A Guide to Social Security Money's Worth Issues

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This article discusses some of the major issues associated with the question of whether workers receive their money's worth from the Social Security program. An effort is made to keep the discussion as nontechnical as possible, with explanations provided for many of the technical terms and concepts found in the money's worth literature. Major assumptions, key analytical methods, and money's worth measures used in the literature are also discussed. Finally, the key findings of money's worth studies are summarized, with some cautions concerning the limitations and appropriate usage of money's worth analyses.

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The question of whether workers receive their money's worth from Social Security has received a great deal of public attention. Most analysts agree that past retirees have generally received benefits worth well in excess of the taxes that they paid. This result reflects the nature of a pay-as-you-go social insurance program that grants full benefit rights to workers who have contributed to the program for only a short time after the program begins.[1] As the program matures, workers contribute over more of their working lives, and the balance between taxes and benefits naturally becomes less favorable.

As this balance becomes less favorable, criticism of alleged inequities under the program is likely to increase. Some analysts have projected, for example, that many young workers can no longer expect to receive their money's worth from Social Security.[2] Others have suggested that the redistribution of lifetime resources under Social Security is excessive or that the program effectively discriminates in possibly inappropriate ways on the basis of gender, race, marital status, or other individual characteristics.[3]

To facilitate the evaluation of such arguments, this article discusses some of the major issues associated with Social Security money's worth questions. An effort is made to keep the discussion as nontechnical as possible and to explain technical terms and concepts where necessary. Various measures that have been used in money's worth analyses are explained and contrasted. Some of the major assumptions and analytical methods used in such analyses are identified, along with indications of how these assumptions and methods affect the conclusions. The results of some of the more important money's worth studies are summarized, and the article closes with a discussion of the limitations and appropriate usage of money's worth analyses.

Frequently Used Money's Worth Measures

Four different measures are frequently used to evaluate the money's worth question. These measures are referred to in this article as the "payback period," the "benefit/tax ratio," the "lifetime transfer," and the "internal rate of return." Although different in concept, all of these measures are concerned with the balance between Social Security taxes and benefits over workers' entire lifetimes.[4]

The payback period is an estimate of the length of time required for a beneficiary or beneficiary couple to recover in benefits the value of the taxes that they paid into the Social Security program while they were working. If the payback period is shorter than their expected remaining lifetimes when they start receiving benefits, then they can expect to receive more than their money's worth from Social Security. Conversely, if the payback period exceeds their life expectancies, then Social Security would be a "bad deal" from their perspective. The payback period measure is often used in articles appearing in publications with broad readership. Unfortunately, some of these articles lack technical competence, and the payback period measure is sometimes misused, as discussed in the following section. The payback period is also referred to as the "break-even period;" a similar measure used in some studies is the "break-even age."

The benefit/tax ratio compares the total lifetime value of a worker's Social Security benefits with the total lifetime value of his or her Social Security taxes. If the ratio of lifetime benefits to lifetime taxes is greater than one, then workers receive more than their money's worth from Social Security. If the ratio is less than one, then workers fail to get their money's worth. The benefit/tax ratio is sometimes referred to as the "benefit/cost" ratio; the inverse of this ratio, the lifetime "tax/benefit" or "cost/benefit" ratio, is also used in some studies.

The lifetime transfer is a similar measure that compares the difference, rather than the ratio, between the total lifetime value of benefits and the total lifetime value of taxes. If lifetime benefits exceed lifetime taxes, then the lifetime transfer is positive, and workers get more than their money's worth from Social Security. A negative lifetime transfer indicates that workers do not get their money's worth. The lifetime transfer measure is also referred to in some analyses as the "net lifetime transfer" or the "lifetime wealth increment."[5]

Finally, the internal rate of return measures the interest rate that a worker would have to receive on his or her Social Security tax payments in order to generate benefits equal to those received under Social Security. That is, if a worker made savings account deposits equal to (and at the same time as) his or her Social Security tax payments and then made withdrawals from the account equal to (and at the same time as) his or her Social Security benefits, then the internal rate of return is equal to the savings account interest rate that would leave the worker with a zero balance at the end of his or her life. Thus, if the internal rate of return is larger than the interest rate available to workers for their own investments, then they receive more than their money's worth from Social Security—that is, they receive a higher "interest rate," or internal rate of return, from the Social Security program than from their private savings. Conversely, if the internal rate of return is smaller than the interest rate that workers can earn privately, then they do not get their money's worth from Social Security.

These four money's worth measures are illustrated in table 1. In order to focus on the money's worth measures rather than on details of the example, the table provides a highly simplified illustration of a hypothetical worker's lifetime spanning only five periods. In this example, assume that a single worker pays social insurance taxes of $1,000 in each of three periods before retiring and receives benefits of $2,000 in each of two periods before dying. These transactions are represented in the "Taxes" and "Benefits" columns under the "Current values" heading in the first section of the table. The "Net benefits" column under that heading depicts the value of current benefits less taxes in each period.

The columns under the "Accumulated values" heading in the first section of the table convert the current values to accumulated values taking into account the interest that could have been earned on these transactions *if* they had been invested or borrowed privately. This example assumes that the interest rate at which such private transactions would take place is 10 percent per period, compounded each period.

The first three columns under the "Accumulated values" heading depict the accumulated values in each period of past taxes, benefits, and net benefits. Under the accumulated taxes column, for example, accumulated taxes in the first period simply reflect the tax payment in that period of $1,000. In each succeeding period, accumulated taxes from the previous period, plus interest, are added to the current tax payment; the accumulated taxes value for any period, then, is equivalent to the balance for a savings account, paying 10 percent interest per period, in which deposits are made equal to the assumed tax payments. In period 2, for example, accumulated taxes are equal to the $1,000 tax payment made in period 1, plus $1,000 x .1 = $100 interest on that payment, plus the $1,000 current tax payment in period 2, for a total accumulated value of $2,100. Similarly, in period 3, accumulated taxes from period 2 ($2,100) plus interest ($2,100 x .1 = $210) are added to the period 3 tax payment ($1,000) to arrive at the total accumulated taxes value ($3,310) for period 3. The next two columns for accumulated benefits and accumulated net benefits under the 10 percent interest rate assumption are computed using the same approach.

The final column under the "Accumulated values" heading uses the internal rate of return, instead of the assumed 10 percent market interest rate, to accumulate net benefits. The internal rate of return for this example can be calculated as 12.074 percent. Using this interest rate to accumulate net benefits, then, produces an accumulated value of benefits less taxes equal to zero at the end of the worker's lifetime, consistent with the definition of the internal rate of return discussed above. In effect, then, this worker can be considered to be earning an interest rate of 12.074 percent from the social security program in this example.

Section 2 of table 1 depicts the accumulated or present values of *lifetime* taxes and benefits, where these accumulated or present values are evaluated as of different periods. These values will be used later to calculate the lifetime benefit/tax ratio and lifetime transfer measures for this example. Lifetime accumulated taxes and benefits are given by the period 5 values under the "Accumulated values" heading in section 1 of the table; that is, these period 5 values represent taxes and benefits accumulated over the entire lifetime assumed for this example. However, these lifetime accumulated values can also be evaluated or represented in terms of their "present values" in other periods.[6] For example, when evaluated as of the last (or fifth) period, the accumulated value of lifetime taxes in this example is $4,005.10, as given by the value for period 5 in the first section of the table under the "Taxes at 10 percent" column under the "Accumulated values" heading. Alternatively, the "present value" in period 1 of this period 5 accumulated value can be calculated as $4,005.10 / (1.10^4) = $2,735.54;[7] that is, the period 1 present value of $2,735.54 corresponds to the amount that would have to be deposited in period 1 into a savings account paying a compound interest rate of 10 percent per period in order to accumulate to $4,005.10 four periods later in period 5. In this sense, then, $2,735.54 is the period 1 "present value" of $4,005.10 in period 5. Similarly, the period 4 present value of the period 5 accumulated value of $4,005.10 is calculated as $4,005.10 / 1.10 =$3,641.00.[8]

Table 1.—Money's worth measures example assuming a 10 percent market interest rate

Section 1: Period values	Current values			Accumulated values			
						Net benefits at—	
Period	Taxes	Benefits	Net benefits	Taxes at 10 percent	Benefits at 10 percent	10 percent	Internal rate of return
1	$1,000.00	0	-$1,000.00	$1,000.00	0.00	- $1,000.00	- $1,000.00
2	1,000.00	0	- 1,000.00	2,100.00	.00	- 2,100.00	- 2,120.74
3	1,000.00	0	- 1,000.00	3,310.00	.00	- 3,310.00	- 3,376.81
4	0	$2,000.00	2,000.00	3,641.00	$2,000.00	- 1,641.00	- 1,784.53
5	0	2,000.00	2,000.00	4,005.10	4,200.00	194.90	.00

Section 2: Lifetime accumulated or present values

Accumulated or present value of lifetime taxes, by evaluation period:	
In first period (1)	$ 2,735.54
At retirement (period 4)	3,641.00
In last period (5)	4,005.10
Accumulated or present value of lifetime benefits, by evaluation period:	
In first period (1)	$ 2,868.66
At retirement (period 4)	3,818.18
In last period (5)	4,200.00

Section 3: Money's worth measures

Payback period	Less than 2 periods		
Internal rate of return	0.12074		
	Evaluation period		
	First	Retirement	Last
Benefit/tax ratio	1.04866	1.04866	1.04866
Lifetime transfer	$133.12	$177.18	$194.90

Section 3 of the table displays the values of all four money's worth measures for this example. As shown, the worker in this example receives more than his or her money's worth by all four measures. As noted above, the payback period is defined as the number of periods required after retirement for accumulated benefits to equal accumulated taxes. As shown in section 1 under the "Taxes at 10 percent" and "Benefits at 10 percent" columns, accumulated benefits exceed accumulated taxes by period 5, indicating that the payback period in this example is something less than the assumed two-period length of the retirement period. Similarly, the internal rate of return of 12.074 percent in this example exceeds the assumed market interest rate of 10 percent, again suggesting that this worker gets more than his or her money's worth. The lifetime transfer is also positive in this example; when evaluated in period 5, for instance, the lifetime transfer is $194.90, the difference between the accumulated values of lifetime benefits ($4,200.00) and lifetime taxes ($4,005.10). Similarly, the ratio of lifetime benefits to lifetime taxes is $4,200.00 / $4,005.10 = 1.04866 in this example, again indicating a favorable balance between lifetime benefits and lifetime taxes.

Note that the ratio of lifetime benefits and taxes is independent of the evaluation period, while the present value of the lifetime transfer differs depending on the period in which it is evaluated. This is illustrated in the last rows of table 1, which show the benefit/tax ratio and lifetime transfer measures when evaluated as of the first period, the fourth period at retirement, and the last period.[9]

In this simplified example, the lifetime taxes and benefits for the hypothetical worker were assumed to be known with certainty. Similar calculations can be made for actual workers whose lifetime taxes and benefits are already known; that is, for actual cases where the worker and any dependents potentially drawing benefits on the account of the worker have all died and where all of the taxes paid by the worker and all of the benefits paid on the account of the worker can be identified. Many money's worth questions of interest relate to outcomes for persons and age groups presently alive or not even born, however, requiring the projection of future taxes and benefits for these groups. Money's worth analyses can incorporate such projections by calculating the taxes and benefits that are "expected" in a statistical sense, given certain assumptions.[10]

To illustrate, consider the case of a single worker, now retired, whose past taxes and benefits can be identified. To further simplify the example, suppose we know that this worker will remain unmarried and will not return to work, and suppose we also know what program adjustments will be made to this worker's present benefit in future periods. The only remaining uncertainty in this case, then, is how long this individual will survive. Money's worth measures can deal with this uncertainty by calculating expected benefits in each future period. In this example, the expected benefit E_t in any given future period t is given by the product of the probability S_t that the individual will survive to that period and the benefit B_t that will be received if the individual survives; that is, $E_t = S_t \times B_t$. Calculating expected outcomes in actual cases, of course, involves many other uncertainties that significantly increase the complexity and data requirements for money's worth analyses, as discussed below. These uncertainties can include changes over the lifetime in marital and family status, labor-force participation patterns, unemployment spells, earnings levels and growth rates, and so forth.[11]

It is also important to recognize that the four money's worth measures discussed above do not always give equivalent indications of whether workers receive their money's worth from the program.[12] More generally, the different measures can produce different rankings of outcomes across workers with different tax and benefit streams.[13] As such, it is important to use the money's worth measure most appropriate for the particular question being asked.

The payback period measure is often used in articles aimed at the general public, because it is relatively easy to explain and understand. Technical deficiencies limit its usefulness in more rigorous analyses, however.[14] Because of these deficiencies, the payback period generally can give only a rough indication of whether or not particular workers can expect to get back their money's worth from Social Security over their remaining lifetimes.

While the other money's worth measures are technically superior to the payback period measure, the choice among them depends on the particular question being addressed. The internal rate of return measure is useful from an expositional standpoint, since it allows comparison with any interest rate of the reader's choosing, while the other money's worth measures incorporate a particular interest rate assumption into the estimates.[15] As noted earlier, however, the internal rate of return is not always a reliable indicator of the relationship between the present values of lifetime taxes and benefits. Again, both the benefit/tax ratio and lifetime transfer measures are consistent indicators of whether or not lifetime benefits exceed lifetime taxes, but can produce different rankings of outcomes. These differences arise in part from the fact that the internal rate of return and benefit/tax ratio measures do not reflect the size of the "investment" represented by workers' lifetime Social Security tax contributions, while the lifetime transfer measure does. For example, some groups may experience higher internal rates of return or benefit/tax ratios but lower lifetime transfers than other groups because their lifetime tax contributions, or "investments" in the program, are also lower than the other groups, more than offsetting the higher internal rates of return or benefit/tax ratios.[16]

By definition, the lifetime transfer measure is the appropriate indicator of

the extent to which the lifetime incomes of participants are affected by the balance between lifetime benefits and taxes, because this extent depends on the difference, rather than the ratio or rate of return relationship, between lifetime benefits and taxes. For many money's worth questions, then, specifically those that aim to identify the effect of lifetime taxes and benefits on the lifetime incomes of program participants, the lifetime transfer is the most appropriate money's worth measure.[17]

For other money's worth questions that focus on the relative attractiveness of the Social Security program as an "investment" alternative, regardless of the size of the tax "investments" that different participants are required or allowed to make, the internal rate of return or benefit/tax ratio measures are more appropriate. The internal rate of return, benefit/tax ratio, or other relative money's worth measure is also generally used to establish whether lifetime redistribution under the program is "progressive" or "regressive" with respect to some lifetime measure of economic well-being—for example, the program might be described as progressive if the internal rate of return or benefit/tax ratio declines as lifetime earnings increase.[18, 19]

Assumptions and Analytical Methods

Unfortunately, money's worth measures are sometimes used or developed incorrectly, with misleading results. The implications of the assumptions or analytical methods used in money's worth studies are not always fully appreciated, leading to incorrect interpretations of the estimates.

This section discusses a number of key assumptions and analytical methods that can lead to incorrect interpretations. As the discussion below indicates, some of the views expressed in this section are not universally held by money's worth analysts.

Tax Incidence

One problem with many money's worth analyses is that they ignore the employer's share of the Social Security payroll tax. Some analysts believe that the employer contribution should not be included in money's worth calculations.[20] One rationale sometimes cited is that the employer's contribution should be considered as pooled for the general benefit of all covered workers or to fund the redistributional component of the program. The view of most economists addressing the money's worth issue is that this type of argument really misses the point. The question is simply one of whether employees are paid less than otherwise because of the employer tax, or whether the tax is shifted to consumers in the form of higher prices or paid by the owners of the business in the form of lower profits. If workers' wages are lower because of the tax on employers, for example, then, in reality, workers actually pay the tax, even though it is collected from the employer.

Obviously, money's worth analyses become much simpler under the assumption that employers shift the tax directly to workers, since this allows the employer share of the tax to be assigned to specific workers or groups of workers. Under other assumptions of who ultimately pays the employer share of the tax, identifying the specific individuals or groups who bear the burden of the tax becomes much more difficult. Because workers are also consumers and shareholders, however, they collectively bear much of the burden of the employer share of the tax under any of the shifting assumptions.

In any event, ignoring the employer share of the tax is clearly inappropriate, because it results in the comparison of benefits with taxes that are insufficient to fund those benefits; as a consequence, Social Security appears to be a much better deal than it actually is when all taxes required to fund the program are considered. While the question of who bears the burden of the Social Security payroll tax is still a matter of debate among economists, the most widely adopted assumption in money's worth analyses is that the tax is shifted over time by employers to workers in the form of lower wages.[21]

Financial Balance

A similar problem arises in some money's worth analyses that make estimates under currently legislated tax and benefit provisions, even when the program is projected to be out of long-run financial balance. If the program is in long-run financial deficit, for example, money's worth estimates for at least some age groups will be more favorable than the outcomes that those groups will actually experience when the tax increases or benefit cuts required to bring the program back into financial balance are enacted. An analogous effect is that money's worth estimates for some groups would be too pessimistic if the program were projected to have a long-run actuarial surplus that will not be maintained. While such estimates are of interest since they indicate program outcomes under current legislation, they are misleading in the sense that they compare taxes and benefits which will have to be changed for at least some groups to bring the program back into financial balance.

Interest Rate

A third problem with many money's worth analyses is that they fail to correctly incorporate the effect of the interest rate or, more generally, fail to rationalize the interest rate used in the study or fail to provide a range of estimates under alternative interest rate assumptions. In some simplistic payback period analyses, for example, workers' tax payments in each year of their working lives are simply added together to compute total lifetime tax payments. Simply adding together taxes over time, of course, is equivalent to trying to compute one's current savings account balance by simply adding together all prior deposits to the account. Obviously, such an approach would underestimate the current balance to the extent of any interest earnings that were posted to

the account. If the deposits were made over an extended period of time, these interest earnings could be substantial.

While it is clear that interest must be taken into account, there is disagreement among analysts about the appropriate interest rate to use. In fact, the differences in the conclusions reached by different money's worth studies are often due to differences in the interest rates used in the studies. The issues involved include whether Social Security should be compared to risky or conservative investments, whether different interest rates are appropriate for individuals in different economic circumstances, and whether the interest rate should be net of income taxes.

Some of these issues can be resolved if the money's worth question is carefully stated. A critical factor in the choice of the interest rate is the nature of the alternative to which the Social Security program is being compared. A frequent form of the money's worth question is whether workers could do better than under Social Security if they were required to save privately for their own retirement.[22] For this type of question, a strong argument can be made that the interest rate should reflect the rate at which workers could accumulate funds over time with the same assurance of nondefault and stability of return as under the present Social Security program. Otherwise, the present program would be compared to an inherently different program in terms of the risks faced by participants.[23] In the context of present income tax rules, an after-tax rate of return is appropriate from the perspective of the individual. Together, these criteria suggest that the after-tax rate of return to long-term Federal Government bonds[24] is an appropriate market comparison for money's worth questions of this type, with some downward adjustment in the rate to account for other risk-reducing characteristics of the Social Security program, such as the automatic inflation-adjustment of benefits.[25]

Of course, other types of money's worth questions can also be posed, requiring the use of other interest rates. For example, one money's worth question that might be raised is "given the interest rates that different workers presently face with regard to their borrowing or lending decisions, would they consider Social Security to be a good or bad investment?" This latter type of question could lead to the use of widely varying interest rates for different individuals, depending on whether they were net borrowers or lenders, on the types of assets in their investment portfolios, and on their personal income tax rates; much higher interest rates might be appropriate for many individuals, including those who are net borrowers and those preferring to invest in riskier alternatives. An additional factor arguing for the use of a higher interest rate for some individuals in the context of this latter type of money's worth question is the potential uncertainty they may have concerning future legislative changes in the program. One way to incorporate such uncertainty into the analysis is to increase the "risk premium" component of the interest rate used in the comparison.[26]

It should be kept in mind that this individual-specific type of money's worth comparison is incomplete in that it implicitly ignores some of the social costs and gains of leaving decisions about retirement saving, disability insurance, and life insurance entirely up to individual workers. For example, workers benefit from greater freedom of choice in developing their own retirement saving and insurance strategies, but social costs are generated by those workers who fail to adequately provide for these contingencies or whose investments perform poorly.[27] In addition, well-known insurance problems such as adverse selection affect the ability of the private sector to provide "fair" insurance in many cases, implying other potential social advantages of universal public insurance programs that are not reflected in this latter type of money's worth comparison.[28]

In summary, then, the appropriate interest rate to use in a money's worth analysis depends critically on the particular question the estimates are intended to address. In this sense, no single interest rate is "correct" for all money's worth analyses. As such, it is important for money's worth studies to rationalize the particular interest rates used and to indicate the nature of the money's worth questions that the estimates are designed to answer. Providing estimates for a range of interest rate assumptions broadens the range of questions that can be addressed. In most studies, readers are left to sort out these issues on their own or, worse, misled by authors with particular political biases—the higher the interest rate, for example, the less favorable the Social Security program tends to appear. In general, if the intended comparison is between the present program and some compulsory private alternative program with equivalent assurance of nondefault and stability of return, then a relatively low interest rate somewhat below the rate of return to long-term Federal Government bonds is appropriate. Alternatively, if the intended comparison does not incorporate an alternative compulsory program, then higher interest rates may be appropriate for many individuals.[29] By comparing inherently different alternatives, however, this latter type of money's worth comparison is incomplete in that it ignores some important social costs and gains that differ among the alternatives considered.

Administrative Costs

A deficiency of nearly all money's worth analyses is that they ignore the administrative costs of the alternative to which the Social Security program is being compared. Because past or projected Social Security taxes and benefits appear directly in the money's worth measures, administrative costs of the Social Security program are already implicitly incorporated.[30] That is, the past or projected benefits that can be paid under the program for a given level of tax collections are

reduced by the costs of administering the program. The corresponding costs of administering the alternative to which the Social Security program is being compared, however, are not typically represented in the money's worth measures. This omission biases the money's worth measures against the Social Security program. This bias is larger as a percentage of benefits for the Disability Insurance (DI) program than for the Old-Age and Survivors Insurance (OASI) program, but important for both.[31] Even if the alternative being compared to OASI, for example, simply consists of requiring workers to save privately by investing in a certain type of government bond, additional administrative costs would be created under the alternative for both the worker and the government. One difficulty of including such alternative administrative costs into the comparison, of course, is that they are difficult to quantify.[32] Nevertheless, it is important to recognize this inherent bias in nearly all money's worth analyses.

Hypothetical Versus Actual Data

One approach adopted in many money's worth studies is to construct lifetime Social Security tax estimates for what are referred to as "hypothetical," "representative," "prototypical," "simulated," or "synthetic" workers who differ in various characteristics.[33] In some of the less sophisticated hypothetical worker analyses, for example, an "average worker" might be characterized as a worker who has always earned the economy-wide average wage during each year of a working life assumed to span a particular number of years; a "low earner" might be characterized as one always earning the minimum wage or always earning some assumed fraction of the economy-wide average wage. Other characteristics, such as gender, race, marital status, and different types of dependents, might be used to differentiate workers within each earnings category. Given the assumed earnings, marital status, dependents, and other characteristics of the hypothetical worker, then, expected lifetime taxes and benefits can be estimated by applying Social Security tax and benefit provisions and the probabilities that the worker and eligible dependents will survive to pay the taxes and collect the benefits.[34]

The major advantages of using relatively unsophisticated hypothetical worker cases, such as the "average worker" and "low earner" cases discussed in the previous paragraph, is that money's worth outcomes are relatively easy to estimate and update and the hypothetical cases are relatively easy to explain and understand. A major disadvantage of this less sophisticated approach, however, is that the results can be misleading, since such hypothetical workers are not really representative of the corresponding categories of actual workers. An economy-wide average wage series is unlikely to be representative of the average earnings experience of the group of workers born in any given year, for example. More generally, workers of different earnings levels, gender, race, and marital status exhibit differences in other factors as well, such as ages of labor-force entry, labor-force participation and unemployment patterns, lifetime earnings patterns, ages of retirement, survival probabilities, and so forth, which affect actual money's worth outcomes but are not adequately taken into account in the hypothetical worker analyses. While the direction of the biases introduced by these differences is unknown in many of the hypothetical cases,[35] a number of studies have indicated that the biases introduced by unrepresentative hypothetical assumptions can be quite important.[36]

Some money's worth studies employing more sophisticated versions of the representative worker approach are less subject to these deficiencies. Given adequate data and analysis, it is theoretically possible to construct tax and benefit streams and calculate money's worth estimates that are actually representative of particular groups of workers. The more detailed the worker categorizations, however, the more deficient available data sources and the more difficult the attendant analyses become. Very few representative worker analyses have made serious attempts to differentiate the earnings estimates and survival probabilities by the same set of characteristics used to categorize the money's worth outcomes, and even these efforts were constrained by data limitations and analytical difficulties.[37]

The important point to note here is that money's worth analyses that present results for hypothetical workers differing by various characteristics should be treated as only illustrative unless the earnings estimates and survival probabilities underlying the tax and benefit streams developed for these workers and their dependents are constructed so as to be actually representative of workers and dependents with those characteristics—that is, the tax and benefit streams and survival probabilities must take into account the type of differences in lifetime experiences noted above for workers in the different categories. If the worker categories are disaggregated by earnings level, for example, but the survival probabilities or detailed characteristics of the lifetime earnings profiles are not, then the corresponding money's worth estimates cannot be counted on to be representative of actual workers at different earnings levels. These less sophisticated hypothetical worker analyses are primarily useful, then, to provide a rough feel for the general trend in money's worth outcomes over time for workers whose earnings happen to correspond to those assumed in the analyses, but they cannot generally be regarded as representative of the corresponding categories of workers.

One way to avoid some of the problems associated with the hypothetical or representative individual approach is to base money's worth calculations on historical data for actual sample cases, but this approach has problems and limitations of its own. Projections of money's worth outcomes for future workers cannot be estimated directly from sample data, of course, and must rely on the representative individual

approach. Even for historical analyses, studies based on sample data are constrained by limitations of the data available in Social Security administrative files.[38] Historical benefit data for the individuals in these files are available for only a relatively recent period. Although more historical years are available for the individual earnings records, detailed earnings data prior to 1951 are not available in current administrative files.

More generally, money's worth outcomes based solely on historical sample data cannot be estimated for many age groups because the full lifetimes of only the oldest age groups participating in the Social Security program have been completed. For younger age groups, even money's worth studies using actual sample data must extend the historical data for individual cases to the ends of their potential lifetimes. This extension implicitly requires the introduction of representative individual methods to create simulated data to fill out the as yet uncompleted lifetimes of sample individuals who are still living. Even sample individuals whose working lifetimes are complete and whose initial retirement benefits are known require the projection of survival probabilities, changes in family composition, and benefit changes over time. If the sample data are categorized by such factors as lifetime earnings level, gender, race, and marital status, then the family composition probabilities and survival probabilities must also be disaggregated by those characteristics for the money's worth estimates to be representative of those categories of workers. The problem becomes more severe for age groups whose working lives are not yet completed, since such cases require the projection of future earnings and retirement ages as well.

In short, the use of sample data is subject to many of the same problems afflicting the representative individual approach, although the problems are less severe to the extent that some historical information is available for each sample individual. In general, then, money's worth estimates based on historical sample data are typically more reliable or representative than estimates based purely on the hypothetical or representative individual approach, especially for age groups whose working lives are largely completed.

Summary of Study Results

Money's worth studies can be classified into two types. The first type focuses on whether given cohorts of workers or typical members of those cohorts receive their money's worth from Social Security.[39] The second type of study focuses on the distribution of results across characteristics of interest within a given cohort of workers—that is, how does the program treat lower-paid workers relative to higher-paid workers, single workers relative to couples, males relative to females, and so forth.

The rest of this section summarizes some of the more important results for money's worth studies of each type. Because an extensive literature review is beyond the scope of this article, this summary focuses on results from publications that are most noteworthy, in my view, either because they are based at least in part on sample data, rather than on an insufficiently sophisticated hypothetical worker approach, or because they were conducted more carefully or documented more completely, imparting more import to the results. The references listed at the end of this article provide additional reading for those interested in a more comprehensive view of the literature.

The discussion in the following paragraphs is also limited to results under the OASI program, since relatively few studies have focused on money's worth outcomes under the DI program. In addition to the difficulties discussed above facing all Social Security money's worth studies, the estimation of disability incidence rates poses an additional formidable hurdle for analyses of the DI program, particularly in distributional analyses where the incidence rates, to be representative, must be differentiated by such characteristics as year, age, gender, race, earnings or income level, and marital status.

In a recent study, Bakija and Steuerle (1993) estimate results under the DI program for hypothetical workers of different gender, earnings level, and family composition groups in the 1965 birth cohort under three alternative tax assumptions,[40] but these results are limited because critical inputs, such as earnings profiles, ages of labor force entry and retirement, mortality rates, and disability incidence rates, are not differentiated by the same characteristics as the estimated results. Although subject to these limitations, the study results include that: (1) all of the hypothetical worker examples considered are projected to receive positive net lifetime transfers under DI except for high wage workers; (2) males fare better than females at the same earnings level, since females have a lower probability of becoming disabled; (3) dependent benefits add only moderately to the value of DI, both because of program limits on family benefit awards and because dependent children are generally associated with younger workers, whose disability incidence rates are lower; and (4) the DI program is progressive with respect to lifetime earnings, in the sense that lifetime benefit/tax ratios decline as earnings increase across the three hypothetical earnings levels considered, holding gender and family composition constant.[41]

Results for Cohorts as a Whole Under OASI

Most analysts agree that cohorts who have reached retirement age to date have generally received, or can expect to receive, benefits worth well in excess of the value of the taxes that they paid. This is illustrated in table 2, which presents various present values and inflation-adjusted internal rates of return under the OASI program, as estimated by Duggan *et al.* (1993), for selected groups of cohorts born between 1895 and 1922. These esti-

mates are based on a sample of actual case histories drawn from the Social Security Administration's Continuous Work History Sample (CWHS) and incorporate both the employee and employer share of the Social Security payroll tax for wage earners, implicitly assuming that the employer share is shifted to the employee. The present values in table 2 are calculated using historical and projected interest rates earned by the Social Security trust funds.[42]

Under the assumption of these interest rates, the "Net benefits" column in table 2 corresponds to the lifetime transfer money's worth measure discussed above. The benefit/tax ratio measure can also be computed from table 2 as the ratio of the "Benefits" column to the "Taxes" column for each birth cohort group. For example, the ratio of lifetime benefits and taxes for the 1895-1903 cohort is equal to 120,322 / 14,220 = 8.46. Under this interest rate assumption, then, all of these cohorts received lifetime benefits well in excess of the lifetime taxes that they paid.

The rate of return column in table 2 provides confirmation of this result, with inflation-adjusted rates of return ranging from 12.5 to 5.9 percent. By way of comparison, the inflation-adjusted rate of return on long-term government bonds over the period 1937 to 1992 averaged about 0.6 percent.[43] Relative to privately available investments of comparable default risk and stability of return, then, these early cohorts have received much more than their money's worth from the OASI program. The OASI rates of return to most of these cohorts even compare favorably to much riskier investments, such as common stocks, which averaged a 7.3 percent rate of return over the 1937 to 1992 period after adjustment for inflation. As noted above, this result reflects the large transfers that a pay-as-you-go social insurance program grants to early cohorts.

As a pay-as-you-go social insurance program matures, the balance between taxes and benefits naturally becomes less favorable for later cohorts. This effect has been widely documented in the literature[44] and is apparent across the cohort groups displayed in table 2. This effect is even more apparent across the wider range of individual birth cohorts included in chart 1 and table 3, which are taken from a recent study by Leimer (1994). This analysis also incorporates both the employee and employer share of the Social Security payroll tax for wage earners and derives historical taxes and benefits by cohort from Social Security administrative data sources. Projections of future taxes and benefits by cohort are derived from a long-run simulation model calibrated for general consistency with the intermediate assumptions of the 1991 Trustees' Report.[45]

Chart 1 depicts two graphs, labeled as "Present law" and "Balanced budget." The present law graph depicts inflation-adjusted internal rates of return under the OASI program for each cohort, assuming that the present and future tax and benefit provisions under present law remain unchanged.[46] The most striking feature of this graph is the steep decline in internal rates of return across the early cohorts, following the general pattern expected for a maturing pay-as-you-go social insurance program. As indicated in chart 1 and table 3, the estimated internal rates of return under present law decline from 36.5 percent for the 1876 cohort[47] to 11.9 percent for the 1900 cohort to about 4 percent for the cohorts now reaching retirement age to about 1.9 percent for the cohorts now reaching employment age. Projected inflation-adjusted rates of return under present law flatten out at a little over 1.7 percent for the most distant cohorts included in the analysis.

Because the OASI program is not in actuarial balance over the entire period covered by the cohorts represented in chart 1, a second graph, denoted by the "Balanced budget" label, is included to illustrate the effects on internal rates of return of a series of gradual tax increases designed to bring the OASI program into actuarial balance over the full projection period through the year 2150.[48] As shown in table 3, these tax increases have no effect on the early cohorts, since the tax increases do not begin until 2020, but the most distant cohorts considered experience a drop in their projected internal rate of return from 1.7 percent to 0.9 percent. Although many other tax and benefit adjustments could be adopted to bring the OASI program into long-run actuarial balance,[49] this particular example indicates that such alternatives will have a substantial effect on the internal rates of return experienced by many cohorts. This result illustrates the problem noted above in some money's worth studies that make estimates under currently legislated tax and benefit provisions even when the program is not in long-run actuarial balance.

While it is clear that the early cohorts participating in the Social Security program have received much more than their money's worth from the program and that the balance

Table 2.—Estimated present values and inflation-adjusted internal rates of return under OASI, by birth cohort group, as estimated by Duggan, Gillingham, and Greenlees (1993)

Birth cohort	Sample cases	Present values (1988 dollars)			Rate of return (in percent)
		Taxes	Benefits	Net benefits	
1895-1903	10,420	$14,220	$120,322	$106,102	12.5
1904-1910	10,440	22,877	122,869	99,992	9.4
1911-1916	9,907	30,959	116,986	86,027	7.6
1917-1922	9,117	37,651	89,357	51,705	5.9

Chart 1.—Inflation-adjusted OASI internal rate of return under present law and balanced budget tax schedules, by birth cohort, as estimated by Leimer (1994)

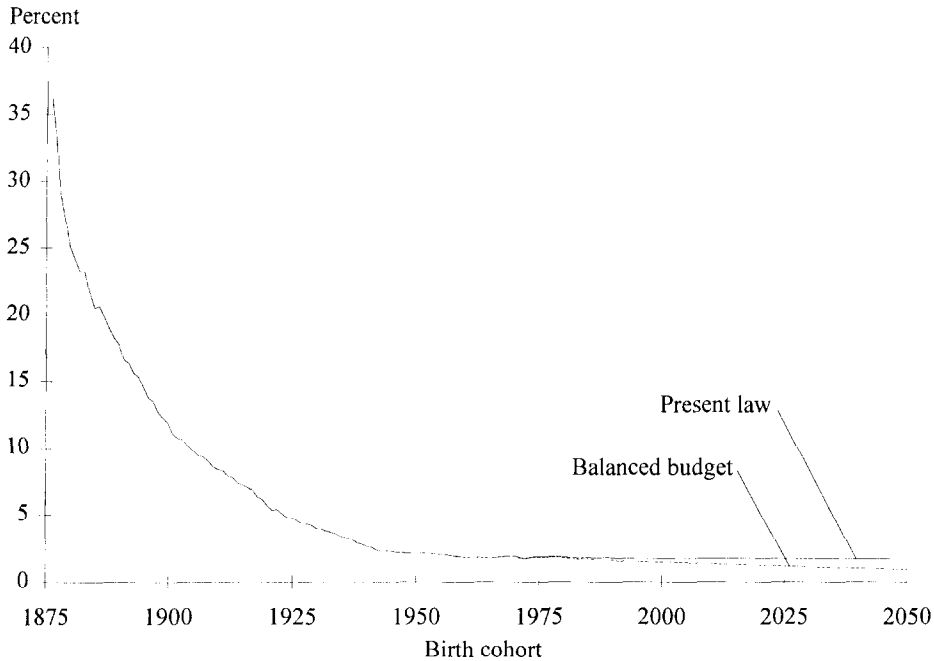

Table 3.—Inflation-adjusted internal rates of return under OASI, for selected birth cohorts, as estimated by Leimer (1994)

[In percent]

Birth cohort	Rate of return		Birth cohort	Rate of return	
	Present law	Balanced budget		Present law	Balanced budget
1876	36.5	36.5	1975	1.9	1.8
1900	11.9	11.9	2000	1.7	1.5
1925	4.8	4.8	2025	1.7	1.2
1950	2.2	2.2	2050	1.7	.9

between taxes and benefits has become less favorable for later cohorts, analysts disagree about whether the internal rate of return will fall so low that current and future workers can no longer expect to get their money's worth from the program on average. For cohorts as a whole, the different conclusions reached by different studies appear to be due largely to the use of different interest rates for comparison with outcomes under the Social Security program.

As indicated above, the appropriate interest rate depends on the particular money's worth question being asked. Following the arguments above, if the comparison is between the OASI program and some compulsory private alternative with equivalent assurance of nondefault and stability of return, then the appropriate interest rate is something less than the rate of return on long-term government bonds. As noted above, the average annual inflation-adjusted return on such bonds over the 1937-92 period was 0.6 percent. Using this long-run historical average as the basis of comparison, then, the internal rates of return displayed in chart 1 and table 3 suggest that even the most distant cohorts are projected to receive more than their money's worth on average under either the present law or balanced budget projections.[50] Using interest rate projections generated by the model underlying the internal rate of return estimates presented in chart 1 and table 3 for the balanced budget scenario, Leimer (1994) projects positive net lifetime transfers for future cohorts using the after-tax rate of return on long-term government bonds but negative net lifetime transfers for those cohorts using the after-tax rate of return to capital. Similarly, the data in chart 1 and table 3 indicate that future cohorts would probably receive higher returns on average from a fully funded program that invests in common stocks, which experienced an average annual inflation-adjusted total return of 7.3 percent over the 1937-92 period. This does not necessarily imply that future workers would have been better off under such a program, because there are other considerations involved,[51] but it does illustrate the dependence of money's worth conclusions on the particular question being asked and, therefore, on the interest rate used for comparison with the Social Security program.

Distribution of Results Within Cohorts Under OASI

The second type of money's worth study focuses on the distribution of results within a given cohort of workers. Here the concern is with the differential treatment of lower-paid workers relative to higher-paid workers, of single workers relative to married couples, of single-earner couples relative to two-earner couples, of different races, and so forth. Differential treatment among some of these groups is clearly intended—the "tilt" in the benefit formula, for example, is intended to treat low-wage workers more favorably than high-wage workers. Other types of differential treatment that may occur, such as between races or sexes, may not be intended. Consequently, it is important to study the outcome of Social Security tax and benefit provisions to determine if intended differential treatment is effective and to identify any areas of

possibly unintended differential effects.

Studies based at least in part on historical data have generally, but not always, reached consistent conclusions regarding the broad lifetime redistributional effects of the Social Security program.[52] The most relevant of these studies suggest that:[53]

- The Social Security program has been progressive with respect to income or lifetime earnings—that is, internal rates of return or benefit/tax ratios tend to decline as measures of earnings or income increase, even when other factors are held constant.[54]
- Internal rates of return and benefit/tax ratios have been more favorable for women than for men and for married couples than for single individuals. Women tend to fare better than men, even when other factors (such as earnings) are held constant, because of their lower mortality rates. Couples tend to fare better than singles primarily because of the spouse benefit; single mortality rates also generally exceed those for married individuals.
- On average, whites have received lower rates of return than nonwhites, due in part to the historically lower earnings of nonwhites coupled with the progressivity of the program; these factors appear to outweigh the generally lower survival probabilities for nonwhites.[55] When factors other than race (such as earnings levels) are held constant, there is some evidence that money's worth outcomes for the retirement portion of the Social Security program are less favorable for nonwhites than for whites.[56]

Many of these results are illustrated in table 4, taken from Duggan *et al.* (1993), for a sample of persons born from 1895 to 1922.[57] Again, the "Net benefits" column is equivalent to the lifetime transfer measure discussed above, and the lifetime benefit/tax ratio measure can be computed as the ratio of the "Benefits" column to the "Taxes" column. As shown, "dependent couples" (defined as single-earner couples with dependent spouse) fared better on average in terms of both the internal rate of return and the lifetime transfer than did "individual" workers (defined to include both single persons and dually entitled beneficiaries and their spouses).[58] On average, females fared better than males by the rate of return measure, but received lower average lifetime transfers because their higher rate of return applied to much lower average lifetime taxes than for males.[59] On average, nonwhites fared better than whites by the internal rate of return measure, but blacks received smaller lifetime transfers on average because of their lower lifetime tax payments. Finally, the program was progressive, on average, across lifetime earnings levels for this sample, as indicated by the decline in internal rates of return across the earnings categories; again, the lifetime transfer increased across the earnings categories, reflecting an increase in lifetime tax payments sufficient to outweigh the decline in internal rates of return.

Table 4.—Estimated present values and inflation-adjusted internal rates of return under OASI for the 1895–1922 birth cohorts, by various worker classifications, as estimated by Duggan, Gillingham, and Greenlees (1993)

Worker category	Sample cases	Present values (1988 dollars)			Rate of return (in percent)
		Taxes	Benefits	Net benefits	
All sample workers	39,884	$26,000	$113,082	$87,082	9.1
Household type:					
Individual	28,252	23,527	89,484	65,957	8.6
Dependent couple	11,632	32,007	170,396	138,390	9.8
Gender:					
Female	15,388	17,037	96,204	79,167	10.9
Male	24,496	31,630	123,684	92,054	8.5
Race:					
White	35,437	27,010	116,963	89,953	9.1
Black	3,767	17,447	76,972	59,525	9.6
Other	680	20,766	110,872	90,106	10.7
Earnings:					
Low	13,294	5,820	67,675	61,855	13.8
Medium	13,295	23,303	111,027	87,724	9.9
High	13,295	48,876	160,540	111,665	7.6

The most relevant money's worth studies that project the distributional results of the program for future retirees under present law have generally reached conclusions consistent with those summarized above for studies based on historical data.[60] Specifically, these studies generally suggest that the program will continue to be progressive with respect to earnings for future retirees,[61] that single females will receive higher internal rates of return and benefit/tax ratios than single males, and that single-earner couples will generally fare better than singles or two-earner couples by those measures.

Such distributional money's worth comparisons frequently motivate proposals for reform of the program to correct what some perceive as inequitable treatment across various categories of workers. The redistributional character of the OASI program, coupled with the general decline in internal rates of return and lifetime transfers as the program matures, also raises concerns that some groups within future retirement cohorts may experience negative lifetime transfers even if the cohorts receive more than their

money's worth on average. Such concerns explain why money's worth studies have received a great deal of attention and highlight the need for further research to improve our understanding of how the Social Security program affects the lifetime incomes of successive cohorts over time and of different groups within each cohort.

Additional research is especially important in the analysis of the distributional effects of the program within cohorts, since relatively few studies are based on sufficiently sophisticated hypothetical worker methods or on historical data covering fairly complete lifetimes. Areas meriting particular emphasis include: (1) fully differentiating future earnings and mortality projections by the same set of characteristics used to categorize the distributional results (that is, for example, by age, gender, race, family status, and earnings or income level); (2) estimating program outcomes over full lifetimes for entire historical or future cohorts, rather than just for subsets of those cohorts, such as those attaining retirement age; and (3) estimating the separate and combined effects of both the OASI and DI programs.

Limitations and Appropriate Usage of Money's Worth Measures

Some of the technical limitations of money's worth measures and methods of analysis have already been mentioned. Two broader issues also merit emphasis. First, money's worth measures provide only one perspective on the performance of the program and ignore some of its political and social value. For example, money's worth measures examine the effect of the program over individual lifetimes, while some analysts believe that the program is more appropriately viewed from the perspective of a current period tax and transfer program.[62] Such analysts might focus on the current period regressivity of the Social Security payroll tax over the top range of the income scale, for instance, and consider whether such a tax is an appropriate vehicle for transferring resources to the elderly population or whether the Social Security benefit structure adequately targets needy recipients in the current period, regardless of their prior tax contributions. The internal rate of return and benefit/tax ratio measures provide little information concerning the adequacy of benefits compared to measures of current need or even relative to prior earnings; the lifetime transfer measure provides only indirect information on the adequacy of benefits relative to current needs and no information on adequacy relative to prior earnings. In short, the relevance of money's worth measures depends in part on one's view of the purpose and goals of the Social Security program. Specifically, money's worth measures are most appropriate for revealing the intercohort and intracohort redistributional effects of the program using lifetime, rather than current period, measures of economic well-being.

The second broader issue is that money's worth measures are potentially narrow or misleading indicators of the true effect of the program on lifetime incomes. Some analysts believe, for example, that many of the transfers effected by the Social Security program simply substitute public transfers for private transfers that would have occurred otherwise.[63] They argue that children or, more generally, the working community would privately support the aged population if Social Security did not. To the extent that Social Security transfers exceed those that would have occurred privately, they argue that much of the excess is privately transferred back to heirs to compensate for the increased unfunded liability of the program (in the form of future benefit promises), which the heirs also inherit as a form of government indebtedness. To the extent that these arguments hold, money's worth measures can be interpreted as an accounting artifice with limited policy relevance; in other words, the "redistribution" implied by the money's worth measures either would have occurred in the absence of the program or is negated by offsetting private transfers.

On the other hand, if these arguments do not hold, the redistribution effected by the program and identified by the money's worth measures is likely to have altered the labor supply and saving behavior of the lifetime transfer recipients. Depending on the intensity of such behavioral effects, their economic consequences may be substantial. For example, cohorts receiving positive net lifetime transfers would likely have increased their lifetime consumption to some extent, reducing saving and capital formation, and thereby reducing the rate of economic growth and the lifetime earnings of program participants in subsequent years. From this perspective, then, money's worth measures may give only a narrow and possibly distorted view of the total economic effects of the Social Security program on lifetime incomes.

It is also important to keep in mind the narrower technical issues and limitations of money's worth analyses discussed earlier in this article. Great care must be taken in interpreting the results of money's worth analyses, since many have been developed improperly or qualified insufficiently. Assumptions of particular importance are the interest rate and the incidence of the employer's share of the payroll tax. An important technique to watch for is the use of hypothetical individuals that are not really representative of the corresponding categories of workers.

While all of these cautions should be kept in mind, money's worth analyses that are carefully done can nevertheless provide important information about the lifetime effects of Social Security tax and benefit provisions. Such analyses can help determine if intended differential treatment is effective and whether the program has other, unintended, distributional effects.

Notes

[1] The liberalization of benefits for current retirees has the same effect.

[2] As examples, see Boskin *et al.* (1983), Boskin *et al.* (1987), Hurd and Shoven (1985), Pellechio and Goodfellow (1983), and Wolff (1993).

[3] As examples, see Bennett (1979), Boskin *et al.* (1987), Burkhauser (1979), Holden (1979), and Hurd and Shoven (1985).

[4] Another measure that is sometimes mistakenly referred to as a money's worth measure is the "replacement rate." The replacement rate typically compares initial benefit levels with earnings in the period preceding the receipt of benefits; as such, the replacement rate can be used as a measure of the adequacy of benefits relative to the prior earnings that the benefits partially replace. In contrast, money's worth measures reflect the balance between Social Security taxes and benefits over entire lifetimes.

[5] Other variants of these money's worth measures have also been used. Several measures related to the benefit/tax ratio and the lifetime transfer compare the current benefit with the actuarially fair annuity that could be purchased with the accumulated value of lifetime taxes, assuming the availability of such annuities. These measures include the "benefit/fair annuity ratio" and the "current transfer" measures, where the current transfer is defined as the difference between the current benefit and the fair annuity. Although not discussed elsewhere in this article, the "benefit/fair annuity ratio" and the "current transfer" measures are simply the current period analogues to the lifetime benefit/tax ratio and the lifetime transfer measures, respectively. A key implicit assumption associated with these current period analogues is the intertemporal pattern of the inflation adjustments (and any other intertemporal adjustments, such as those associated with the earnings test or income taxation of benefits) to the expected annuity stream over the period during which benefits may be received. For a fair comparison of the current benefit to a current annuity value, for example, the inflation adjustments assumed for benefits over the entire benefit period would also have to be assumed for the annuity stream. Contrary to suggestions sometimes encountered in the literature, current period analogues such as the benefit/fair annuity ratio or current transfer do not possess any special advantages over their corresponding lifetime measure analogues in "disentangling" the "earned" and "transfer" components of Social Security benefits. In fact, the current period analogues in some studies are misleading indicators of lifetime redistributional effects, since they fail to incorporate the same (proportional) pattern of intertemporal adjustments in the computation of the annuity stream as are assumed to apply to the benefit stream. If the same pattern is applied to both streams, *relative* current period analogues should have identical values, except in special cases, to their lifetime measure counterparts; as examples, the benefit/fair annuity ratio generally should be identical to the lifetime benefit/tax ratio, and the ratio of the current transfer to the current benefit generally should be identical to the ratio of the lifetime transfer to lifetime benefits. Taken by itself, however, the current transfer is an individual-specific proportion of the lifetime transfer, generally precluding its use as an indicator of lifetime money's worth outcomes across individuals or groups. Examples of other money's worth measures that can be found in the literature include the ratio of the net lifetime transfer to lifetime taxes, the ratio of the net lifetime transfer to lifetime earnings, and the ratio of the current transfer to the fair annuity based on accumulated taxes.

[6] The "present value" measure is sometimes referred to as the "discounted value" or "discounted present value."

[7] The 1.10^4 term in this expression represents the value 1.10 raised to the fourth power; that is, $1.10^4 = 1.10 \times 1.10 \times 1.10 \times 1.10$, consistent with the assumption of a 10 percent interest rate, compounded over the four periods between period 1 and period 5.

[8] More generally, if the interest rate is constant over time, the discounted present value of a dollar n periods into the future is equal to $1/(1+r)^n$, where r represents the interest rate during the interim. That is, if $1/(1+r)^n$ is deposited into a savings account at some point in time earning interest rate r compounded each period, its accumulated value n periods later is 1.

[9] When evaluated as of the first period, for example, the benefit/tax ratio (1.04866) is calculated as the ratio, and the lifetime transfer ($133.12) is calculated as the difference, between the $2,868.66 period 1 present value of lifetime benefits and the $2,735.54 period 1 present value of lifetime taxes, as given in the second section of table 1.

[10] Missing historical data may also have to be estimated in many cases using similar techniques.

[11] Microsimulation modeling provides an alternative but equivalent approach to dealing with these uncertainties. That is, microsimulation could be used to simulate the relevant lifetime experiences for a large number of persons differentiated by characteristics of interest, such as gender, race, marital status, and earnings level, where the lifetime experiences for each simulated individual are determined by random draws from probability distributions that are conditional on the individual's current characteristics. The distribution of money's worth outcomes for individuals of differing characteristics could then be calculated from the simulation results. Identifying the conditional probability distributions required for the microsimulation approach, however, encounters the same complexities and data limitations that plague the "expected" value approach.

[12] If properly computed, the benefit/tax ratio and lifetime transfer measures do give the same indication of whether a given tax and benefit stream is associated with a positive or negative money's worth outcome, since one is the ratio and the other the difference between lifetime benefits and lifetime taxes. For certain kinds of tax and benefit streams, however, the payback period and internal rate of return measures may give different indications than the benefit/tax ratio and lifetime transfer measures.

[13] This applies even to the benefit/tax ratio and lifetime transfer measures. See Leimer (1994) for further discussion and some examples.

[14] The payback period does not actually indicate expected outcomes in the statistical sense, because it simply allows the comparison of an expected remaining lifetime with the payback period. Put another way, the lifetime transfer measure compares the expected value of lifetime taxes and benefits in a statistically correct way, with the potential tax and benefit component at each possible future age weighted by (that is, multiplied by) the probability of its occurrence. In contrast, the payback period measure generally is derived from a projected stream of potential benefits unweighted by the probabilities of their occurrence. As such, the payback period measure can produce different conclusions than the lifetime transfer measure.

[15] The other measures are more flexible, however, in that they allow the use of an interest rate series that varies over the lifetime, while the internal rate of return is constant by definition.

[16] Using an inexact savings bank analogy, the smaller lifetime "deposits" made by some workers to their Social Security "accounts" may limit them to smaller "withdrawals," despite a higher "interest rate."

[17] The lifetime transfer may not be a reliable indicator of the total effects of the program on the economic well-being of program participants, of course, because of other factors such as borrowing constraints or broader effects of the program on economic growth that affect the lifetime incomes of program participants but are not reflected in their taxes and benefits.

[18] Money's worth studies generally have not rationalized their choice of progressivity measures. In the context of *current* period tax or transfer programs, progressivity is often defined in terms of the pattern of taxes or net transfers under the program relative to some *current* measure of "ability to pay" or "economic well-being;" a progressive income tax, for example, might be defined as one where the tax as a proportion of income (the tax rate) rises as income rises. In the *lifetime* context of money's worth analyses, the analogous approach would examine the pattern of *lifetime* net transfers relative to a measure of *lifetime* economic well-being relevant to the program. One reasonable progressivity measure in money's worth analyses, then, would be the ratio of the lifetime transfer to lifetime earnings; a social security program might be defined as progressive if this ratio declines as lifetime earnings increase. The internal rate of return and benefit/tax ratio might be rationalized as progressivity measures because they indicate the relative attractiveness of the social security program as an "investment" alternative or because of their generally close relationship to the lifetime transfer/lifetime earnings ratio; for example, if the social security tax rate were proportional over all earnings and constant over workers' lifetimes, then the lifetime benefit/tax ratio could be derived as a linear transformation of the lifetime transfer/lifetime earnings ratio. In general, however, the internal rate of return and benefit/tax ratio are not direct measures of lifetime transfers relative to a measure of lifetime economic well-being.

[19] Although money's worth analyses generally have used *relative* measures to examine the progressivity or regressivity of lifetime redistribution under Social Security, some have instead defined progressivity to require that the *absolute* lifetime transfer (not the lifetime transfer/lifetime earnings ratio or other relative measure) must decline as lifetime earnings increase. This absolute definition has some undesirable properties in both current period and lifetime contexts. An analogous standard of progressivity applied to current period income tax analysis, for example, would characterize a flat-rate income tax as progressive, implying a different standard of progressivity than that generally adopted. In a lifetime context, an absolute lifetime transfer standard of progressivity can be inconsistent in its characterization of a pay-as-you-go social security program at different stages of program maturity—this absolute standard may imply that such a program is extremely regressive in its early stages, when all generations are receiving large absolute transfers, even if higher lifetime earners in each generation of participants experience lower lifetime transfer/lifetime earnings ratios than lower lifetime earners; this absolute standard could then imply that the same program is extremely progressive when the program matures to the point that, say, workers break even on average, with high earners receiving negative, and low earners positive, net lifetime transfers.

[20] For example, see Myers and Schobel (1992), pp. 48-49.

[21] While different studies have reached different conclusions, the assumption that the employer share of the tax is shifted directly or indirectly to workers is supported by a number of theoretical and empirical analyses. Based on a theoretical analysis, for example, Feldstein (1974) concludes that in the long run labor will bear at least 100 percent of the net burden of a tax on labor income. See Dye (1984) for a summary of a number of empirical analyses.

[22] This article focuses on money's worth questions that are posed from the standpoint of the options available to individual participants in the program. An alternative type of analysis would evaluate the efficiency of the pay-as-you-go financing of the Social Security program from the standpoint of the options available to society as a whole. Different interest rate considerations are appropriate for such analyses and are not addressed in this article. See Leimer (1991) for a further discussion of these issues.

[23] For this type of money's worth question, the risks faced by participants under the Social Security program are appropriately evaluated from the perspective of the policymaker comparing the present program against some alternative private saving program in which workers might be required to participate. For other forms of the money's worth question, these risks may be more appropriately evaluated from the perspective of program participants, as discussed below.

[24] A number of money's worth analyses use the (before-tax) rate of return to Social Security trust fund assets. This generally is not an appropriate interest rate for the type of money's worth question discussed in this paragraph, because the return to trust fund assets generally does not reflect the rate at which workers themselves could accumulate funds over time with the same assurance of nondefault and stability of return as under the present Social Security program. The rate of return to trust fund assets may be an appropriate rate, however, to identify lifetime redistribution under Social Security from the perspective of the *program* (rather than from the perspective of individual workers). See Leimer (1994) for further discussion of this distinction as well as estimates of both *money's worth* outcomes and *lifetime redistribution* across successive generations of workers.

[25] See Leimer and Richardson (1992) for empirical estimates and a discussion of the theoretical issues associated with the risk-reducing characteristics of the program. Their estimates suggest that an inflation-adjusted interest rate close to zero or even negative may be appropriate from the perspective of individual workers. In this article, the term "inflation-adjusted interest rate" refers to the interest rate after an adjustment for inflation has been made to the observed nominal interest rate. For small rates of inflation, the inflation-adjusted interest rate is approximately equal to the nominal interest rate minus the inflation rate, and is sometimes referred to as the "real" interest rate.

[26] This form of risk adjustment is strictly appropriate only if the risk component associated with future taxes and benefits is perceived to grow exponentially over time.

[27] In addition to increased public or private spending to assist such workers, these social costs can include the social disutility associated with increased poverty or a less equal distribution of income as well as the social stigma experienced by beneficiaries of means tested programs or private charity.

[28] Adverse selection refers to the tendency of those who are "bad" insurance risks to buy insurance, and those who are "good" insurance risks to avoid its purchase, when insurance purchase is voluntary. This problem arises even if insurance coverage is mandatory, but plans with different provisions are marketed by different insurance providers. Consumers with high risks in particular areas will tend to gravitate toward plans offering better coverage of those risks, driving insurance costs above what would be required to cover those risks in the general population. See Thompson (1983), pp. 1440-1442, for additional discussion of other advantages of universal public insurance programs.

[29] To provide a feel for potential differences in the rates of return to relatively conservative and risky investments, the average annual inflation-adjusted yield on long-term government bonds over the period 1937-92 was 0.6 percent, while the average annual inflation-adjusted yield on common stocks over the same period was 7.3 percent.

[30] These administrative costs exclude some associated costs incurred by employers, the self-employed, and other government agencies in their transactions with the Social Security program. These associated costs should also be incorporated into the analysis to the extent that they are avoided under the alternative to which the Social Security program is being compared, but obvious difficulties arise, analogous to those discussed above in the tax incidence section, in identifying who ultimately pays these costs.

[31] In 1992, for example, net administrative expenses amounted to 2.7 percent of benefits under the DI program but only 0.7 percent of benefits under the OASI program. Administrative costs and operating expenses in the private insurance industry are generally much higher, reflecting marketing costs, adverse selection, and the inability to exploit the economies of scale enjoyed by a compulsory, nearly universal, public program. See Leimer (1991) for additional discussion.

[32] Conceptually, one way to incorporate the omitted administrative costs of the alternative into the money's worth measures is to include those costs as a type of Social Security benefit in each period of the analysis, that is, increase Social Security benefits in each period by an appropriate amount to reflect the omitted administrative costs of the alternative in that period. The rationale behind this approach is that those costs are avoided under the present program and can therefore be treated as a benefit of the present program when comparing it to the alternative. Again, there may be difficulties in identifying who ultimately pays these costs, depending on the nature of the alternative.

[33] Most of the money's worth studies included in the list of references to this article use the hypothetical worker approach. Recent examples include both Kollmann (1995) references, Steuerle and Bakija (1994), and Myers and Schobel (1992). In addition, the Office of the Actuary of the Social Security Administration regularly estimates money's worth outcomes for selected hypothetical worker cases under the current Trustees' Report assumptions, although generally not in published form in recent years. (The annual report to Congress by the Board of Trustees of the Old-Age and Survivors Insurance and Disability Insurance trust funds is referred to in this article as the annual Trustees' Report.)

[34] Some analyses compute money's worth measures using the expected remaining lifetimes of program participants (that is, for future taxes and benefits, they estimate the expected remaining lifetime and consider projected taxes and benefits only over that period), as opposed to the correct method of weighting potential taxes and benefits at all possible future ages by the probability of survival to those ages. Another compromise made in some studies is to assume survival of program participants until retirement (or some other key age) and compute payback periods or other money's worth measures conditional on that survival.

[35] These differences often work in opposite directions, so that the net effect on money's worth estimates depends on the relative strengths of the opposing biases. For example, lower wage workers may enter the labor force earlier than higher wage workers, at least for full-time employment, but may also retire earlier. Lower wage workers may have generally higher mortality rates, which increases the expected lifetime value of survivor benefits but decreases the expected lifetime value of retirement benefits. Lower wage workers' employment experience may be more sporadic, and higher wage workers are more likely to be subject to the income taxation of benefits. Lower wage workers are also treated more generously by the "tilt" in the benefit formula, which grants higher earnings replacement rates to lower wage workers, but the degree of this tilt varies sharply over the "average indexed monthly earnings" (AIME) measure used in the computation of benefits. Other differences across workers at different lifetime earnings levels, such as differences in the typical shapes of the age-earnings profiles and how those differences interact with differences in the way that the AIME and money's worth measures weight earnings at different ages, must also be taken into account. The net effect of all of these influences is unknown in advance and is effectively ignored by most hypothetical individual analyses.

[36] For example, Aaron (1977) and Leimer (1978) used similar approaches, but differences in the representative individual assumptions used by each led to opposite conclusions concerning the progressivity of the program. Other studies, such as those by Meyer and Wolff (1987) and Wolff (1987) illustrate the importance of using mortality differentials that are differentiated by the characteristics used to classify workers.

[37] Aaron (1977) and Leimer (1978) are examples of such efforts.

[38] See Smith (1989) for a description of the Social Security Administration's Continuous Work History Sample, a file which has been used for a number of money's worth analyses. Another file with historical Social Security administrative data and additional demographic information that has been used for money's worth analyses is the 1973 Exact Match file, which is described in Kilss and Scheuren (1978).

[39] A cohort is defined here as the group of workers who are born during a given period of time, such as a year, or who retire during a given period of time.

[40] One of the tax assumptions uses presently legislated (1992 law) DI tax rates, which are insufficient to fund projected DI benefits under recent Trustees' Report intermediate projections. A second tax assumption is that, beginning in 1993, the combined employer/employee DI tax rate is raised from 1.2 to 1.75 percent. The third tax assumption uses pay-as-you-go tax rates after 1995. Under each of the tax assumptions, lifetime benefits are compared to lifetime combined employer and employee taxes under the DI program, assuming an inflation-adjusted discount rate of 2 percent.

[41] Using a less common, absolute, definition of progressivity, Bakija and Steuerle find "a pattern of within-cohort regressivity rather than progressivity" (p.16) under their 1992 law tax rate assumption, in the sense that the net lifetime transfer to the average wage male worker case was higher than to the low wage male worker case, even though the lifetime benefit/tax ratio was lower. Under their other tax rate assumptions, even the net lifetime transfer declined as earnings increased across the three hypothetical earnings levels.

[42] These inflation-adjusted interest rates averaged 1.2 percent between 1937 and 1990 and were projected to stabilize at about 2.2 percent beginning in 2003. See Duggan *et al.* (1993) for further detail on their underlying assumptions and sample selection criteria.

[43] The period since 1937 corresponds to the historical period during which Social Security taxes were collected.

[44] Many of the studies included in the list of references following this article document this effect. Examples of studies that present money's worth results for cohorts as a whole include Leimer (1994), Leimer and Petri (1981), and Moffitt (1984).

[45] See Board of Trustees (1991). Leimer (1994) provides additional detail on the other assumptions and techniques used to develop

assumptions and techniques used to develop the estimates in chart 1 and table 3.

[46] Under this scenario, the OASI trust fund is allowed to become negative and borrows at the government bond rate projected by the long-run simulation model.

[47] Leimer (1994) reports that the collective inflation-adjusted internal rate of return across all cohorts born prior to 1876 was estimated as 75.0 percent.

[48] The particular "balanced budget" projection illustrated in chart 1 and table 3 increases the combined OASI employer-employee tax rate linearly from the presently legislated 10.98 percent in 2020 to 14.74 percent in 2099, after which the tax rate is assumed to remain constant. This tax increase brings the OASI program into rough actuarial balance over the 75-year Trustees' Report projection period as well as over the full projection period (through 2150) used in the Leimer study. See Leimer (1994) for additional detail.

[49] For comparison, Leimer (1994) also includes a second balanced budget scenario that uses a series of gradual reductions in benefit awards, rather than a series of gradual tax increases, to bring the OASI program into long-run actuarial balance.

[50] This conclusion is also consistent with the evidence cited above suggesting that an inflation-adjusted rate of return close to zero or even negative may be appropriate from the perspective of individual workers.

[51] The high intertemporal volatility in the rate of return to capital compared to the rate of growth in a tax base derived from labor income may argue for at least partial pay-as-you-go financing or, in a funded program, deliberate overfunding, at least initially, with benefit payouts based on the lesser of the rate of growth in the tax base or the rate of return to trust fund assets. See Leimer (1991) for a further discussion of these issues.

[52] In addition to the Duggan *et al.* (1993) study discussed below, examples of money's worth studies that examine within-cohort distributional effects and are based at least in part on historical data include Burkhauser and Warlick (1981), Freiden *et al.* (1976), Hurd and Shoven (1985), Meyer and Wolff (1987), and Wolff (1987).

[53] Of these studies, those using money's worth measures that incorporate interest rates (rather than using the internal rate of return measure) apply the same interest rate series to all individuals or couples, regardless of their economic circumstances (rather than attempting to apply different interest rate series to different individuals or couples, depending on their economic circumstances).

[54] Even studies based on historical sample data that have used mortality rates differentiated by income level suggest that these mortality differentials may reduce, but do not eliminate, the progressivity of the program. For example, see Meyer and Wolff (1987); holding other factors (including gender, race, retirement age, retirement year, marital status, and years with covered earnings) constant, introducing mortality rates differentiated by income, education, and marital status, as well as by age, race, and gender, had little effect on their progressivity measure for a sample of beneficiaries who retired between 1962 and 1972.

[55] An earlier study by Hurd and Shoven (1985) found lower rates of return for nonwhites than for whites, on average, but data limitations forced them to assume, in effect, that tax payments of young decedents, while they were alive, were the same as for those who survived to interview age. A later study by Duggan *et al.* (1993) based on Social Security administrative data did not suffer from this limitation and found higher rates of return for nonwhites than for whites, on average.

[56] Very few studies have made rigorous attempts to identify the independent contributions of various worker characteristics to money's worth outcomes while holding other characteristics constant. Among the studies that have made such attempts, the result that nonwhites fare less well than whites holding other characteristics constant was not a universal finding. Using a multiple regression model, Freiden *et al.* (1976) found that nonwhites received slightly lower internal rates of return than whites, holding other characteristics (including lifetime earnings, gender, retirement age, retirement year, age at entry into covered employment, years with covered earnings, and extent of self-employment earnings) constant, for a sample of beneficiaries with no dependents retiring between 1967 and 1970. Applying similar models to a sample of beneficiaries who retired between 1962 and 1972, Wolff (1987) and Meyer and Wolff (1987) found that single nonwhites fared less well than single whites, holding similar sets of characteristics constant (Meyer and Wolff included variables similar to those for Freiden *et al.*, except for the entry age and self-employment earnings variables, while Wolff included years of education in addition to the variables used in Meyer and Wolff), but these results did not carry over to couples in general. Because these studies rely on samples of retired beneficiaries, they do not reflect differences by race in the probability of attaining retirement age or in benefits to survivors of early decedents.

[57] The Duggan *et al.* analysis uses mortality rates differentiated by age, gender, and race, but not by other characteristics, such as household type or lifetime earnings.

[58] Dually entitled beneficiaries are spouses who are entitled to a benefit on their own account that is less than the benefit to which they are entitled as dependent spouses. These somewhat unusual "household type" groupings in the Duggan *et al.* (1993) analysis were forced by limitations of the CWHS.

[59] Using the inexact savings bank analogy, the much larger lifetime "deposits" made by males to their Social Security "accounts" allowed them to make larger "withdrawals," despite their lower rate of return. Again, limitations of the CWHS forced somewhat complicated gender groupings in the Duggan *et al.* (1993) analysis. In particular, the female category includes many dual beneficiaries, whose benefits include some portion based on the earnings of their spouse, while the male category includes many "dependent couple" records that associate the contributions of a male insured worker with benefits paid both to the worker and his wife. Despite these complications, the general thrust of these gender-based differences in money's worth outcomes is the same as that found in other studies based on historical sample data.

[60] Examples of studies projecting money's worth results for future retirees include Boskin *et al.* (1987), Leimer (1978), Myers and Schobel (1992), Pellechio and Goodfellow (1983), and Steuerle and Bakija (1994).

[61] Again, the usual definition of "progressive" is used here, namely, that the internal rate of return, benefit/tax ratio, or other analogous relative money's worth measure used in the analysis tends to decline as lifetime earnings increase.

[62] For example, see Pechman, Aaron, and Taussig (1968), especially pp. 74-77.

[63] See Lesnoy and Leimer (1985) for a more complete, nontechnical, discussion of these issues.

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