REPORT OF THE

PANEL ON SOCIAL

SECURITY FINANCING

TO THE

COMMITTEE ON FINANCE

UNITED STATES SENATE

PURSUANT TO

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(II)

Hon. RUSSELL B. LONG,
U.S. Senate,
Washington, D.C.

DEAR MR. CHAIRMAN: The Panel on Social Security Financing, appointed by the United States Senate Committee on Finance pursuant to Senate Resolution 350 of the Ninety-third Congress, is honored to transmit to you our report. The members of this Panel are unanimous in the findings and recommendations therein. We believe that we have given sufficient study to the essential questions so we are confident that our observations justify attention and action by your Committee.

We are grateful to the Committee for the privilege of engaging in this extremely important activity.

Respectfully yours,

WILLIAM C. L. HSIAO,
Project Director.

PANEL ON SOCIAL SECURITY FINANCING

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(V)

Report of the Panel on Social Security Financing

Preamble

The panel [1] was appointed as a result of a Senate Resolution of June 26, 1974 sponsored by the Senate Committee on Finance, for the purpose of giving to that Committee "an expert, independent analysis of the actuarial status of the social security system."

The request for this evaluation arose from the Finance Committee's examination of the 1974 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds. Specifically, the following statement in that Report (at page 38) precipitated the request:

> The long-range actuarial cost estimates ... show an actuarial balance of − (minus) 2.98 percent of taxable payroll over the valuation period of 75 years, which substantially exceeds the acceptable limit of variation. . . .

This panel's study has been limited to the OASI segment of the OASDI system. The estimate in the Trustees' Report attributed more than 85 percent of the projected average deficit to the OASI segment, and only the remaining 15 percent to the Disability Insurance segment.

This Report supports the conclusion that a long-range deficit of material size is likely. It recommends that attention be given to means of financing this deficit; but, equally of importance, it recommends that changes in benefit structures be sought to reduce the present undue sensitivity of the benefit structure to fluctuations in economic conditions.

This Report contains no specific proposals for the means of removing or narrowing the expected financial gap; such proposals are outside this Panel's charge.

In view of limitation of time, the Panel concentrated its study on the structure of the retirement benefits and its impact on the financing of the program. Other benefit formulas such as survivor benefits may deserve an equally thorough study.

I. Summary of Findings and Recommendations

First Finding: The Actuarial Status of the OASDI System is Unsatisfactory

Our studies suggest that the income to the OASDI program over the next 75 years, arising from the payroll tax rates scheduled under present law, will fall considerably short of the amounts needed to pay

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[1] The Panel members are: Peter A. Diamond, Professor of Economics, Massachusetts Institute of Technology; William C. L. Hsiao, Associate Professor of Economics, Harvard University; Meyer Melnikoff, Senior Vice President and Actuary, Prudential Insurance Company; Ernest J. Moorhead, retired actuary; Edmund S. Phelps, Professor of Economics, Columbia University; Walter Shur, Executive Vice President, New York Life Insurance Company.

the benefits provided by that same law. Our best estimate is that this income will need to be increased by an average of about 20 percent during the first half of this period, and to be about doubled during the second half.

Thus, we not only confirm the seriousness of the long range financing problem indicated in the 1974 Trustees' Report, but we believe that the size of the deficit may be even greater than predicted in that Report. Following is a brief comparison, for selected years, of payroll tax rates scheduled under present law, and projected expenditures expressed as percentages of taxable payrolls from the 1974 Trustees' Report and from this Panel's analysis:

[In percent]

Calendar year	Combined payroll tax rate	Expenditures as a percentage of taxable payroll	
		1974 Trustees' Report	This panel
1975	9.9	10.2	10.2
1990	9.9	11.0	11.5
2010	9.9	12.7	14.6
2030	11.9	17.6	23.3
2050	11.9	17.2	23.9
Average	10.9	13.9	16.9
Average deficit		3.0	6.0

Our estimates of expenditures as percentages of taxable payrolls exceed those in the Trustees' Report for two principal reasons. First, we assumed that fertility rates would continue their downward trend until 1980 before beginning an upswing. The 1974 Trustees' Report assumed that the trough in fertility rates had already been reached. Second, we assumed a long term average inflation rate of 4 percent per year compared to the Trustees' 3 percent assumption. These assumptions are discussed fully in Section VII of this report.

We conclude, as others have, that the serious long range financing difficulties of the OASDI program are attributable jointly to the expectation of an increasing ratio of OASDI beneficiaries to the working population, and the nature of the benefit formula. Our figures suggest that each of these two factors accounts for about half of the problem.

While the long range financing problem is far more serious than the short range one, we believe the benefit structure of the social security system should be overhauled in the near future along with additional financing. Unless this is done the present Trust Fund will be seriously eroded in the years immediately ahead, and will be exhausted by the late 1980's.

SECOND FINDING: THE PRESENT FORMULA FOR DETERMINING BENEFIT
AWARDS AT RETIREMENT RESPONDS IRRATIONALLY TO CHANGES IN THE
RATE OF INFLATION

The present Social Security benefit formula, legislated in 1972,
automatically adjusts benefits to reflect changes in the Consumer
Price Index. Also the maximum taxable earnings base rises according
to increases in average wages under covered employment. These "in-
dexing" provisions were introduced to provide a more orderly and
timely means of adjusting benefit levels in response to inflation, rather
than the ad hoc increases voted from time to time by the U.S. Con-
gress. An automatic mechanism for this purpose is commendable, but
only if it operates in a rational manner.

One measure of the rationality of a retirement benefit formula is
the so-called "replacement ratio." This is simply the ratio of the bene-
fit award at retirement to the worker's earnings just before retirement.
The general level of these ratios, how they vary for workers whose
earnings histories differ or who retire at different times, and how they
vary under differing economic conditions, are important indicators of
the ability of the system to achieve its intended purpose.

We find that the present benefit formula responds irrationally to
changes in the rate of inflation, and can produce patterns of replace-
ment ratios inconsistent with the generally understood purpose of the
social security system. As we see it, there are two problems.

First, the benefit formula is hypersensitive to changes in the rate
of inflation. The present automatic provisions operate to increase re-
placement ratios when the rate of inflation increases, and they do so
even when real wage growth (i.e., wage growth after adjustment for
increases in the price level) remains constant. For example, if the real
wage growth of an individual were a constant 2 percent, a low earnings
worker without a spouse who retired in the year 2050 would have a
replacement ratio of 65, 86, or 109 percent, depending on whether the
rate of inflation during his working years was 2, 3, or 4 percent. Thus,
large changes in replacement ratios can arise from small changes in
the inflation rate. Of course, large changes in replacement ratios imply
large changes in the financial cost of the Social Security system.

Second, the operation of the formula easily leads to numerous in-
stances where replacement ratios—for many workers who had experi-
enced no fall-off in earnings just before retirement—approach and even
exceed 100 percent. This results in the anomaly of large numbers of
workers having standards of living just after retirement higher than
just before retirement. The problem would be further aggravated
of course, in the case of workers with spouses eligible for the additional
50 percent benefit.

We have no objection to a benefit formula which automatically in-
creases the dollar amount of benefit awards at retirement or after re-
tirement to properly reflect inflation. Our objection is to a benefit
formula which automatically changes replacement ratios when there
are changes in the rate of inflation. We believe that any general changes
in the level or pattern of replacement ratios are of such fundamental

importance to a social insurance program, that they should be made only as a direct result of conscious policy decisions by the U.S. Congress.

Unless material changes are made in the present benefit formula, Congress will not have the appropriate control over the reasonableness and consistency of benefits and it will be difficult, if not impossible, to finance the system on a satisfactory actuarial basis.

THIRD FINDING: PRESENT METHODOLOGY FOR FORECASTING AND ANALYSIS PURPOSES IS INADEQUATE FOR THE SYSTEM'S MAGNITUDE AND COMPLEXITY

Although recognizing that present mathematical and statistical procedures may indeed have been appropriate in the past, we believe that these procedures are no longer adequate to the tasks rightly demanded of them for validity of estimation, and for understanding of the workings of the system under different demographic and economic conditions and with alternative benefit and tax structures.

Recommendations—This Panels' recomendations are:

1. That strong measures be taken to restore the financial health of the OASDI Program.

2. That the benefit structure be changed to eliminate its irrational response to changes in the rate of inflation. This is essential to achieve financial soundness. The first step should be a prompt thorough study of several possible changes in benefit structure.

3. That improved procedures be adopted to reveal the costs, implications and controllability of this program.

These recommendations flow directly and logically from our three findings. We believe that exploration and research will result in orderly transition to a new benefit structure and new forecasting procedures which will enable this country's Social Security system to serve the best interests of our people.

The rest of this Report describes the present financing method and retirement benefit structure of the OASI segment of the system, and amplifies the three findings and the recommendations already discussed.

II. DESCRIPTION OF METHOD OF FINANCING

The system is now designed to function as a *self-supporting, current-cost financing* arrangement.

The expression *self-supporting* means that the sole sources of dollars to pay benefits and expenses are the payroll taxes collected for the Trust Funds and the interest earned on the invested balances of those Funds.

The expression *current-cost financing* means that the balance in each Trust Fund is a contingency fund only. The aim has been to maintain it at a level which is neither much more nor much less than the amount of the next year's benefits and expenses.

By this financing procedure, the currently employed people of the United States who are covered by Social Security and their employers pay into the system each year a sum that in total is very close to the amount needed for the benefits and expenses of the following year.

Under this essentially simple arrangement two major financing problems arise. Both of these warrant close attention and concern.

The first problem is that of inability to forecast future benefits with sufficient precision so that future contribution rates adequate to provide for those benefits can be accurately scheduled far in advance. The size of this problem was greatly increased when Congress in 1972 introduced a system that by its indexing provisions became extraordinarily reactive to economic influences.

The second problem is that the outlays for benefits might some day rise to a level requiring covered workers to contribute more than they are willing to pay. It is reasonable to suppose that the level at which such a breakdown could occur is strongly affected by the degree of confidence that the working population has that they in turn will receive the Social Security benefits promised to them. This is among the reasons why it is very important that people understand how the system works and have confidence in its integrity.

This recital of the financing procedure and its potential problems leads directly to one definition of what constitutes *satisfactory actuarial status* [2] of a social insurance system designed as the United States system is. The actuarial status of such a system is satisfactory if, but only if, there can be reasonable confidence (a) that future scheduled income and future scheduled outgo will be in harmony with the current-cost financing concept defined above, and (b) that the future scheduled taxes to support the system are within the limit of practical acceptability to the social security tax-paying population.

III. DIFFICULTIES AND UNCERTAINTIES IN FORECASTING

Attempts to forecast conditions and the consequences of those conditions far into the future are necessary so that today's contributors can be given the reasonable assurances already mentioned of what taxes will be required of them and what benefits they in their turn may count upon. But forecasting future results with even an approach to precision must be clearly understood to be impossible. Any forecast is open to error, and some forecasts are open to large error.

Furthermore, some elements of a forecast can be estimated with even less confidence than others. In general, the most unpredictable elements are those whose trends depend most heavily upon human actions not yet taken. To illustrate, the mortality rate, difficult though it is to forecast, is a relatively stable element: but the fertility rate and the trend in the purchasing power of the dollar are leading examples of peculiarly unstable elements.

One need only look back to realize the hazards of forecasting. In 1946 it was authoritatively estimated that the 1975 United States population would perhaps be as low as 147 million, or perhaps be as high as 191 million; in 1958 the corresponding low and high forecasts of the 1975 population were 216 million and 244 million; the event—a population of 213 million has confounded both those prophecies. And only three years ago we find (in the Report of the 1971 Advisory

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[2] The 1971 Advisory Council on Social Security defined actuarial soundness for a social insurance system as "whether the expected future income from contributions and interest on invested assets will be sufficient to meet anticipated expenditures for benefits and administrative costs over the valuation period." We have used the expression "satisfactory actuarial status" in preference to the commonly used words "actuarial soundness" because the words "actuarial soundness" sometimes generate mistaken ideas that a social insurance system is weak if its financing is not akin to that which is workable for a private insurance or private pension system. This concerns particularly the need in private plans to build reserves sufficient, in conjunction with future contributions, to provide the future benefits of the plans. Building such reserves in a social insurance system may have merits from other standpoints, but is not necessary to ensure "satisfactory actuarial status."

Council on Social Security) use without comment of an assumption that in 1974 the Consumer Price Index would increase by 2.6 percent!

For the financing of the Social Security System the circumstances are: (a) forecasting has to be done; (b) decisions arising from those forecasts must be made; (c) a manageable system is one that relies as little as possible upon those elements that most thoroughly defy efforts at prediction.

IV. PREDICTABILITY AND IMPACT OF MAJOR ELEMENTS THAT DETERMINE CONTRIBUTIONS AND BENEFITS

The Table in this section is the result of this Panel's informal attempt to appraise, for each major element that enters into any forecast of Social Security Trust Fund income and disbursements, (a) the relative predictability of the item over the 75-year period that is customarily and appropriately used for forecasting, and (b) the relative impact of the foreseeable variations in the item upon the financial results for the System.

Because so many of these items have major impact but poor predictability, the Panel members believe that projections should be made using a variety of assumptions. The selection and identification of the forecaster's preferred choice (sometimes called the single best estimate) is commended, but we think the public should be kept informed of the size of the deviation in financial consequences that results if each of several combinations of other plausible conditions occurs.

TABLE 1.—PREDICTABILITY AND IMPACT TABLE

Elements That Determine Size of Taxable Payroll

Element	Long-range predictability	Relative impact
Fertility rate	Very low	Very high.
Migration rate	Low	Very low.
Mortality before retirement	Moderate	Low.
Labor force participation and unemployment rates, by sex.	Low	Moderate.
Wage patterns	Very low	Very high.

Elements That Determine Amounts of Benefit Payments

Mortality before retirement	Moderate	Low.
Mortality after retirement	Moderate	High.
Retirement-age patterns	Moderate	High.
Wage patterns [1]	Very low	Very high.
Cost-of-living index [1]	Very low	Very high.

Other Elements Affecting Balance in Trust Fund

Interest earnings on trust funds	Moderate	Very low.
Administrative expenses	Moderate	Very low.

[1] The prediction problem is considerably alleviated if the structure of the benefit is such that only the differences between the rates of change in wage level and cost of living need be estimated to predict benefits. Unfortunately this alleviating condition does not exist in the benefit structure under the present law.

V. ASSUMPTIONS USED BY THIS PANEL IN ESTIMATING FUTURE BENEFIT COSTS

To estimate what tax rate will be needed each future year to keep the current-cost financing system in reasonable balance, one must undertake to predict each of the following four elements:

1. The size of the tax-paying population;
2. The tax-base generated by that population;
3. The size of the benefit-receiving population; and
4. The total amount of benefits payable to that benefit-receiving population.

Each of these is the result of other estimates or assumptions which will be the subject of this section.

The Panel has studied the assumptions that were used to develop the cost estimates that appear in the 1974 Trustees' Report (74 TR). As already emphasized, we recognize great uncertainties about future demographic and economic trends. For each projection factor there is a range of reasonable assumptions. The Panel found that the assumptions used in 74 TR lie within this reasonable range; nevertheless, in several important items we believe an assumption differing from that used for 74 TR is more realistic and reasonable. The balance of this section contains descriptions of these differences with discussions of the reasons for them.

SIZES OF THE TAX-PAYING POPULATION AND BENEFIT-RECEIVING POPULATION

The starting point for estimating the tax-paying and benefit-receiving populations is the expected size of the whole United States population, divided between the people aged 20–64 and those aged 65 and over. The following are the estimates of the 74 TR and of this Panel:

U.S. POPULATION

[In millions of people]

	1975	1980	1990	2000	2025	2050
Ages 20 to 64:						
74 TR	122	132	147	159	173	181
This panel	122	132	147	156	154	154
Ages 65 and over:						
74 TR	23	25	29	31	48	51
This panel	23	25	29	31	49	50

The important difference between the two estimates is in the size of the population aged 20–64 through the first half of the twenty-first century. The cause of this difference is a differing estimate of the fertility rate, offset somewhat by a differing estimate of the mortality rate that affects the result in the opposite direction. These two differences are discussed in the following paragraphs.

Fertility rate

The expression "fertility rate" for a particular calendar year means the number of children that a woman entering child-bearing ages can expect to have throughout her child-bearing years if the birth rates then current apply to her and she survives those years. Thus, a fertility rate slightly higher than 2.0 is necessary if a mature population is to remain level in numbers—the so-called zero population growth.

The following are fertility rates for recent years, and the assumptions of 74 TR and of this Panel:

FERTILITY RATES, ACTUAL AND ASSUMED

	Actual				Assumed				
	1965	1970	1972	1973	1975	1980	1990	2000	2025	2050
74 TR	2.9	2.4	2.0	1.9	1.9	2.0	2.1	2.1	2.1	2.1
This panel	2.9	2.4	2.0	1.9	1.9	1.6	1.8	1.9	2.1	2.1

With the humility learned from many past experiences, demographers agree that it is hazardous indeed to forecast future fertility. There has been a persistent decline in the United States fertility rate, since 1800, from which a sharp rise that occurred in 1945–1960 is now recognized to have been a transient deviation. Since 1960 the rate has dropped by one-half, from 3.7 to 1.85, the latest estimate for 1974. This decrease undoubtedly reflects increasing attention to family planning, more and better birth control methods, and major changes in life-styles of some segments of our society.

On the other hand, there are indications that the current downward trend may in due course be checked and then reversed. There is plausible rationale for a "wave" phenomenon such as that postulated by Professor Richard A. Easterlin, and there are the results of recent surveys indicating that young married couples expect to have enough children to produce a national fertility rate somewhat above the present level.

The difference between the fertility rate used for 74 TR and that adopted by this Panel relates solely to when such an upswing will occur. The 74 TR estimate assumed that the trough had already occurred in 1974 and that the uptrend would begin immediately. This Panel's assumption is that the decline will continue for the remainder of this decade, reaching 1.6 in 1980, then slowly increasing, reaching 2.1 in the year 2010, then remaining constant.

Mortality rate

Prevailing mortality rates affect finances of the system in two ways: below age 65 they contribute to determining the size of the tax-paying population; above age 65 they are the principal determinant of the number of beneficiaries. The following summarizes the comparative assumptions of 74 TR and of this Panel:

MORTALITY TREND ASSUMED

74 TR—Steadily Improving to Year 2000, then No Further Improvement.
This Panel—Steadily Improving to Year 2050, with Certain Other Changes.

This Panel had some doubts about the abrupt cessation of mortality improvement at the year 2000 that was used for 74 TR. Accordingly we extended the improvement at the same rate through the entire projection period.

Furthermore, the Panel believes that the improvement at the older ages for women resulting from Cause of Death I (Disease of the Heart) and Cause II (Malignant Neoplasms) could, on the basis of past trends, be greater than were forecast for 74 TR.

A detailed description of the Panel's evaluations on mortality rates is set forth in Appendix A.

Other factors affecting population size

Other factors that have a bearing on the size of the tax-paying population include the labor participation rate and the unemployment rate. In both cases the Panel accepted the assumptions used for 74 TR, but in the first of those we did so because of lack of time for study and with some misgivings. There follows a brief discussion of our views on this subject.

Labor force participation rate

The Panel concurs with the 74 TR assumptions for labor force participation rates for men, but believes that the corresponding assumptions used for women may be to low.

In 74 TR it was assumed that the proportion in the labor force of all women in the United States population will increase by approximately 10 to 20 percent for various age-groups during the next 25 years, remaining constant thereafter. The ultimate participation rate for women between ages 40 and 60 was taken as about 60 percent, in contrast to rates for men ranging from 90 to 97 percent.

Having in mind the rapid changes in the roles of women, their increasing entry into business and professional careers, and the development of day-care centers freeing women for work outside the home, the Panel believes that participation rates for women will increase more than has been assumed in 74 TR; we suggest an ultimate rate close to 70 percent for women at all ages up to age 60.

TAX-BASE AND BENEFIT AMOUNTS

This subsection discusses the elements that determine Items 2 and 4 of the tabulation at the beginning of this Section V.

Starting points for determining what tax-base (taxable earnings) will be generated, and what benefit amounts will be payable from time to time are the rates of wage increase and Consumer Price Index increase to be experienced from time to time. These elements are known to be related to each other rather closely, in that an increase in the latter usually results in a corresponding increase in the former, and

sometimes vice versa. It is customary to base projections on assumptions of constant rates of increase of each of these, not because history suggests such a situation—on the contrary, they have been subject to wide swings and fluctuations—but because it is hoped that a reasonable estimate can be made of the average rate equivalent to the different rates that will be experienced. It is also customary to derive the assumption for growth of money-wages in two steps, i.e. by postulating separately the respective growths of real wages and of costs of living, then combining these to derive the growth rate of money-wages.

The following summarized the comparative assumptions of 74 TR and of this Panel:

[In percent]

| | Annual rates of increase, 1975 to 2050 in— | | |
	Real wages	CPI	Money wages
74 TR.....................	2	3	5
This panel...............	2	4	6

A discussion of the real-wage and CPI assumptions follows. Since the figure in each case is a rate compounded over 75 years, the importance of differences of 1 percent or even much less is very great.

Rate of growth in real wages

The Panel finds the 74 TR assumption of real-wage growth of 2 percent per year reasonable and acceptable. Any differing assumption that we might have used would have been on the lower side of this, perhaps 1¾ percent.

Essentially there are two approaches to predicting real-wage increase. One is to base it on the trend of the past. Another is to examine the causes, and to project the effect of each cause separately into the future. The Panel studied both these approaches and concludes that each supports a growth rate in the range of 1¾ to 2 percent.

Since business cycles affect real-wage growth, any analysis of past trends must adjust for the cyclic position of the economy. The Panel used a standard statistical process that related the average wage in covered employment to both the unemployment rate and time. This analysis was done for the period 1955–72, the starting year 1955 having been chosen because that was the effective date of the last major extension of employment categories covered under Social Security.

Results of this show that the average rate of growth has been 1.8 percent per annum after adjusting for cyclic fluctuations.

Turning to the second approach, examining the separate causes of real-wage growth, we accept the verdict of economists who have

analyzed the major causes and, based on their findings, we adopt the following assumption for the numerical value of each of these:

[In percent]

	Annual rate of increase
From increased output per worker	+1.9
From increases in capital investment per worker	+.4
From environmental protection costs	−.1
From length of work-week and other human causes	−.3
Net total	+1.9

A discussion of this subject is in Appendix B. The conclusion is that a real wage growth of close to 2 percent per annum is supportable and appropriate.

Rate of inflation

There is greater uncertainty about the projection of the price level than in any other factor involved in the OASDI cost estimate. Not only have rates fluctuated widely in the past; also, the past trends are not necessarily valid indicators of the future. Many institutional and structural changes in the U.S. economy and governmental actions in response to those changes have significant influences on inflation rates.

There are several reasons why the Panel prefers a higher estimate of the rate of increase in CPI than the 3 percent used in 74 TR. These include the following:

1. In recent years the trend has been toward accepting higher inflation rather than a lengthy slump in employment. This trend may presage public acceptance of a higher inflation rate in the future than in the past. Particularly at a time when an unusually large number of youthful job-seekers would otherwise raise the unemployment rate above normal, it will not be acceptable to use increased unemployment as a weapon to bring price levels down.

2. The outlook is that methods of inflation-fighting not directly affecting the unemployment rate, such as wage and price controls, will be tried but sparingly.

3. A nation's tolerance for inflation depends upon its exposure to inflation. The recent inflationary impact, to levels previously regarded as unthinkable, increases the threshold of national tolerance.

With all these considerations in mind, the Panel believes a 4 percent or a 5 percent assumption for the rate of CPI increase is equally appropriate. We have selected 4 percent for use in our basic cost estimate in this Report.

VI. Cost Estimate Resulting From This Panel's Assumptions

Table 2 shows the estimated costs in selected calendar years of the present OASDI program using the assumptions of 74 TR and those itemized in Section V of this Report. All assumptions not discussed in this Report are identical for both reports.

The words Excess Cost used in the Table mean the excess of the percentage of taxable payroll needed for benefits and expenses (plus any addition to the Trust Fund to maintain it at a level equal to next year's benefits and expenses) over the scheduled combined contribution rates for employees and employers under the present law, after allowing for the offsetting interest earnings on balances in the Trust Fund. The scheduled combined contribution rates are: 9.9 percent until the year 2010, 11.9 percent thereafter.

TABLE 2.—EXPENDITURES AND EXCESS COSTS, AS PERCENT-AGES OF TAXABLE PAYROLL

Calendar year	1974 trustees' report		This panel's assumptions	
	Estimated cost	Excess cost	Estimated cost	Excess cost
1975	[1]10.2	0.3	10.2	0.3
1980	[2]10.3	.4	10.4	.5
1985	10.4	.5	11.0	1.1
1990	11.0	1.1	11.5	1.6
1995	11.3	1.4	11.8	1.9
2000	11.3	1.4	12.2	2.3
2005	11.7	1.8	13.0	3.1
2010	12.7	2.8	14.6	4.7
2015	14.1	2.2	16.7	4.8
2020	15.7	3.8	19.2	7.3
2025	17.0	5.1	21.6	9.7
2030	17.6	5.7	23.3	11.4
2035	17.7	5.8	24.0	12.1
2040	17.7	5.8	24.9	13.0
2045	17.9	6.0	24.7	12.8
2050	17.2	5.3	23.9	12.0
Average rates	13.9	3.0	16.9	6.0

[1] The estimated cost in 1975 only represents benefits and expenses, no contribution to the balance of the trust fund.

[2] Interpolated from data given.

Note: In 1975 each 1 percent of taxable payroll means $7 billion.

The difference in the estimated cost between the 74 TR and this Panel's estimate arises from different assumptions used. Roughly one-third of the difference (1 percent of taxable payroll) is due to demographic factors and the remainder is due to the anticipated higher rates of increase in price levels. (For details on the importance of the two types of assumptions compare Table 2 with Table 4.)

VII. PROPOSALS FOR CHANGES IN THE RETIREMENT BENEFIT FORMULA

Even though the primary request to this Panel is for evaluation of the financial status of the system we have addressed ourselves also to some large questions about the benefit structure and its possible revisions. We have done this because so much of the difficulty that is foreseen is attributable to the characteristics of the benefit structure.

In this section, after describing the present retirement benefit formula and how it works, we shall outline some essential features that determine the suitability of a benefit structure and shall discuss some proposals that are being, or in our opinion should be, given serious study.

DESCRIPTION OF PRESENT BENEFIT FORMULA

(This description is limited to the broad essentials of the benefit formula, deliberately ignoring modifications that are important to the groups of people they affect.)

Calculation of benefits payable in 1975

Upon retirement now of a worker aged 65, the monthly benefit is determined from an amount based on the wage-history of that worker called the Average Monthly Wage (AMW). The averaging is over a period of years (y) before retirement. The "y" period in 1975 is 19 years for men, 16 for women. The formula, which is complex, results in a monthly benefit that, in accordance with recognized social insurance principles, does not increase proportionately as the AMW increases; furthermore its slope changes rather sharply at particular values of AMW.[3] The pattern of the formula is shown in the chart on page 14.
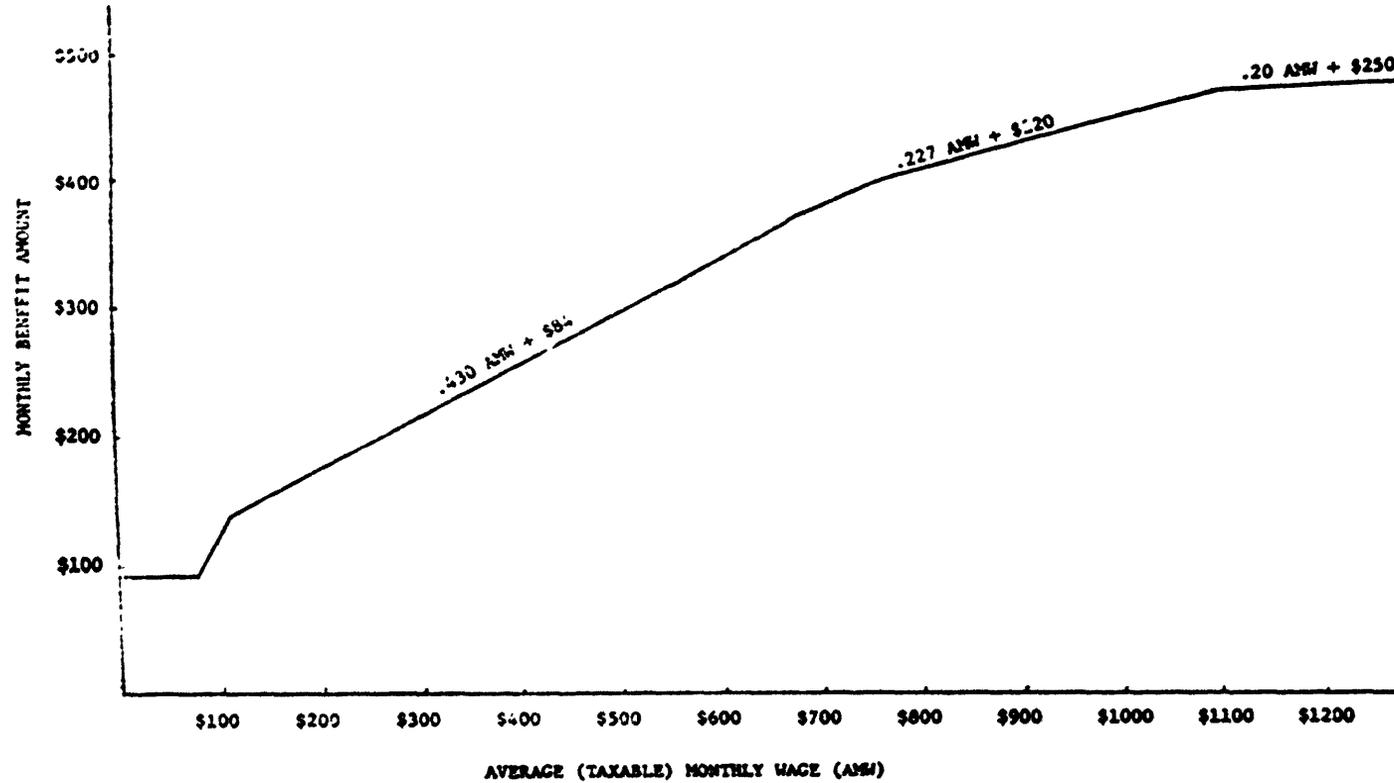
The monthly benefit thus calculated is increased if the retired worker has a spouse. If at the worker's retirement the spouse is aged 65 or over this increase is 50 percent.

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[3] It can readily be shown that this pattern is closely approximated by a set of formulas as follows:

Size of AMW	Approximate formula for benefit
$110 to $650	0.436 AMW+$84.
$650 to $1,100	0.227 AMW+$220.
More than $1,100	0.200 AMW+$250.

These simplified formulas are useful both for comprehension of the nature of the formula and for investigative work.

CHART SHOWING APPROXIMATE RELATION BETWEEN

MONTHLY BENEFIT AMOUNT AND AVERAGE MONTHLY

WAGE IN PRESENT BENEFIT TABLE

14

MONTHLY BENEFIT AMOUNT

$500

$400

$300

$200

$100

.20 AMW + $250

.227 AMW + $120

.430 AMW + $84

$100 $200 $300 $400 $500 $600 $700 $800 $900 $1000 $1100 $1200

AVERAGE (TAXABLE) MONTHLY WAGE (AMW)

The AMW, however, is not necessarily the total average monthly wage that the worker has received throughout the "y" period, but is limited to the average of the monthly earnings on which Social Security taxes were collected, an important difference. This limit was originally (1935) set at $3,000 and has now reached $14,100. The increase in this amount, called the Maximum Taxable Earnings Base (MTEB), has accelerated markedly in recent years. In 1955 the MTEB was $4,200; by 1960 it had become $4,800; by 1970, $7,800; and has almost doubled in the last five years to the present $14,100.

Calculation of benefits payable in future

The elements that determine the benefit are scheduled to change significantly as time goes on. The changes are as follows:

1. The "y" (averaging period) will gradually lengthen until it reaches 35 years for both men and women in 1994.

2. The benefit formula will be changed as the Consumer Price Index increases, the benefit increase being generally proportionate to the CPI increase. (The changes occur only when the CPI increases by at least 3 percent.)

3. The MTEB itself is scheduled to rise (and the Benefit Table to be extended at a fixed rate of 20 percent of the AMW) whenever an increase in the cost of living triggers an increase in the benefit formula.

4. As a result of past changes in MTEB, benefits for many people reaching age 65 in the future will be different from those persons with identical earnings histories who had previously retired because the averaging period will contain years subject to a different MTEB.

JUDGING THE MERITS OF A BENEFIT PATTERN

Different people have different yardsticks for judging the appropriateness of the benefit pattern in a social insurance system, and will place different emphasis upon each of numerous objectives. There will be unanimous acceptance of basic adequacy as a primary requirement. Also most people will attach major importance to three other considerations, namely:

(a) *Consistency* between benefits payable to those who retire at different times.

(b) *Reasonableness* of the relationship between the wage-history of a worker before retirement, and the benefit for him or her that begins at retirement.

(c) *Control* exercisable by the government over the emerging pattern of benefits as time goes on and economic condition change.

This Panel agrees with those who have said that the prospective benefit pattern that emerges from the present benefit formula fails to measure up when these judgment standards are applied to it. Lack

of consistency, unreasonableness and lack of control are serious problems.[4]

The most succinct description of the condition, in our view, is that the present benefit formula is "over-indexed." Over-indexing arises because benefit amounts are determined by two major factors: Average monthly wage and the benefit table. The benefit table is directly related to increases in Consumer Price Index. Meanwhile the average monthly wage also tends to rise with price increases. Hence increases in price levels enter twice in the determination of benefit amounts. The following table illustrates the effects of this. The figures are excerpted or derived from Actuarial Note Number 87, by Albert Rettig and Orlo R. Nichols, Office of the Actuary, Social Security Administration (April 1974). The words "Replacement Ratio" mean the ratio of the starting retirement benefit to the earnings immediately before retirement.

TABLE 3.—REPLACEMENT RATIOS AT RETIREMENT AT AGE 65 IN THE YEAR 2050

[In percent]

Taxable earnings category	Assumed annual increases in earnings/CPI respectively		
	4 percent/ 2 percent	5 percent/ 3 percent	6 percent/ 4 percent
(1) Worker without spouse:			
Maximum	32	38	44
Median	42	52	63
Low	65	86	109
(2) Worker with spouse aged 65:			
Maximum	48	57	66
Median	63	78	95
Low	98	129	164

The taxable earnings categories used for this illustration (described in the Actuarial Note) are suitable for making the point demonstrated by these figures.

Figures such as those in the Table just given focus attention on two problems that may be labelled The Sensitivity Problem and The Size of Benefit Problem.

[4] These problems are admirably discussed by Lawrence Thompson in Technical Anal sis Paper No 1, Office of Income Security Policy, Department of Health, Education, and Welfare (Sept. 1974). Attention is particularly directed to the statement on page 34 :
.... It seems clear that present provisions of the Social Security Act introduced a degree of both irrationality and unpredictability into the process by which replacement ratios are set. The unpredictability comes from extreme sensitivity of future replacement ratios to the prevailing economic conditions. The irrationality comes first from the fact that replacement ratios derive not from a conscious policy decision about what level retirement benefits "ought to be," but from the chance intersection of the offsetting impact of wage and price changes; and second from the fact that the present system appears perfectly capable of producing, under realistic assumptions about wage and price trends, rather implausible replacement ratios.

The Sensitivity Problem illustrated is that varying rates of CPI. increase even while real wage increases remain constant, cause the replacement ratios to move sharply upward or downward, especially for workers with low and median income.

To illustrate the gravity of this situation, the Panel has had calculations made using all of the assumptions in the Report *except* that instead of assuming that the annual rates of increase in earnings and in CPI respectively will be 6 and 4 percent, assumptions on the one side of 5 and 3 percent, and on the other side of 7 and 5 percent, have been substituted. The costs for selected years corresponding to those displayed in Section VI. become the following:

TABLE 4

Calendar year	Expenditures as percentages of taxable payroll		
	5 percent/ 3 percent	6 percent/ 4 percent	7 percent/ 5 percent
1974	10.1	10.1	10.1
1980	10.3	10.4	10.4
1985	10.4	11.0	11.0
1990	10.9	11.5	11.8
1995	11.2	11.8	12.2
2000	11.3	12.2	12.8
2005	12.0	13.0	13.9
2010	13.2	14.6	15.8
2015	15.0	16.7	18.4
2020	17.0	19.2	21.3
2025	18.8	21.6	24.3
2030	20.0	23.3	26.5
2035	20.3	24.0	27.5
2040	20.8	24.9	28.7
2045	20.5	24.7	28.6
2050	19.7	23.9	27.9
Average rates	14.9	16.9	18.5

From this it can readily be seen that, even when the rate of growth in money wages remains uniformly 2 percent higher than the rate of CPI increase, the benefit cost is heavily affected by just a 1 percent change in the rate of CPI growth itself.

The Size of Benefit Problem illustrated is that in several cases in the Table the replacement ratio points to the anomaly of a standard of living after retirement that, apart from all other resources that the retired worker may call upon, will actually be higher than the pre-retirement standard of living. (Without detracting from the significance of this problem in this particular illustrated situation, this Panel advises caution in assuming that a replacement ratio higher than, say, 75 percent *necessarily* is unreasonable; it may be that the

individual's income just before the benefit starts has been extraordinarily low or was not typical of his income over a period of recent prior years.)

PROPOSALS FOR BENEFIT FORMULA REVISION

In designing a benefit formula, one faces two basic questions: (1) How should the initial retirement benefit be related to the individual's wage history? (2) How, after retirement, should the initial benefit be changed as economic conditions change?

In seeking suitable answers to the first of these questions, the Panel has focused upon two conspicuously appealing possibilities for calculating a retirement benefit. One of these is called the Real Wage Approach; the other the Relative Wage Approach. We limit ourselves to a brief statement here, with details given in Appendix C.

The Real-Wage Approach substitutes for the Average Monthly Wage (AMW) a new figure which could be called an Average Real Monthly Wage (ARMW). To illustrate for a retirement in 1976, the first step in determining the ARMW would be to express each prior year's wages in terms of 1975 dollars. This would be done by multiplying each year's wages by the ratio of the CPI in 1975 to the CPI in the year the wages were earned. The sum of these real wages would then be divided by the number of months involved to obtain the ARMW, and the initial benefit would be determined by applying an appropriately designed benefit formula. Under this approach, for a given history of real wages benefit awards at retirement are indexed to increases in the CPI, but not to increases in money wage levels.

The Relative Wage Approach substitutes a different figure for the AMW. This figure could be referred to as an Average Relative Monthly Wage. The procedure under this approach for a retirement in 1976 is exactly as described in the preceding paragraph, except that each prior year's wages would be converted to their 1975 equivalent by multiplying it by the ratio of the average wage in 1975 to the average wage in the year the wages were earned. Under this approach, benefit awards at retirement are indexed to increases in money wage levels, but not to increases in the CPI.

An essential feature is that under neither of these two approaches are initial retirement benefits indexed to both CPI increases and money wage levels as they are under present law.

This Panel has tentatively developed a preference for the Real Wage Approach. We wish that there had been available to us more information about typical wage patterns and replacement ratios than we have been given; we think it important not to forget that there is a material difference between the pattern of earnings for an individual and that for the economy as a whole, and we believe that a study of typical replacement ratios would be revealing and helpful.

Turning to the second of the basic questions stated at the beginning of this subsection, two contrasting aspects of the economy merit consideration for "escalation" or "indexing" after retirement. One of these

would tie the subsequent benefit level to the Consumer Price Index (as at present); the other would vary the benefits according to the index of average covered wages earned currently in the economy as a whole. Doubtless the first of these should be the major factor reflected, but by introducing also the second factor, even with minor weight, into the arithmetic, Congress would be tying incomes of the retired somewhat to the economic health and productivity of our nation. If our nation were doing well in these respects, those already retired would share in the gains; if it were doing poorly, they would share, presumably in a limited way, in the general setback in living standards.

The major conclusion this Panel has reached is that the benefit formula needs to be revised and that thorough study of several possible ways to revise the present unsatisfactory condition is needed. Such a study should take into account various problems that are involved or related thereto, such as the problem of transition from the present to a better formula, and questions about the choice of retirement age (or incentives to hasten or to postpone retirement) in the light of the long term change in demographic composition. The appropriate earnings test after retirement would also be considered. The study would enquire into the future appropriateness of the present tax-free status of the benefit, and would pay attention to the relationship between any change contemplated here and any other supplemental income plans for low-income people, such as the present Supplemental Security Income program and a negative income tax, that the U.S. Congress may undertake to consider.

VIII. This Panel's Recommendations on Methodology for Preparing Long-Range Cost Estimates

Any method used to estimate future income and outgo of the Social Security program should possess at least the following attributes:

(a) *Accuracy.*—It should use best available techniques so as to predict results with reliability and minimum bias.

(b) *Timeliness.*—It should permit quick, in some cases immediate, responses to legislative requests and other planning needs for information.

(c) *Analytical value.*—It should reveal the meaning and the detailed impact of any alternate benefit formula, financing method or assumptions being studied.

(d) *Authority.*—It should command the confidence of both the policymakers and the technical community.

A description of the methodology now employed to prepare the long-range actuarial cost estimates of the OASDI program is given in the document "Long-Range Cost Estimates for Old-Age, Survivors and Disability Insurance System, 1974," prepared by the Office of the Actuary. SSA. The Panel studied this paper and obtained supplementary information from the Office of the Actuary. Our findings are summarized in this Section.

PROBLEMS OBSERVED IN PRESENT METHOD

The heart of the present procedure is the simulation of wage histories and benefits by using as examples five hypothetical male workers. The Panel doubts that five sample situations can adequately represent the variations in wage histories and benefits that are involved, having 'n mind the myriad subgroups in our population, the divergent patterns of wage histories, the many interruptions of earnings by ill health and temporary departures from the labor force and the differences in earnings as retirement time grows close.

Also, the current method uses only one average rate of wage increase, applying it to all workers. The difficulty is that numerous economic studies have shown that the historical rate of such increase is greatly affected by the age, sex, education and occupation of the worker. These differences are likely to become particularly significant in the rapidly changing economic environment into which this country has already entered.

Some of the broad approximations that result from the procedures just described tend to overestimate, others to underestimate, future costs. The major departures, which indeed may at present largely counterbalance one another, seem to us to be as follows:

(1) Since the wages of higher-income people are known to increase at more rapid rates than those of lower-income people, and the benefit formulas are progressive in character, the present procedure appears to *overestimate* future costs in this respect.

(2) Because the present simulation procedure ignores workers with interrupted wage histories, increases in part-time and sporadic workers will mean an *underestimate* of future costs with the present methodology.

(3) Because the wage rates for men and women are becoming more nearly equal, instead of remaining fixed at the present ratio, the present procedure *underestimates* future costs.

(4) The technical process for calculating average benefits in current-payment status in an era of declining mortality among retired people tends to *overestimate* future costs.[5]

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[5] Under the present method, the average benefits in current-payment status are computed as follows:

$$B_y = \sum_{x=0}^{last} ({}_x f_y \, d_{y-x} \, {}_x a_y)$$

where $_x f_x$ is the proportion of the number of benefits in current-payment status in the year y that were awarded in the year $y-x$; and $_x a_y$ is the factor which reflects all automatic increases in benefits between the year $y-x$; and y: d_{y-x} is the average benefit awarded in the year $y-x$. When the mortality rate is declining, retired people live longer. Because the present method assumes that $_x f_x$ is a fixed distribution, it tends to *overestimate* the costs.

METHODOLOGY RECOMMENDATIONS OF THIS PANEL

This Panel believes that better projection methods are in existence which, if adopted, can easily remedy the shortcomings of the current method and cause it to embrace more thoroughly the attributes listed at the beginning of this Section. The solution, we think, lies in making more thorough use of computer capabilities already proving useful in many public and private programs including that of the Railroad Retirement Board. An example we have in mind is MERGE, a model constructed from the records of 72,000 representative taxpayers that is used extensively to estimate the effects upon taxpayers and government revenue of any proposed new tax legislation. To develop such a simulation, the Social Security Administration would have first to conduct their study of the wage histories of numerous categories of workers.

Adoption of this recommendation promises to provide a wealth of analytical information for policymakers, showing how subgroups of the American people are affected by either continuing or changing any law currently in effect, and increasing the confidence of those who have occasion to study the finances and social consequences of the system.

IX. ACKNOWLEDGEMENTS

The members of this Panel are unanimous in the findings and recommendations contained in this Report. Although time pressure has in some ways circumscribed our effort, we believe that we have given essential questions sufficient study so that we can be confident that our observations justify attention and concern.

Our thanks are cordially extended to Mr. Michael Stern and other staff members of the U.S. Senate Committee on Finance for their unstinting assistance and support throughout this endeavor, and to Mr. Francisco Bayo, Deputy Chief Actuary and the staff of the Office of the Actuary, Social Security Administration, for conferring helpfully with us, and for promptly furnishing the large amounts of information and calculations that we requested.

The members of the Panel will gladly make themselves available for any discussions of these subjects that the United States Senate Committee on Finance may desire. We are grateful to the Committee for the privilege of engaging in this extremely important activity.

Appendix A

Mortality Assumption

I. MORTALITY IMPROVEMENT ASSUMED FOR POPULATION PROJECTION UNDERLYING TRUSTEES' REPORT

In the population projection underlying the 1974 Trustees' Report it was assumed that mortality would improve until the year 2000, after which there would be no further improvement.

Rates of improvement to the year 2000 were determined essentially as follows:

1. Past trends in mortality rates were studied by sex, quinquennial age groups, and by cause of death according to the Eighth Revision of the International Lists of Diseases and Causes of Death. These causes are as follows:

    I. Diseases of the Heart (390–398; 402, 404, 410–429);
    II. Malignant Neoplasms (140–209);
   III. Vascular Diseases (400; 401, 403, 430–458, 582–584);
   IV. Accidents, Suicide, and Homicide (E800–E989);
    V. Diseases of the Respiratory System (460–519);
   VI. Congenital Malformations and Certain Diseases of Early Infancy (740–778);
 VII. Diseases of the Digestive System (other than Cirrhosis of the Liver) (520–577, except for 571);
VIII. Diabetes Mellitus (250);
  IX. Cirrhosis of the Liver (571); and
   X. All Other Causes.

2. Judgments were made for each sex, quinquennial age group, and cause of death, based on observation of these past trends, as to the improvement in mortality from the year 1972 to the year 2000.

3. The improvement in mortality from the year 1972 to the year 2000 was determined for each sex and quinquennial age group by combining the effect of improvement in each of the various causes of death. The combination was based on the distribution of deaths by cause for 1968 as obtained from the Vital Statistics of the United States.

The results of the above three steps are shown in the following Table A for the two most important causes of death at the older ages, Cause I (Diseases of the Heart) and Cause II (Malignant Neoplasms), and for all causes combined.

TABLE A.—MORTALITY RATES IN THE YEAR 2000, AS PER-CENTAGES OF CORRESPONDING RATES IN 1972

Assumed for Population Projection Underlying Trustees' Report

Age group	Males			Females		
	Cause I	Cause II	All causes	Cause I	Cause II	All causes
Under 1	90	80	73.0	70	90	74.3
1 to 4	80	80	89.2	60	90	89.3
5 to 9	70	85	91.9	50	90	91.1
10 to 14	70	90	95.3	40	90	89.1
15 to 19	70	90	98.2	40	85	91.1
20 to 24	70	90	98.2	40	85	89.4
25 to 29	70	90	97.0	50	85	87.3
30 to 34	70	90	95.0	60	90	88.2
35 to 39	75	95	93.7	70	90	90.1
40 to 44	80	95	92.4	80	95	93.3
45 to 49	85	95	92.0	80	95	92.5
50 to 54	85	95	91.0	80	95	91.4
55 to 59	90	95	92.1	80	95	89.6
60 to 64	90	95	92.0	80	95	88.4
65 to 69	95	95	93.9	80	95	87.0
70 to 74	95	95	94.7	80	95	85.8
75 to 79	95	95	93.5	80	95	86.0
80 to 84	95	95	92.0	85	95	87.7
85 to 89	95	95	91.8	90	95	91.3
90 and over	95	95	91.5	95	95	93.2

II. THIS PANEL'S REVIEW

In general, the Panel finds that the methodology and projected mortality rates underlying the population projections in the Trustees' Report are reasonable. However, for our own projections, we have made the following changes.

First, the Panel believes that the annual rate of projected mortality improvement should be continued beyond the year 2000, throughout the entire projection period. We recognize that the two most recent projections (Actuarial Study No. 46 and Actuarial Study No. 62) both assumed mortality improvement only to the year 2000. However, we know of no basis for assuming such an abrupt discontinuity in future mortality improvement.

Second, the Panel believes that the rates of mortality improvement at the older ages assumed for female mortality resulting from Cause I (Diseases of the Heart) and Cause II (Malignant Neoplasms) were

somewhat less than could be anticipated from past trends and the current outlook. This expected greater improvement in mortality at the older ages will lead to increased outlays for benefit payments to retired beneficiaries.

Table B shows the levels of mortality improvement assumed by the Panel for female mortality attributable to Causes I and II, compared with the corresponding levels assumed for the Trustees' Report. The Panel's figures are based on judgment, supported by a least squares analysis of the relevant mortality rates for the years 1953 through 1969, inclusive.

TABLE B.—MORTALITY RATES IN THE YEAR 2000, AS PER-CENTAGES OF CORRESPONDING RATES IN 1972

Comparison of Levels Assumed for Population Projections Underlying Trustees' and Panel's Reports

Age group	Females, cause I		Females, cause II	
	Trustees' report [1]	Panel's report [2]	Trustees' report [1]	Panel's report [2]
Under 1	70	70	90	90
1 to 4	60	60	90	90
5 to 9	50	5C	90	90
10 to 14	40	40	90	90
15 to 19	40	40	85	85
20 to 24	40	40	85	85
25 to 29	50	50	85	85
30 to 34	60	55	90	85
35 to 39	70	55	90	85
40 to 44	80	60	95	85
45 to 49	80	60	95	90
50 to 54	80	60	95	90
55 to 59	80	65	95	90
60 to 64	80	65	95	90
65 to 69	80	65	95	85
70 to 74	80	70	95	85
75 to 79	80	70	95	75
80 to 84	85	70	95	75
85 to 89	90	100	95	100
90 and over	95	100	95	100

[1] Mortality improvement only to year 2000.
[2] Annual rate of mortality improvement between 1972 and 2000 continued throughout projection period.

PRODUCTIVITY (REAL WAGE) GROWTH

In selecting their central set of assumptions, the Office of the Actuary assumed that wages would grow at 5 percent per year, and the CPI at 3 percent. Thus they assumed that real wages, wages measured in dollars of constant purchasing power, would grow at approximately 2 percent. We find the assumption of 2 percent real wage growth fully acceptable and would also have found an assumption of 1¾ percent to be just as acceptable. Any larger move away from the past trend seems to us to be inappropriate for a central assumption.

Since the business cycle affects the growth of real wages, any measurement of recent trends must allow for the current cyclic position of the economy. There are several different ways to make such an allowance. One method is to use a linear (least squares) regression relating the average wage in covered employment (or its logarithm) to both the unemployment rate and time. If this is done for the period since 1955 (when the major extensions in social security coverage had been completed) the real wage growth shows a rate of growth of 1.8 percent. A similar calculation for the average earnings of employees and the self-employed also shows a growth rate of 1.8 percent per annum.

While this historical examination gives some idea of an appropriate rate,[1] it is not as satisfactory for forecasting purposes as examining the causes of wage growth and projecting these causes separately into the future. Only by means of such an analysis can one estimate the quantitative significance of different ways in which the future will differ from the past.

To examine the growth of wages, it seems appropriate to examine the growth of productivity and the relationship between wages and productivity. Economists examining the long-term growth of productivity[2] have related output per worker to advances in technical knowledge and the scope of economies of scale, increases in capital per worker, changes in availability of raw materials, changes in the length of the working year, and changes in the average quality of the labor force reflecting age, experience, sex, and education. (Changes in the willingness to tolerate pollution and other environmental costs may also be important in the future. Its significance can be approached by considering part of capital expenditure as improving the environment and only part as contributing to the growth of measured productivity, and so to wages which will be subject to payroll tax.)

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[1] Of course the growth in productivity in the U.S. economy is not a new phenomenon. There has been steady substantial productivity growth for a long time. For a discussion of growth since 1800, see M. Abramovitz and Paul A. David, "Reinterpreting Economic Growth: Parables and Realities," American Economic Review, May 1973.

[2] See e.g., E. F. Denison, *Accounting for United States Economic Growth 1929–1969*, The Brookings Institution, 1974.

While many technological improvements must be built into new capital equipment before they become available to the economy, it is the advance of technology itself which is the major contributor to the long run growth of productivity. There is no obvious reason why technical advances should not continue in the future at a rate approximating that of postwar U.S. history. A rate of 1.9 percent per annum seems to be a good approximation to the contribution of technical advance to productivity.[3] (i.e., increased output per worker).

Expenditures for investment have in the past contributed significantly to the growth of productivity per worker. Contributions between 0.3 to 0.6 percent per year have marked the postwar period. Even recognizing that some capital expenditures will improve the environment rather than productivity, there is still scope for a considerable contribution arising from capital investment that does increase productivity. Since there is no reason to anticipate that environmental concern will decrease the growth of productivity, we assumed a 0.4 percent per year (perhaps, as with going to the moon there will be technological gains from focusing on a new set of problems), it seems appropriate to calibrate its importance by comparing it with the importance of capital expansion. It seems unlikely that its importance will exceed 25 percent of the importance of capital expansion, (i.e., a negative 0.1 percent rate).

Increased expenditures for imported raw materials will also tend to slow the growth of productivity, the major element here being the increased cost of energy. Without necessarily expecting oil prices to decline relative to other prices, it seems appropriate to anticipate no major increases in price relative to other prices because substitutes will presumably become available in both the short and long run. Again we would not expect this factor to be very large compared with the contribution of capital, surely less than 25 percent of its importance and probably only 10 percent. Combining these elements and recognizing the variability in capital expenditures a figure of 0.3 percent per annum is a reasonable estimate of the contribution to growth from these sources.[4]

The remaining factor contributing to the growth of productivity in the long run is the composition of the labor force. The continued exodus of labor from low productivity sources in agriculture and among the self-employed has contributed significantly to the growth of productivity in the past. Denison estimates a contribution still as large as 0.3 for 1964–69 (*op. cit.*, Tables S–10, page 121). This source of growth, while diminished, will continue to make a positive impact for the near future at least.

A second element in the use of the labor force is the average work week. This has declined steadily in recent times and will continue to decline in the future. This decline in the average is primarily due to a growth of part-time workers relative to full-time, and of women (who have shorter work weeks than men). This expected continued decline in the average work week will subtract significantly from the growth of productivity per worker.

[3] See Denison, *On. Cit.* table 6-2, pages 70-71. It seems appropriate to project the calculation for the nonresidential business sector of the economy as the best predictor of general movements.

[4] This represents 75 percent of the 1948 to 1969 average. See Denison, Op. Cit., table S-4, page 114.

Analysts of productivity have been aware of the slowdown in productivity growth that started in the late 1960's.[5] This slowdown is explainable by the changing composition of the labor force. The recent past has seen large growth of both young workers and working women. Since they have less work experience and tend to fill jobs of lower productivity this makes a negative contribution to the growth in average productivity. Since we expect the female labor-force participation rate to continue to rise in the near future, we expect this part of the negative contribution to continue, at least for the short term. However, the aftermath of absorption of the postwar baby boom into the labor force will cause the percentage of workers who are at the youngest ages to decline, so this negative contribution will not continue for very long.

Offsetting this effect is the steady rise in the average education level of the labor force. While it is expected that education levels will tend to stabilize in the next two decades, for the short-term future this positive contribution of education should continue, offsetting the negative contribution from changing labor force participation rates. For past periods these labor contributions have always been significantly positive. It seems appropriate to project a smaller contribution than in the past; considering the length of the period and the selection of a single growth rate for the whole period, a small negative contribution seems appropriate.

Combining these factors, a negative contribution of 0.3 percent per annum appears to be a conservative but not unreasonable projection.

Combining all the above factors, we find a 2 percent growth of productivity to be a reasonable projection for the next 75 years. However, wages subject to payroll tax do not necessarily keep pace with productivity growth. While some of the recent growth of fringe benefits, taking the form of pay without work (increased paid holidays, vacation, etc.) do not affect taxable wages, other fringes, such as employer contributions to pensions and health plans, do decrease the share of labor compensation which is subject to payroll tax. Thus we would expect wage growth to lag somewhat behind productivity growth; thus we conclude that rates of growth of 1¾ percent and 2 percent per annum span a reasonable range for the central assumption as to wage growth for the next 75 years. Another ¼ percent on either side, 1½ to 2¼ percent gives an ample range to explore and would embrace probable values. Any value outside this range is difficult to support from past experience and trends.

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[5] See, e.g., George Perry, "Labor Force Structure, Potential Output and Productivity," Brookings Papers on Economic Activity, 1971.

Appendix C

Benefit Formulas

As discussed in the text, the current benefit formula is overindexed. This makes the future benefit pattern (and necessary financing) highly sensitive to the rates of price and wage increase even if real wage growth is constant. Thus having 4 percent CPI growth with 6 percent wage growth has significantly different long-run effects, in terms of the necessary tax rate, from 3 percent CPI growth with 5 percent wage growth.

An extremely important feature of a well designed benefit formula is its insensitivity to purely inflationary factors which leave real wage growth unaffected. While there are many possible benefit formulas which have this property, the two basic approaches we have considered have been (1) using a Real Wage (that is, a wage measured in dollars of constant purchasing power) and (2) using a Relative Wage (that is, a wage measured relative to the average of wages in the economy).

To make these definitions clear let us express them as formulas. If w_i^t is the wage subject to payroll tax of individual i in year t: $\overline{w}_t$, the average of wages subject to payroll tax in the economy in year t: CPI_t, the consumer price index in year t; T the length of the averaging period, and s the first year of retirement, we have:

$$\text{Average Real Wage} = \frac{1}{T} \sum_{s-T}^{t=s-1} \frac{w_i^t}{CPI_t}$$

$$\text{Average Relative Wage} = \frac{1}{T} \sum_{s-T}^{t=s-1} \frac{w_i^t}{\overline{w}_t}$$

To complete the benefit formula using the real wage approach, one would determine a benefit in dollars of constant purchasing power from a benefit table relating benefits to the average real wage. Actual benefits in any year would be the benefits in constant dollars measured in the table multiplied by the Consumer Price Index. This would represent a "coupled" system as at present, but without any sensitivity to purely inflationary factors. Of course, benefits would be sensitive to changes in the growth of real wages, but this seems entirely appropriate because a social security benefit logically changes as the wealth of the economy changes.

To complete the benefit formula using a relative wage approach, one would determine a fraction of the average wage in the economy at the time of retirement [6] which would be payable as a benefit on re-

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[6] For simplicity and to avoid complicated incentives on retirement, the wage used might be the average wage in the economy when the worker reaches 62.

tirement. (A benefit table relating such fractions to the average relative wage would be constructed to accomplish this.) After retirement the benefit would increase with the subsequent growth in the Consumer Price Index. This would represent an "uncoupled" system in that CPI growth before each individual's retirement would not directly affect the size of his benefit.

Both approaches are capable of removing excessive inflation sensitivity from the finances of the social security system. Nevertheless, the two systems differ significantly in a number of ways including (1) relative benefits paid to individuals of the same age but with different wage histories, (2) rate of growth of benefits over time as the economy becomes more wealthy, and (3) incentives for early and late retirement. Both approaches should be subjected to detailed searching analyses before any choice is made between them. Such analysis is clearly beyond the scope of this Panel's report.

The following are comments on three significant differences between these approaches.

(1) There is a great variety of rates of growth of wages among different workers in our economy. This is clear from the data on the growth in variance in wages as a cohort of workers' ages. This factor alone makes the needs of the social security system significantly different from those of any private pension plan. It also makes desirable the use of a long averaging period in determining average wages since workers with the greatest need for social security benefits include those who have experienced declining purchasing power of earnings (or even declining wages with significant bouts of unemployment) toward the end of their working lives.

A long averaging period implies significant differences in benefits for some individuals by using different weights in calculating the average wage. Since average wages tend to rise more rapidly than the CPI, use of $1/w_t$ as the weighting factor gives heavier weight to early working years than does use of $1/CPI_t$ as the weighting factor. Thus among those who have the same average wage, individuals with rapid wage growth over their lives will do relatively better with the real wage approach, while those with slower wage growth will do relatively better under the relative wage approach. To compare the two approaches carefully on this account one would need a detailed description of the categories of workers with rapid wage growth and of those with slow wage growth rather than relying upon a merely general sense that the latter group tend to be less well off. In this way one would consider simultaneously the weighting factors in determining average wage and the degree of progressivity desirable in the benefit table.

(2) At a time when demographic factors alone will tend to make a pay-as-you-go system relatively more expensive, it seems entirely appropriate to have the impact felt both in higher taxes and, to some extent, in lower benefits than one would have had without the demographic change (although not lower benefits than were actually paid earlier). Furthermore, since the social security system is not perfect (see particularly the discussion of relative treatment of single per-

sons, and married couples with one and two earners by Pechman, Aaron and Taussig [1]) it seems appropriate to finance increased benefits for those judged by Congress in the future to be particularly needy, in part by granting lower benefits to others than those others would have received (although not by reduced benefits for any individual).

For both these reasons, a benefit formula with a built-in tendency for moderately decreasing tax rates is preferable to one which requires constant or rising necessary tax rates even in the absence of demographic changes. Because of the progressivity in the benefit formula, the real wage approach pays less to high earners than to low earners relative to their tax contributions. Provided the economy grows, the number of high earners in real terms will increase relative to the number of low earners, thus decreasing the tax needs of the system. The relative wage approach described above does not have this feature since, on the average, workers receive the average wage. (A relative wage approach which does have this feature of the real wage approach could be designed, however, by locating the progressivity at a different time in the process of calculating benefits.)

(3) The age at which workers stop paying payroll taxes and start receiving benefits is, of course, an important cost factor. For this reason this Panel has recommended serious analysis of the implications of the current retirement test as changes in the current system occur. Whatever the retirement test, however, it should be recognized that different benefit formulas will result in different benefit increases as a consequence of employment beyond the normal retirement date. The greater the rise in benefits the greater the incentive to postpone retirement (or to forgo early retirement).

Under both approaches, a late earning year can replace an early earning year in the calculation of average wage, if that works to the advantage of the retiring worker. The greater the weight given to early years, the less likely it becomes that a late earning year will contribute more than an early working year, and the smaller the value of such increase when it does occur. Thus, the real wage approach offers greater incentives for longer working lives.

As stated in the text, this Panel tentatively prefers the real wage approach to the relative wage approach. We recognize however, that more thorough analysis might alter this conclusion.

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[1] Social Security: Perspectives for Reform: Joseph A. Pechman, Henry J. Aaron, Michael K. Taussig, The Brookings Institution, Washington, D.C., 1968.

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