When only some rather than all indicators are required to change, higher proportions of the potential are achievable. Therefore, the feasibility of achievement of subsets of goals such as those limited to health and safety or to the quality of the environment is at a higher percentage level. Those specialized estimations are not discussed here, but they are included in the forthcoming book.

However, it is very important to realize that, even if the numbers are assumed to be correct, the maximum feasible potential for change is not an estimate of the probable outcome. Indeed, in a non-market situation represented by large-scale activities which really are not within the scope of an optimizing decision mechanism, the possibilities for losses of efficiency are present at many stages of the implementation of activities as well as in choices of their components. The full range of possible outcomes then, with the base projection taken as given, is between an

### Table 5

### <u>Changes in Levels of Goal Achievement: 1973 Base, 1983 Projection,</u> and the Maximum 1983 Levels (Set at 30% of Technical Potential) Consistent with Judgmental Maximum Resource Supply of the Limiting Resources

		1973 Basa	1974-83 Base	1983 Trend	Maximum 1983 Level Assuming Achievement of a Minimum of 30% of th <u>Technical Potential</u> Increment over			
	Indicators	Estimate	Increment	Projection	Trend Projection	<u>Total</u>		
1.	Average life expectancy at birth - years	71.3	+1.4	72.7	+2.7	75.4		
2.	Percent of persons with major disabilities	17.5	-1.1	16.4	-2.0	14.4		
5.	100,000 persons per year Index of mean performance in	668.0	0	668.0	-134.4	533.6		
	grade 12 based on standard tests Percent of students 3 or more	100.0	+5.0	105.0	+8.1	113.1		
6.	years behind 1973 average Number of persons completing	24.0	-5.0	19.0	-4.8	14.2		
7.	college - thousands Number of persons not in main-	957.0	+385.0	1,342.0	+390.0	1,732.0		
8.	stream of labor force-millions Median earnings of individuals	11.1	-2.3	8.8	-2.2	6.6		
9.	in 1973 dollars-thousands Percent of population below poverty	5.9	+1.9	7.8	+0.4	8.2		
10.	standard Percent of population in near	11.4	-2.7	8./	-2.6	0.1		
11.	poverty conditions Percent of population with living	4.8	-1.3	3.7	-2.1	<b>2.</b> J		
12.	standard loss of over 30% Family income ratio: 20th to	ð.0 25.0	+0.1	25.0	-2.1 +2.7	27.7		
13.	90th percentile Mean family income, Negroes as	65.0	+6.0	71.0	+3.6	74.6		
14.	Hourly earnings of women as percent	60.0	0	60.0	+3.3	63.3		
15.	Percent of persons living in adequate housing	88.0	+4.0	92.0	+2.4	94.4		
16.	Percent of persons living in adequate neighborhoods	77.0	+10.0	87.0	+3.9	90.9		
17.	Percent of population affected by bothersome pollution	62.0	-16.0	46.0	-11.1	35.1		
18.	Percent of persons regularly taking part in recreation	21.0	+33.0	54.0	+8.4	62.4		
19.	Index of preservation of life and natural forms	100.0	+10.0	110.0	+18.0	128.0		
20.	basic science-thousands	81.0	+58.0	139.0	+24.3	163.3		
~1• 22	thousands	265.0	+58.0	323.0	+94.5	417.5		
<i>44</i> .	person per year	2,111.0	+88.0	2,199.0	+203.1	2,402.1		

increment of zero and an increment of the 30 percent of the technically feasible change in all indicators, and of higher proportions for more limited groups of indicators.

This summary of the results contained in the forthcoming volume is quite brief. But rather than go into details which are or soon should become available, I would like to spend the remainder of time discussing some of the issues applicable to the system as a whole. III. ECONOMIC ANALYSIS OF PRODUCTION APPLIED TO SOCIAL CHANGE

The goals accounting system is a result of application of economic analysis to the study of social change. Specifically, it is an application of economic theories of production and allocation to the questions of production of incremental social changes over a given time interval. Application of economic analysis to a noneconomic subject is not new. Formally, production of social change lends itself as much to economic analysis as any other kind of production. Indeed, present work draws on the considerable amount of economic analysis which has been applied already to many of the fields of social concern. The social concerns with income maintenance and with distribution and with aspects of human capital traditionally have been directly related to economic analysis and research. But, also the economics of some of the more specialized fields, such as health, has been reasonably well developed for some time.

The present study deals with the economics of production rather than of consumption and hence with the supply of rather than the demand for changes in the conditions represented by the 22 indicators. Consequently, the study is based on the economic theory of production. The production and the cost functions are defined by the two matrices which were shown in Tables 2 and 3. Technological conditions expressed in these functions are given exogenously by a survey of technological opportunities. This survey is described in detail in the forthcoming publication. The parameters of the production function include the activity-output and activity-cost coefficients, capacity limits of activities, and the interaction coefficients representing the nonlinearities of production by multiple activities which are included in the multi-stage matrices.

The present production function has a few specific characteristics. First, it is an incremental production function defined for a ten-year period for the discretionary increments of changes in the conditions measured by the indicators. These changes are in addition to changes given by nondiscretionary trends. These trends are treated as given in the use of resources, in the content of ongoing activities, and in the output of the production processes for which the resources are used.

The production function is an activity analysis function. For each activity a capacity level is defined. For activities taken singly, the output is proportionate to the level of activity from zero to the full capacity level. At levels beyond capacity the output remains the same as at the capacity level.

The production function deals with marginal products achievable over the time interval. With this focus of the question, there is no need to explain the base trends or the initial conditions represented in them.

Even though constant returns were assumed within each activity, diminishing returns prevail in production of change in every indicator between the activities even in the absence of interactions, because activities differ in the productivity (i.e., cost-output ratios), for each indicator output, and because more than one activity affects each output. Therefore, the least-cost expansion path for each indicator follows a diminishing returns path (though theoretically it could be constant for some) consisting of segments of progressively lower productivity. The diminishing returns to individual indicators are strengthened by the circumstance that for many indicator outputs there are negative interaction effects among activities.

Another feature of the production function is existence of pervasive joint products even at the present very high level of aggregation. The activity output matrix cannot be particulat all into any submatrices.

The level of aggregation embodied in the production function is very high. Unlike in microeconomic analyses where the individual production processes are well within control of single firms or even departments of individual firms, there are no decision units corresponding to an activity in the present case. The activity is an analytical construct not a counterpart to an organization. In practice, many decision units would correspond to any one of the present activities and there would be much strategic behavior among them, as well as uncertainty, lack of information, time lags and other impediments to optimal equilibrium.

The budget constraint which defines the locus of feasible transformation possibilities is given by the projection of the discretionary resources.

Conceptually, present analysis addresses only the supply side of economic relationships, in that it deals with estimating the production possibilities frontier. It leaves out the demand side which could help identify optimal locus on the possibility frontier. The primary application of the goals accounting system, therefore, lies in efficiency analysis. The methods here developed (assuming that the data used is reliable or materially more reliable than alternative information) may help to establish whether or not a given point lies on the efficiency frontier or within it thus incorporating waste.

However, economic analysis can illuminate the demand side by contributing some criteria to definitions of categories of social concerns and output indicators or at least some criteria for distinguishing among alternative categorizations and measurements.

### IV. IDENTIFICATION OF AREAS OF CONCERN AND OF THE INDICATORS TO MEASURE CONDITIONS IN THOSE AREAS

1. Level of Definition. The areas of concern and their indicators are defined at the level at which the objectives of collective and individual activities can be quantified, the resource uses identified, and the productive relationships estimated. Output defined at this level is presumably more fundamental and more closely related to utility of individuals than the output measured at the level of conventional goods and services exchanged in the market or at the level of workload items of public programs.

Most categories of social concern used in the goals accounting system are readily recognizable from other uses. They include, among others, health, basic education, safety, and recreation. Also, many of the indicators chosen as summary measures of the conditions in these categories are well known statistics, such as mean life expectancy at birth, average earnings of working individuals in constant dollars, or proportion of population below the poverty line. Others, such as the proportion of workers not in the mainstream of the labor force, or the adjusted rate of violent crime, are derived from more or less well-known public or private statistics. A few indicators were simply outlined or postulated, where no statistics exist. This group includes proportion of population affected by pollution, proportion of

population living in satisfactory neighborhoods and the index of conservation.

At this level of definition the categories of concern are not oriented to the even more fundamental but intractable categories of values. The categories and the indicators do not address the fundamental, cultural or moral values or underlying principles of behavior. They are not on that plane. Rather, they represent definitions and measurements at a level intermediate between the conventional economic quantities (real dollar expenditures, man-hours worked, indexes of goods and services produced, etc.), on the one hand and either the fundamental principles of maximizing behavior of individuals (which in the economic literature has been called "utility") or basic and difficult intangibles (happiness, enlightenment, salvation) on the other.

The present system of categories and the indicators they represent attempts primarily to extend the application of economic analysis at least on the production side from the objects of market transactions and the amounts of taxes and public spending to a more generalized process of social production in which the objectives of individual and collective consumption which are measured by aggregate indicators are treated as goods and the market and public goods and services are treated as intermediate inputs.

The present analysis was developed at the time of and is based in part on analytical developments which were motivated by the dissatisfaction with the limitations of and desire to generalize such traditional formulations of the performance variables of the economy as the average family income or the economic growth rate. In going beyond real product and income, the indicator output variables of the goals accounting system attempt to represent the real quantities of some of the results of what the individuals and social institutions, including governments, presumably spend their income for.

Perhaps in the conditions of great economic scarcity, with consumption of necessities absorbing all or nearly all of income, measurement of income was, and is, a sufficient priority indicator for judgments about the level of economic and perhaps even social well-being. But, at higher levels of income, such as now attained in the United States, direct measurement of objectives of expenditure and a long-term view of these objectives and of income are appropriate. Many intellectual developments contribute to interest in direct measurement of the standard of living by means of the indicators of "quality of life."

There is now a much increased understanding of the difference between the expenditure of resources for a purpose and accomplishment of that purpose and of possible difficulties in translating expenditure into its purpose. This distinction is basic to two analytical developments which pursue it in private and in public sectors, respectively: the new economics of consumption and public program analysis. These developments had a large influence on the formulation of the activityoutput and the activity-cost matrices included in the present system.

In the public sector, the initial concern was with attempts to estimate the economic value of benefits produced by public works in order to

compare them with cost.<sup>10</sup> The analysis was extended to comparative costs and effects in defense expenditures and finally to the entire budget of the federal government with considerable adapta-tions in the state and local governments! Underlying this movement was the growing recognition in and out of government that expenditure of money is not a sufficient definition of results of a public program but that these results should be measured in terms more directly relevant to the specific policy objective and presumably to the utility of individuals for whose benefit the program is conducted--in the case of public goods the entire population. While a satisfactory measurement of the public sector output may still be some time in the future, some beginnings have been made in developing useful real output indicators for some government programs.

New research in the consumer sector has been concerned with defining objectives of consumer expenditure. This analysis is much more empirically oriented and has a much firmer theoretical foundation than the analysis of output in the public sector.<sup>12</sup> The more traditional analysis of the consumption process stopped with the act of purchase by consumers of a given commodity. The new approach focuses on the consumption process which entails use of purchased goods along with work, time and other resources in activities on the part of members of households (which could consist of single individuals). The objective of this process is to transform the range of purchased commodities and other endowments and resources of the household into outputs or outcomes such as health or care of children. These outcomes or outputs are more directly related to the utility and hence the objectives of the households than the commodities and other inputs used in their production. This process has been called the household production process. At the same time, it was also realized that individual commodities possess multiple characteristics and that these characteristics when combined with other commodities embodying their own distinct sets of characteristics, can be used as inputs in producing the more desirable combinations of characteristics, which either directly or indirectly can serve in the household production activities. The existence of multiple characteristics has also been used in the analysis of price differentials among the nonhomogeneous consumer and capital goods!4 The present formulation of multiple activities with multiple outputs is analogous to this concept.

2. Partial Coverage. Even at the level of measurement which it addresses, the coverage of the goals accounting system is not complete. Less than the full range of national expenditures is represented.

As already indicated, the categories of concern and their output indicators were defined at one particular level. The present study has explored the extent to which the different types of social changes lend themselves to analysis within the framework of economic production. At the beginning of the present research, attempts were made to include categories of freedom, justice and harmony. Search was made for some at least partial indicators for these categories with which estimates of a set of productive

relationships for conditions represented by these indicators could be developed. These attempts were not successful. The difficulty was encountered at the first stage of specifying an indicator which would satisfy the criteria of general or at least wide acceptability of its relationship to the object it was intended to measure. Therefore, the second level of difficulty which might arise in identifying productive relationships for the activity-output matrix and the activity-cost matrix was not encountered. It was possible, on the other hand, to specify indicators and, at least to some extent, the productive relationship for possible changes in the several dimensions of economic equality which were included as areas of social concern.

All output indicators are assumed to have a recognizable normative direction. As objects of household and collective production, they should have positive marginal utility. At this time, it was postulated that they do, but no validation test has been performed. The general, and perhaps even universal prevalence of positive marginal utilities can probably be argued, a priori, in case of objects of household production, such as health. Such hypotheses of positive marginal utility are testable by the now available empirical methods. But the goals accounting system also includes indicators representing the distributional changes as well as public goods (e.g., science) which are not in any major way objects of observable economic household behavior. Existence of a consensus for valuation of the direction of change is now argued ad hoc for each of these categories. It is not clear whether any empirical validation tests based on observable behavior could be designed at present for these categories.

Coverage of activities is also partial. The list of 28 activities included in the activity output matrix does not correspond to the full range of plausible futuristic scenarios. Not included among the present activities are changes with negative effects on any of the indicators or on basic social values. Also not included are any of the broad changes in the society and culture, such as, for example, changes in the general social climate regarding expectations for the future or in the extent of trust existing among the members of society. Level of trust present in the culture, it has been observed, contributed much to economic growth, for example, through the overwhelmingly voluntary compliance with contracts. Undoubtedly, changes in the level of trust would affect productivity in achievement of social outcomes here discussed. But such changes in culture are autonomous or at least not within the scope of economic production activities.

3. <u>Selection of Categories of Concern</u>. The specification and selection of categories is limited with regard to level and scope. The choice of level, intermediate between conventional goods and services and the basic values was already discussed.

In order to limit the amount of work, it was decided to focus on a group of interrelated concerns and to limit the selection of the areas of concern to domestic social fields, excluding international relations and national defense categories on the one hand and certain business investment and consumption items, mainly food and clothing, on the other. Also excluded were the concerns with the overall performance of the economy, i.e., employment, price stability, international balances, and economic growth for which welldeveloped analytical models already exist, which at some point could perhaps be linked with the goals accounting system. In any case the selection made was thought to have sufficient variety of concerns to permit study of achievement of multiple goals simultaneously.

The categories of concern were determined primarily by reference to earlier categorizations made by others on other occasions. These included categorizations used in the analysis of consumer expenditures and the functional categories of public budgets<sup>15</sup> in earlier goals research at the National Planning Association which in turn followed categorizations in the report of the Commission on National Goals of 1960;<sup>6</sup> in the social indicator field;<sup>7</sup> and in discussions of public affairs.<sup>18</sup>

The choice of some of the categories, such as health, public safety, basic education, and higher education was almost obvious. The reason for including others was less clear-cut, especially for such newer fields of articulated public concern as environmental quality or supply of basic resources. Pollution control was included but the basic environmental improvements and continuity of supply of necessary resources emerged as articulated issues too late to be incorporated in the body of this work. However, as developed, the goals accounting system can readily accommodate future additions, reformulations or deletions of areas of concern.

Some fields which were included, such as conservation, the arts and science, while wellrecognized as objects of collective concern and production, are at present not directly relatable to the framework of household production. One of the issues raised for the future work in goals accounting is how to treat public goods (including distributional) categories of concerns in a theoretical framework based essentially on the household production model aggregated to the national level. One possibility is to omit categories which are not directly objects of household production and perhaps add those, such as food, which were not presently included. The result would be a consumption model with goods redefined as objects of consumption as given by the household production processes permitting perhaps some new useful analyses, e.g., of living standards or cost-ofliving defined in terms of the more basic variables than income and quantities of goods and services. Another possibility, the one followed presently would be to include collective or mostly collective categories alongside those which represent directly objects of household production and hence direct indicators of well-being of families and individuals. Still another possibility would consist of incorporating the collective concerns into a household utility model defined not as elements of governmental activities, such as biomedical research or public schools which contribute inputs to the already recognized household production processes but the public goods, and distributional concerns. Whether such an attempt would be successful is not clear. In any case, the task would be extremely difficult, but perhaps not

hopeless. That useful analytic connections may be feasible is suggested by the circumstance that such a seemingly exogenous variable as population growth has been shown to be, at least in part, directly related to the desired family size and age structure which is an object of household production.<sup>19</sup> Such an approach would undoubtedly require a more complex analytical model than the one embodied in the present set of matrices and a more general concept of resources and cost than is presently used.

Within the field of household production, economic analysis can help in identifying categories of expenditure. The analytical tool of demand analysis may be of help in identifying groups of expenditures corresponding to groups commodities within which economic substitution and complementarity relationships are strong while they are weak or nonexistent between its members and commodities not in the group. The available methodology of econometric research permits in principle to establish which of the alternative categorizations reflect existing behavior better or worse.

As far as public expenditure is concerned, it is easy to identify the formal budgetary categories of governments. Some divergence exists between the detailed institutional decision-making structures, such as governmental agencies, appropriation accounts and congressional committees acting on them and the functional objects of governmental expenditure, but at the summary level the degree of correspondence is considerable. Those categories of public expenditure which already correspond to objects of household production probably should be examined together with private expenditures for those objectives. It is not clear, however, whether formulation of public goods categories should be derived from existing organizational and functional divisions in public budgeting, or whether the criteria for their definition should be sought directly in individual and household behavior.

4. Selection of Indicators of Social Change. The procedure followed in the choice of indicators for the fields of concern was to examine the existing general statistics and the social indicator literature for each field. The objective was to represent the principal or at least one or more of the important concerns of the field, so that the indicators selected would correspond in an important way to the objective of the field of concern. For some fields, such as health, or economic equality of races, it was comparatively easy to identify the statistical indicators which have had wide currency and which would correspond in a reasonably good way to the principal consideration, even if they did not completely cover all the important aspects of the concerns reflected in the field. In the field of health, two indicators rather than one were considered necessary because the state of health cannot be described adequately by survival alone. A person may be in importantly different conditions of health or disability, and the second indicator, prevalence of disabilities was therefore included. Another and sufficient reason for including the second indicator was that the correlation between causes of disability and causes of mortality is comparatively weak and potential reductions in disability are

not highly correlated with potential increases in life expectancy. The degree to which the indicator selected was correlated with an alternative or additional indicator was another criterion for deciding on the number of indicators. If two are highly correlated, little insight is gained and much statistical noise is introduced into calculations by including both indicators.

For some of the other indicators, while some precedent existed, the statistics were very limited or not available at all. In the case of basic education, an index of the average scores of tests of verbal ability, writing and mathematics at the twelfth grade was postulated as the indicator along with the proportion of students more than three years behind the base year average. But, the actual trend data had to be pieced together from different sources, and comparability of different sets of tests had to be assumed. As an indicator for the concern with the public safety, it was decided to use the violent crime rate. But it was necessary to adjust the reported crime statistics for underreporting in order to obtain an estimate of crimes actually occurring. The adjustment was based on the data in the victimization survey conducted in the mid-1960s.

In still other fields, it was necessary to formulate conceptually the kind of indicator which would represent the basic concern and either attempt to develop the actual measurements, which Was possible to do for recreation, or to derive a very rough estimate from rather tenuous information, as in the case of pollution control, or finally simply to postulate an index without even specifying its content and to assume rough orders of magnitudes for possible changes in this index as was done for conservation. This last procedure probably would not be very useful in the future except perhaps at an intermediate stage for facilitating inclusion of new fields for which information is typically very deficient, and rough judgments about the magnitudes may be preferable to omitting the field entirely.

Methods developed in economic research probably can be of some help in distinguishing among alternative indicators and in decisions on how many indicators may be appropriate for a field. In particular, the so-called "hedonic" analysis which attempts to explain differences in prices of complex commodities embodying many diverse characteristics, such as houses or automobiles, may be applicable. It may help in distinguishing, for example, between formulation in terms of one set of characteristics vs. another which would give rise to alternative indicators. For example, an analysis of automobile prices attempted to compare the explanatory power of physical specifications and of the performance variables as determined through consumer reports.<sup>20</sup> In terms of present categories, such an analysis may help, for example, in formulating an index of the quality of neighborhood reflecting judgments of the prospective buyers of houses and tenants derived from alternative formulations of definitions for neighborhood characteristics while holding all the other characteristics of housing constant and analyzing the actual behavior of a representative sample of renters and buyers<sup>21</sup> Such an indicator would represent a great improvement over the presently assumed indicator. Methods of economic research

together with the survey methods and other techniques of social research could within the scope of their applicability inform and test the judgments made by academic researchers and government statisticians in developing indicators and in choosing among them.

### V. TREATMENT OF TIME

Time defines the scope of the goals accounting system. In the estimates presently developed, the time period is 10 years. The output is counted at only one point in time, at the end of the period. Outputs at times before and after the 10th year are not measured. Cost is measured by the flow of resources used over the entire period up to the 10th year, but not beyond that year, with further differentiation of this flow between costs incurred in the first four years and in the later six years of the ten-year period. This distinction corresponds to the distinction made in the resource constraints and in turn reflect judgment that the substitutability of resources between the time periods is limited.

1. Time Dimensions of Output. The output analysis is basically static, though it is incremental and historical in the sense that it is built into a time series analysis and utilizes existing time series statistics. Output is seen only at a point in time. This is an abstraction. perhaps useful, but it entails a limitation. The time of availability of output is clearly an important element in preferences and a truly dynamic analysis which would treat output as a future time path for each indicator, presumably would be more realistic. Such more generalized analysis, however, is totally impractical at the moment. Analytical complexities alone would preclude it. Problems of calculation and numerical analysis would be formidable and possibly insuperable. No basis exists for postulating any pattern of time preferences which might permit some simplification. such as use of discount rates.

It is possible, though, to establish the intertemporal tradeoffs within indicators and among indicators for two or more points in time. Of course, the amount of estimation and the empirical content of such analyses would represent a manyfold expansion of present scope of research.

For that reason, after the completion of the present estimates, a pilot analysis was begun of intertemporal tradeoffs within a single field of concern, in basic education. This work is still in progress and the results are not available, but the basic structure of that analysis can be sketched out. It consists of two output indicators, one the same as presently used for basic education, i.e., the mean level of achievement on the three tests, and the other, slightly different, representing the proportion of students one year or more below the base year mean, both defined at twelfth grade. It deals with the three points in time: 4 years, 10 years and 25 years from the base year which gives estimates for 1977, 1983 and 1998. Because the outputs at each of the three points in time are distinct there are in effect six different outputs in the model. Six activities are identified which can increase the level of one or more of these outputs above the trend level. Some of the activities yield output at one point in time

while other activities yield output at other points. For example, activities consisting of increasing learning in early childhood yield output only in year 25. With the given economic constraint estimated from projections of school age population, economic growth, and revenues available for financing of education, the tradeoff rates in production (transformation rates) among the different pairs of outputs at different points in time can be calculated.

This approach is probably sufficient to form judgments about the structure of the intertemporal tradeoffs. Increasing the number of points in time, which would be a way to approximate a truly dynamic analysis in addition to being very laborious does not appear likely to add much to the insight that could be gained at this time, but this is only a surmise.

2. <u>Time Treatment of Inputs</u>. The inputs are aggregated over the entire period and are also specified as to the time of their use between two subperiods. Clearly, some activities require longer initiation than others or need preparatory phases in order to yield output in a given year. These early phases may include research or simply a build-up phase of a large activity such as removing the financial obstacles to access to higher education. The existing capacity of the higher education institutions would not permit instantaneous admission of all potential applicants, even if the funds were available.

In order to recognize the differences in the time shape of activities, two subperiods were defined of four and six years, respectively, and the expenditures were aggregated over those subperiods. The reasons for choosing only two subperiods and of these particular lengths are as follows: the scope of the present study could accommodate only a few subperiods. Little would be gained by attempting a year-by-year analysis; clearly the data does not permit that fine a resolution. In fact, the empirical data made it very difficult to distinguish among even three subperiods as was attempted initially; two of them invariably got blurred. And yet, one period would not be enough because the time shape of resources availability is highly unequal between the early and later years of the ten-year period. The disparity in the discretionary amounts estimated to be available, say, in the third year and in the eighth year is practically enormous. Because the activities do have different time-cost profiles, the time-shape of the availability of resources is an important determinant of the economic constraint. Using aggregates for two subperiods as distinct inputs, was virtually the only available choice consistent with making some allowance for the differences in the early resource requirements among the activities, on the one hand, and the tremendous differences over time in the supply of the discretionary resources on the other. The length of four and six years was chosen by first reviewing the activity time profiles. It was decided that the initiation phase should be shorter than the implementation phase but longer than two years, because the very short initial period would be very vulnerable to the uncertainties in the actual estimation of the early resource requirements. Also, the very small size of the discretionary resources in the public

sector available over such periods could easily be lost within the margin of fiscal fluctuations. The same problem but in lesser degree applies to the three years. For that reason a four-year initial period was chosen.

The treatment of cost is thus not truly dynamic either but begins to approximate it. At this point, it is far too early to contemplate a dynamic analysis of both outputs and cost. The ongoing study of basic education to which I referred, will deal with cost over several time intervals and may throw some additional light on the implication of treating both outputs and inputs as time sequences.

## VI. RELATION TO POLICY-MAKING

If the experience with the preliminary results is a good guide, the goals accounting estimates are likely to be used in a wide variety of situations as a reference source of information. The particular applications would vary quite a bit with the characteristics of particular users and their purpose, as well as with the type of organization involved. Perhaps the methodology and the data of the goals accounting system could also be helpful in construction of analytical policy models in government, business, and other organizations. But no experience is available with such an application. In any event, the goals accounting system itself is not a policy model. I dwell on this point because it has been often misunderstood.

In part, the goals accounting system consists of a formal optimization (cost minimization) model for social changes measured by indicators representing long term national averages and aggregates. Many formal decision or policy models have also been designed in this form but with different variables. This similarity of form may give a misleading impression that the goals accounting system could be viewed as a decision model. It cannot. It has no utility function and even its efficiency results are limited by the scope of the model. There are also three fundamental empirical differences between decision models applicable to real decision units as they exist and the present goals accounting system.

Differences in Output Variables. The output criteria or output variables in the goals accounting system are very different from the output variables of actual decision units, governmental or private. The output variables in the goals accounting system include such aggregate summary indicators as the national average life expectancy at birth or average earnings per worker while the outputs of actual decision units, such as governmental agencies or program divisions within them concern much more intermediate variables such as, at the national level, research budgets of the different National Institutes of Health or number of persons entering the nursing profession, or at the local level the number and staffing of the school health units.

Theoretically, one could express national life expectancy as a function of intermediate variables representing outputs of a decision unit and of variables exogenous to the decision system of this unit by means of some function such as:

 $L = L(X_i, E_k)$ 

where L represents life expectancy, measured perhaps best as an increment in life expectancy that can occur over a specified time interval, the  $X_i$ 's, i = 1, ...n; stand for the output variables of the programs of the organization for which the policy model is being developed and  $E_k$ 's; k = 1, ...m, are all the other variables which could affect the change in life expectancy. Normally, the effects of the individual  $X_i$ 's would depend on each other, and on the effects of the  $E_k$ 's.

Analyses in which an aggregate social indicator is expressed as a function of policy variables would be useful in many cases, and the present estimates might be of some help in conducting them. But, the very few explicit decision models that actually exist do not make such connections between the output variables of the decision units and the macro indicators. There is a serious and real issue regarding who should be developing such decision models. The agency managers may be correct in their reluctance to go beyond their clear mandate, leaving the task of making these connections to interested outside evaluators. There exists, for example, no stated policy that the government of the United States is attempting to maximize life expectancy, which would permit, in principle, a government agency responsible for a health program to convert its direct output variables Xi into the effects of their output variables on life expectancy,  $X_i \frac{\partial L}{\partial X_i}$ 

Aside from the formidable estimating problems resulting from the instability of the  $\frac{\partial L}{\partial X_1}$  's because

of all the other effects on L, there are still greater difficulties regarding the normative validity of this translation because of differences in the public goods content, equity effects, risk and uncertainty of the individual  $\frac{\partial L}{\partial X_i}$ 's.

Also, it is in the practical interest of maintaining the consensus necessary for the program, to measure its effects by the direct output variables rather than in terms of their effects on social conditions which usually are multiple and often controversial,<sup>2</sup> as well as in the (bureaucratic, but very real) interest of income maximization of the producing unit, i.e., of the budget of the given governmental agency.

This discussion is not meant as an argument against analysis of existing connections between public programs and social conditions, but an attempt to point out that even in the case of large programs of the national government the differences between the objectives of decision units and the macro indicators are fundamental, and the connection between them may be complex, subtle and uncertain. Analogous problems arise from differences in the time horizons.

<u>Differences in Time Horizon</u>. The present analysis deals uniformly with a projection of possibilities of change over a ten-year time interval. The actual decision units have a different time phasing which, on the one hand, seems to involve a much shorter time horizon and, on the other, implies, at least informally and in some inarticulated way, a principle of dynamic optimization where the output is perceived as an entire path in time. Intent of dynamic optimization is often expressed in public policy-making at any level of government; in business, the short-term maximization of accounting profits has been shown to be a comparatively weak and inaccurate explanation of corporate behavior also suggesting dynamic optimization. Finally, studies of household behavior regarding important long-term decisions, for example, in building a family or in choosing jobs, offer evidence of dynamic optimization on part of the households.

Yet, regardless of any normative argument, one may maintain that as a matter of fact for many units in the public sector, the decision-making horizon is shorter than ten years. Then, the kind of activities which are undertaken represent extensions along short-term supply curves, which consist largely of changes in the size of the operating staff and budget. Over the longer period, such as 10 years, the activities would normally embody substantial capital investment and research and development components which are not available for short-term results. The activities in the present goals accounting system were formulated in the long-run period. Therefore, there is no direct correspondence between the time horizons of typical decision units and of the goals accounting system in this regard.

Differences in the Decision Content of Activities. The large-scale activities included in the goals accounting system have no coherent decision mechanism. For that reason, the present goals accounting system resembles more a set of economic projections than a structured decision model. The only way to determine the degree of possible correspondence between the activities as here defined and the outcome of behavior of actual decision units would be to develop a theory of multiple decision-making with different output variables, time horizons and organizational frameworks and behavior patterns within the categories of the present activities and to estimate the dependence of the aggregate system on these microrelationships. While this view may help in making useful conceptual distinctions and may even suggest a desirable direction for future research, such task cannot be accomplished empirically in the foreseeable future.

In defining an activity, attempts were made to picture a realistic scenario under which such an activity could actually occur. These scenarios are not policy scenarios; they are rather contingent trends. For example, the physical fitness component of activity one would occur if, for reasons of health and recreation, large numbers of persons decided to pursue physical fitness and the public and business sectors provided complementary facilities to support such a developing demand. It does not mean that provision of the facilities by the public sector would bring about the interest in physical fitness on the part of individuals. In general, activities rest on the assumption of existence of complementarities between components from different groups of decision units.

I do not believe it would be practical to develop a general purpose policy system model by expanding the present estimates to a greater level of detail. Even if the data could be obtained, its complexity would be overwhelming and its validity questionable. On the other hand, I consider estimation of selected points along the possibility frontiers to be useful, because it provides measurements and information which could be useful in a wide range of applications in research and policy analysis, without being specialized to any particular type of decision units.

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<sup>15</sup>Lancaster, 1966, <u>op</u>. <u>cit</u>.; <u>idem</u>., 1971, <u>op</u>. <u>cit</u>.

<sup>14</sup>Zvi Griliches, ed., <u>Price Indexes and</u> <u>Quality Change</u> (Cambridge: Harvard University Press, 1971); Jack E. Triplett, "The Theory of Hedonic Quality Measurement and Its Use in Price Indexes," (Bureau of Labor Statistics Staff Paper No. 6) (Washington, D.C.: U.S. Government Printing Office, 1971).

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