




CBO MEMORANDUM

**SOCIAL SECURITY AND PRIVATE SAVING:
A REVIEW OF THE EMPIRICAL EVIDENCE**

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PREFACE

Social Security is the largest single item in the federal budget and has a significant impact on the lives of millions of people. Analysts have long been concerned that Social Security, by providing retirement income, may discourage people from saving. This Congressional Budget Office (CBO) memorandum reviews the evidence from a number of studies on the impact of Social Security on saving.

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SUMMARY AND INTRODUCTION

Social Security is the largest single spending program in the federal budget, with outlays of over \$350 billion in 1997. It provides income to retired and disabled workers, their spouses, and surviving children. Social Security has a significant impact on the lives of millions of Americans: it has helped reduce the rate of poverty among the elderly and has assisted them in leading more independent lives.

In addition to its direct effect on the elderly and disabled, Social Security may alter people's behavior in ways that could in turn affect the economy. This memorandum examines one possible indirect effect—the impact of Social Security on private saving. People who expect to receive Social Security may choose to save less for their retirement. In effect, Social Security may substitute for retirement saving: instead of saving money each month for retirement, workers pay a tax on their wages; instead of drawing on their assets, retirees receive checks from the government.

Because most of the Social Security tax revenue from current workers goes directly to fund benefits for current retirees, the Social Security system does not significantly increase government saving. Therefore, to the extent that Social Security reduces private saving, it will also tend to shrink the total amount of saving in the economy by the government and private sector (so-called national saving).¹ Over time, reduced national saving would result in lower levels of wealth and smaller incomes. Of course, any indirect cost of Social Security in the form of reduced saving must be weighed against the benefits of the program.

Analysts and policymakers alike are anxious to study the impact of Social Security on saving because demographic changes will put a great deal of pressure on the program over the next few decades. After 2008, when the oldest members of the baby-boom generation reach age 62, the number of Social Security recipients will rise rapidly. Current projections suggest that the Social Security trust fund will begin to decline in 2021 and will be exhausted by 2032.² A number of possible changes to the system have been proposed to place it on firmer financial footing, and any such change could affect national saving. Although this memorandum will not examine any of those specific proposals, it provides a starting point for estimating the effects

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1. Some researchers argue that it is not appropriate to focus on private saving because the division between private and government saving depends on accounting rules that are essentially arbitrary. (See Jagadeesh Gokhale, Laurence J. Kotlikoff, and John Sabelhaus, "Understanding the Postwar Decline in U.S. Saving: A Cohort Analysis," *Brookings Papers on Economic Activity*, no. 1, 1996.) However, using traditional accounting rules, all the impact of a pay-as-you-go Social Security system on national saving will occur through changes in private saving. Furthermore, the studies reviewed in this paper use data constructed according to those traditional rules. Therefore private saving is the proper focus in this context.
 2. Board of Trustees, Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds, *1998 Annual Report* (April 28, 1998).

of proposed changes on saving by reviewing estimates of the effect of the current system.

Although some economic theories suggest that Social Security may decrease private saving, theory alone cannot establish the size or even direction of such an effect. This memorandum therefore focuses on studies that use either survey data or economic statistics to estimate the effect of Social Security on saving.³ Of course, those studies illustrate only the general impact of the entire Social Security system on saving and thus do not necessarily indicate how changes to specific provisions of the program might affect saving. Moreover, proposals to change Social Security must also be evaluated on other criteria, such as their effect on labor supply, retirement income, and the federal budget.

There are three main ways of attempting to determine empirically (by analyzing data) whether, and to what extent, Social Security has reduced saving. First, a researcher can test whether people who are due to receive relatively high Social Security benefits have relatively low holdings of wealth. That is referred to as cross-section analysis. Second, one can examine how total Social Security liabilities to workers and retirees have changed over time and see if those trends are correlated with changes in saving, controlling for other factors. That method is referred to as time-series analysis. Third, one can compare different countries and see if the saving rate in a given country is related to the generosity of its government-provided pensions. That is referred to as cross-country analysis. All three types of analysis utilize regressions to attempt to isolate the effects of Social Security on saving. A regression is a statistical technique for identifying correlations between variables, holding other variables constant.

This memorandum attempts to determine the effect of Social Security on saving by examining 30 studies: 14 using the cross-section method; nine using the time-series method; and seven using the cross-country method. All three methods face difficulties, and different studies (sometimes even those using the same data) produce different results. Because of that, any estimate of the effect on saving remains tentative and subject to revision. Nevertheless, this memorandum draws the following conclusions from existing research:

3. Several reviews have examined the effect of Social Security on saving. Two excellent examples are A.B. Atkinson, "Income Maintenance and Social Insurance," in A.J. Auerbach and M. Feldstein, eds., *Handbook of Public Economics*, vol. 2 (Amsterdam: New Holland, 1987); and Sheldon Danziger, Robert Haveman, and Robert Plotnick, "How Income Transfer Programs Affect Work, Savings, and the Income Distribution: A Critical Review," *Journal of Economic Literature*, vol. 19, no. 3 (September 1981), pp. 975-1028.

- Cross-section research suggests that Social Security reduces the private wealth held by people. Studies disagree on the magnitude of the effect, making any estimate highly uncertain. A number of studies, however, conclude that each dollar of Social Security wealth (a measure that summarizes the value of future Social Security benefits less the value of future payroll taxes) reduces private wealth by between zero and 50 cents. However, the results are uncertain, and higher or lower effects cannot be ruled out.
- Time-series and cross-country estimates are inconsistent and fraught with conceptual difficulties. They therefore offer little additional information on the relationship between Social Security and saving.

THE THEORETICAL IMPACT OF SOCIAL SECURITY ON SAVING

A number of motives may contribute to a person's desire to save. Depending on which of those motives apply, Social Security could influence saving in different ways and to different degrees. The following sections review some motives for saving and their implications for the effect of Social Security on saving and wealth. For example, if people save for retirement, Social Security may have large effects on saving. If they save for other reasons, Social Security could have much smaller effects. Moreover, whatever their motives, those with little or no saving and without access to credit could not reduce saving substantially in response to Social Security.

The response of saving to changes in Social Security will depend not only on the motives of savers but also on the particular economic circumstances and the exact nature of the changes. For example, an increase in Social Security taxes and benefits above their existing level could well have a very different effect than a similar increase starting from a situation with no taxes or benefits.

Retirement Saving and the Life-Cycle Theory

The starting point for many explanations of saving behavior is the life-cycle theory of consumption and saving. In its most basic form, the theory assumes that people save during their working years solely to finance their retirement, and it implies that the effects of Social Security on saving and wealth accumulation could be quite large. Indeed, under certain conditions, wealth in the form of Social Security could crowd out private wealth dollar for dollar (see Box 1). Social Security wealth is the present value of future benefits payable minus the present value of future taxes due. (Present

BOX 1.
A SIMPLE MODEL OF THE EFFECT OF SOCIAL SECURITY
ON WEALTH ACCUMULATION

A simple example can help show how a mature Social Security system might affect wealth accumulation.¹ Imagine a world with individuals who live for three periods, each period representing 20 years. During each of the first two periods they earn \$30,000; in the third period they are retired and earn nothing (see table below). Suppose, in addition, that they want to maintain the same consumption in each period. If the interest rate is zero, they will consume \$20,000 in each of the first two periods and enter retirement with accumulated savings of \$20,000 to finance consumption in the third period. Consumption is greater than income in the third period, and therefore saving is negative.

Now consider a world that is identical except that the government runs a social insurance system, which levies \$5,000 in taxes in each of the first two periods and pays out \$10,000 in benefits in the third period (see table on next page). The benefits and taxes are equal, so the individual can still afford \$20,000 of consumption in each period. However, saving declines by \$5,000 in each of the first two periods; \$5,000 that would have been saved goes to taxes, and no additional saving is needed because of the benefits due in period 3.

Net Social Security wealth is defined as the present value of future Social Security benefits minus the present value of future Social Security taxes. (Gross Social Security wealth is calculated using only benefits.) With interest rates of zero and a known lifetime, that value can be calculated simply by summing the total dollar amount of future benefits and subtracting the total amount of future taxes. For example, at the end of period 1,

1. In the long run, the effects on the flow of saving will match, in percentage terms, those on accumulated wealth; however, the effects on saving may differ in the period soon after the creation of a Social Security system.

Saving Behavior in the Absence of Social Security (In dollars)

	Period 1	Period 2	Period 3
Income	30,000	30,000	0
Less: Consumption	<u>20,000</u>	<u>20,000</u>	<u>20,000</u>
Saving	10,000	10,000	-20,000
 Memorandum:			
Accumulated Private Wealth (End of period)	10,000	20,000	0

SOURCE: Congressional Budget Office.

BOX 1.
CONTINUED

future taxes amount to \$5,000 (period 1 taxes having already been paid) and future benefits amount to \$10,000 (the dollar amounts are the sums of columns two and three for “Taxes” and “Benefits”), so net Social Security wealth is \$5,000. Note that this exactly matches the difference in accumulated private wealth at the end of period 1 between the tables with and without Social Security (\$5,000 as compared with \$10,000). Social Security wealth has reduced accumulated wealth dollar for dollar.

The situation becomes more complicated if interest rates are positive, but the principle remains the same. Future taxes and benefits must be discounted into an equivalent amount of current dollars in order to calculate Social Security wealth. In that case, a dollar in the future is worth less than a dollar today because a dollar held today can earn interest and grow to a greater amount in the future. Nevertheless, if the return on Social Security implied by benefits received relative to taxes paid is the same as the interest rate, net Social Security wealth will still crowd out accumulated savings dollar for dollar.²

The dollar-for-dollar reduction in wealth, however, depends on a number of assumptions: an unchanging length of retirement (in this example); a certainty on the part of people that they ultimately will receive their benefits; and the assumption that the people behave according to the life-cycle theory.

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2. Retirees in the early stages of the Social Security system earned returns greater than the rate of interest, primarily because they did not pay the present payroll tax over their entire working lives; for them, part of Social Security benefits represents a windfall in excess of taxes paid. By contrast, many of today’s workers are scheduled to receive returns below the current rate of interest.

Saving Behavior with Social Security (In dollars)

	Period 1	Period 2	Period 3
Income	30,000	30,000	0
Less: Taxes	5,000	5,000	0
Plus: Benefits	0	0	10,000
Less: Consumption	<u>20,000</u>	<u>20,000</u>	<u>20,000</u>
Saving	5,000	5,000	10,000
Memorandum:			
Accumulated Private Wealth (End of period)	5,000	10,000	0
Net Social Security Wealth (End of period)	5,000	10,000	0

SOURCE: Congressional Budget Office.

value expresses a stream of future payments as an equivalent lump-sum amount that is paid today.)⁴

Because most of the revenue from the payroll tax is paid directly to current retirees, Social Security is largely a pay-as-you-go system. As a result, the decline in private wealth is not offset by a comparable rise in net government assets. The decline in wealth therefore implies reduced U.S. holdings of domestic capital and foreign assets as well as lower future income.

The condition to derive one-for-one crowding out of private wealth, however, are typically quite restrictive: that Social Security benefits are expected with certainty; that they do not influence the age of retirement; and that people who wish to borrow against future income are able to do so.⁵

Those conditions, however, are unlikely to hold exactly. For example, people may not be completely certain that they will receive all the benefits due them under current law. The Social Security program has been modified many times, sometimes significantly altering the amount of benefits that a person ultimately receives. Indeed, some surveys show that many working people have serious doubts about whether they will actually receive full benefits when they retire.⁶ That uncertainty reduces the perceived value of future Social Security benefits and hence their effect on saving.

Social Security also encourages many workers to retire earlier. Current retirement benefits are reduced for eligible recipients whose wages exceed certain thresholds. Social Security may therefore encourage some to retire who would otherwise have stayed in the labor force. People who retire earlier require more resources to finance a longer retirement, so they have to save more than they would otherwise. If that retirement effect was large enough, Social Security could actually

4. In calculating the value of Social Security wealth, future payments and taxes are discounted not only by an interest rate but also by the mortality rate of the individual. The mortality rate is included because taxes and benefits are paid only as long as the recipient is alive.

5. Even if all of those conditions did not strictly hold, one-for-one (or greater) crowding out could still occur if, for example, the Social Security system reduced individuals' lifetime income, causing them to reduce future as well as current consumption.

6. For example, one poll finds almost one-third of respondents reporting that they are "not at all confident" that "Social Security will continue to provide benefits of equal value to those received by retirees today." See Peter Yakoboski and Jennifer Dickemper, "Increased Saving but Little Planning: Results of the 1997 Retirement Confidence Survey," *Employee Benefit Research Institute Issue Brief* (1997).

raise saving. Some studies conclude that Social Security has led to earlier retirement, although others find little effect.⁷

The effect of Social Security on saving could also be reduced if those who wish to borrow against future earnings are not able to do so. An individual may wish to borrow to finance consumption during his or her younger years when income is relatively low, assuming that retirement saving could be undertaken later in life. However, financial markets may be reluctant to lend against uncertain future income. Those who would like to but cannot borrow do not alter their saving behavior under Social Security. Although Social Security encourages them to borrow even more, they are unable to do so.

The life-cycle theory also assumes that people divide income only between personal consumption and saving. However, some portion of income might also be used to help others—for example, to support elderly parents. So in some cases the fact that elderly parents receive Social Security would allow their children to reduce that support, without significantly altering their own saving.

Social Security benefits are annuities, paying a stream of income to recipients over their lifetime rather than a lump sum. That has an ambiguous impact on the effect on saving. Depending on market conditions and individual circumstances and preferences, the annuity feature of Social Security could either increase or decrease the effect of the program on saving (see Box 2).

Precautionary Motives for Saving

In addition to saving for retirement, individuals may also save to protect themselves against uncertain events such as the loss of a job, a cut in pay, or medical expenses. That type of saving, called precautionary, might be affected less by Social Security than is retirement saving. Some theoretical research claims that precautionary saving may account for most of the saving among young workers for whom earnings are low and retirement distant, although other studies have had difficulty identifying precautionary behavior in the data.⁸

7. See Alan B. Krueger and Jorn-Steffen Pischke, “The Effect of Social Security on Labor Supply: A Cohort Analysis of the Notch Generation,” *Journal of Labor Economics*, vol.10, no. 4 (October 1992), pp. 412-437; and David M. Blau, “Labor Force Dynamics of Older Men,” *Econometrica*, vol. 62, no. 1 (January 1994), pp. 117-156.

8. Christopher D. Carroll, “Buffer-Stock Saving and the Life Cycle/Permanent Income Hypothesis,” *Quarterly Journal of Economics*, vol. 112, no. 1 (February 1997), pp. 1-55; Martin Browning and Annamaria Lusardi, “Household Saving: Micro Theories and Micro Facts,” *Journal of Economic Literature*, vol. 34, no. 4 (December 1996), pp. 1797-1855.

BOX 2.
SOCIAL SECURITY AS AN ANNUITY

Social Security benefits constitute an annuity because they are a stream of payments that last for the lifetime of the recipient and the recipient's spouse. The fact that Social Security benefits are distributed as an annuity, rather than a lump sum, has an ambiguous impact on the size of the effect on private wealth.

If people do not fully value the annuity they receive from Social Security, then the effect on their saving will be smaller. That situation may arise for a variety of reasons: those annuities cannot be bequeathed to heirs, they may not cover unexpectedly large expenses, and they will constrain the consumption of people who have little wealth. To the extent that Social Security provides annuities that are not fully valued by recipients, it will crowd out private saving by less than a dollar for a dollar.

However, if people value Social Security's annuity more than its cost, then the effect on their saving will be larger. That situation may arise because private annuities tend to cost more than an "actuarially fair" price because people who expect to live a long time are more likely to purchase annuities, and insurance companies must set prices high enough to make money off the average person who buys an annuity. To the extent that Social Security provides a cheaper annuity, it could tend to reduce saving by an amount over and above its dollar value.

The old-age component of Social Security would not greatly affect the saving pattern of people who save primarily for precautionary motives because it does little to protect workers from uncertain events. However, other components of Social Security may serve as a substitute for some precautionary savings. The disability and survivors components of the Social Security program insure against injury and death. Without Social Security, many people might accumulate extra assets to guard against those eventualities. In that case, Social Security would reduce saving.

Bequest Motives for Saving

Another possible motive for saving is to provide bequests or gifts. Social Security can affect saving for bequests because it is a transfer from the young (in the form of taxes) to the old (in the form of benefits). Some older people might offset that transfer by increasing their personal transfers, in the form of bequests or gifts, to their descendants. The extra saving for increased personal transfers could offset—in the extreme case, completely offset—any reduction in saving for retirement. Furthermore, as mentioned above, the impact of Social Security on saving could be

reduced if in its absence, resources would flow in the opposite direction, from adult children to their elderly parents.

Rules of Thumb and Lack of Foresight

The models of saving described in the previous sections assume that people's decisions about saving are rational and involve making forecasts of events many years into the future. Such calculations could take a good deal of time and effort, and some people might not find the cost worthwhile. Instead, they may rely on simple rules of thumb, such as saving a fixed fraction of their income. To the extent that people use such rules, small changes in Social Security would have little effect on saving. (Large changes, however, such as abolishing Social Security, might lead them to change their rules of thumb.)

Moreover, some people may fail to plan for retirement at all. They may discount their future well-being at a very high rate so that their standard of living in retirement will have little relevance to current choices. Or they may assume someone else—the government, their children, or others—will provide for them in their old age. People who make no provision for retirement will not change their saving behavior in response to Social Security.⁹

Conclusion

Most people probably have a variety of reasons to save. Because the exact motivation behind saving is not completely understood, it is difficult to determine the effect of Social Security on saving using economic theory alone. Although on balance, economic theory suggests that Social Security could reduce saving, it cannot establish the magnitude of the effect.¹⁰ Empirical research therefore plays an important role in estimating the effect on saving.

9. Many people have very little private wealth at retirement, lending support to the idea that they may be failing to plan for retirement; see Congressional Budget Office, *Baby Boomers in Retirement: An Early Perspective* (September 1993), pp. 27, 70. Of course, those low levels of assets could be a result of the existence of Social Security, especially for lower-income households, given the progressive benefit schedule.

10. It is theoretically possible that Social Security could increase saving, but that would require a large reduction in retirement age in response to the system.

CROSS-SECTION ESTIMATES OF THE EFFECT OF SOCIAL SECURITY ON SAVING

Cross-section studies examine data on people and attempt to determine whether those who expect to receive higher Social Security benefits have saved less and thus accumulated lower levels of private (nonpension) wealth, other things being equal. Most studies begin by estimating the total value of Social Security benefits that a person is expected to claim less the taxes to be paid, adjusted for the length of time before the benefits will be received (or taxes paid) and the probability that the recipient will survive—the “present value” of the benefits minus the taxes. That sum is referred to as Social Security wealth. Then, using regression analysis, a researcher tests whether the level of private wealth held by people is related to their Social Security wealth, controlling for other factors such as age and income. If those with more Social Security wealth tend to have less private wealth, that correlation suggests that Social Security may have caused them to save less and thus build up less wealth over time.

The magnitude of the effect on saving can be summarized in one number: the amount by which private wealth changes for each additional dollar of Social Security wealth. The simple life-cycle theory implies that each dollar of Social Security wealth reduces private wealth by one dollar.

Results of Cross-Section Studies

Figure 1 on pages 12 and 13 presents an overview of the results of cross-section studies together with alternative views of the uncertainty of the estimates. The first panel of Figure 1 shows the full range of estimates of the effect of a dollar of Social Security wealth on private wealth that results from different regressions in each study, illustrating the sensitivity of results to alternative ways of specifying the regression analysis. The second panel shows a two-standard-error band around the median estimate from each study, illustrating a statistical estimate of the uncertainty of those single estimates (see Box 3 on page 14). If the regression specification and statistical assumptions used are correct, one can be 95 percent confident that the true value lies within the two-standard-error band around an estimate.

The estimates cover a wide range. They vary from 0.38 to -1.67 (implying that a dollar of Social Security wealth affects private wealth by between plus 38 cents and minus \$1.67), and the limits of the standard-error bands around the median estimates run from over 1 to less than -2. Most estimates, however, and the great majority of median estimates, lie between zero and -0.5. In addition, at least part of the standard-error band around the median estimate in each study is included in that range. Thus, despite the great variation among the estimates, the cross-section evidence suggests

that each dollar of Social Security wealth most likely reduces private wealth by between zero and 50 cents, with the most likely estimate lying near the middle of that range.

Causes of Divergent Results

The results of the 14 cross-section studies differ partly because they use data from different surveys. The fact that different data sets yield different answers is not surprising, but it suggests that at least some of the samples are not entirely representative of the population as a whole. That suggests that the uncertainty of the estimates is greater than that implied by the statistical analysis of a single data set.

Specific Studies. Several of the highest and lowest estimates in Figure 1 may carry less weight because of special factors. For example, the Feldstein and Pellechio and the Novos studies both use a relatively small data set of about 100 people.¹¹ Novos argues that the large effect on private wealth found by Feldstein and Pellechio depends crucially on six farm operators in the sample. If those six people are excluded, the estimate of the effect shifts from one that is large and negative to one close to zero. Some researchers argue that farmers should be excluded from analyses of saving because their saving behavior appears to be different from that of others. In any case, the fact that such a small number of people play such a large role in the results casts doubt on the reliability of both estimates.

David and Menchik find a positive effect on wealth of 0.13.¹² Their study examines wealth at time of death, using probate inheritance records rather than survey data on the level of wealth during a person's lifetime. The probate records may be more accurate than survey responses. However, the records exist only for those with wealth at or above the filing requirement level, and those wealthy decedents may not be representative of the population in general. In addition, the level of Social Security wealth used in their regression equation is measured as of age 65 rather than at the time of death, when assets are measured. The inconsistency creates some problems for interpreting the results. For example, if the date of death were known with certainty, a person behaving according to the life-cycle theory would spend all of his or her assets by that date, so that there would be zero wealth

11. Martin Feldstein and Anthony Pellechio, "Social Security and Household Wealth Accumulation: New Microeconomic Evidence," *Review of Economics and Statistics*, vol. 61, no. 3 (August 1979), pp. 361-368; and Ian E. Novos, "Social Security Wealth and Wealth Accumulation: Further Microeconomic Evidence," *Review of Economics and Statistics*, vol. 71, no. 1 (February 1989), pp. 167-171.

12. Martin David and Paul L. Menchik, "The Effect of Social Security on Lifetime Wealth Accumulation and Bequests," *Economica*, vol. 52, no. 28 (November 1985), pp. 421-434. As described above, Social Security could increase private wealth if it caused people to retire earlier.

FIGURE 1. ESTIMATED IMPACT OF A \$1 INCREASE IN SOCIAL SECURITY WEALTH HEALTH IN CROSS-SECTION STUDIES



SOURCE: Congressional Budget Office based on the sources below (see the bibliography for full citations).

NOTE: When there was an even number of estimates, the lower of the two central estimates was chosen as the median. When there were separate estimates for couples and for singles, only the one for couples was included.

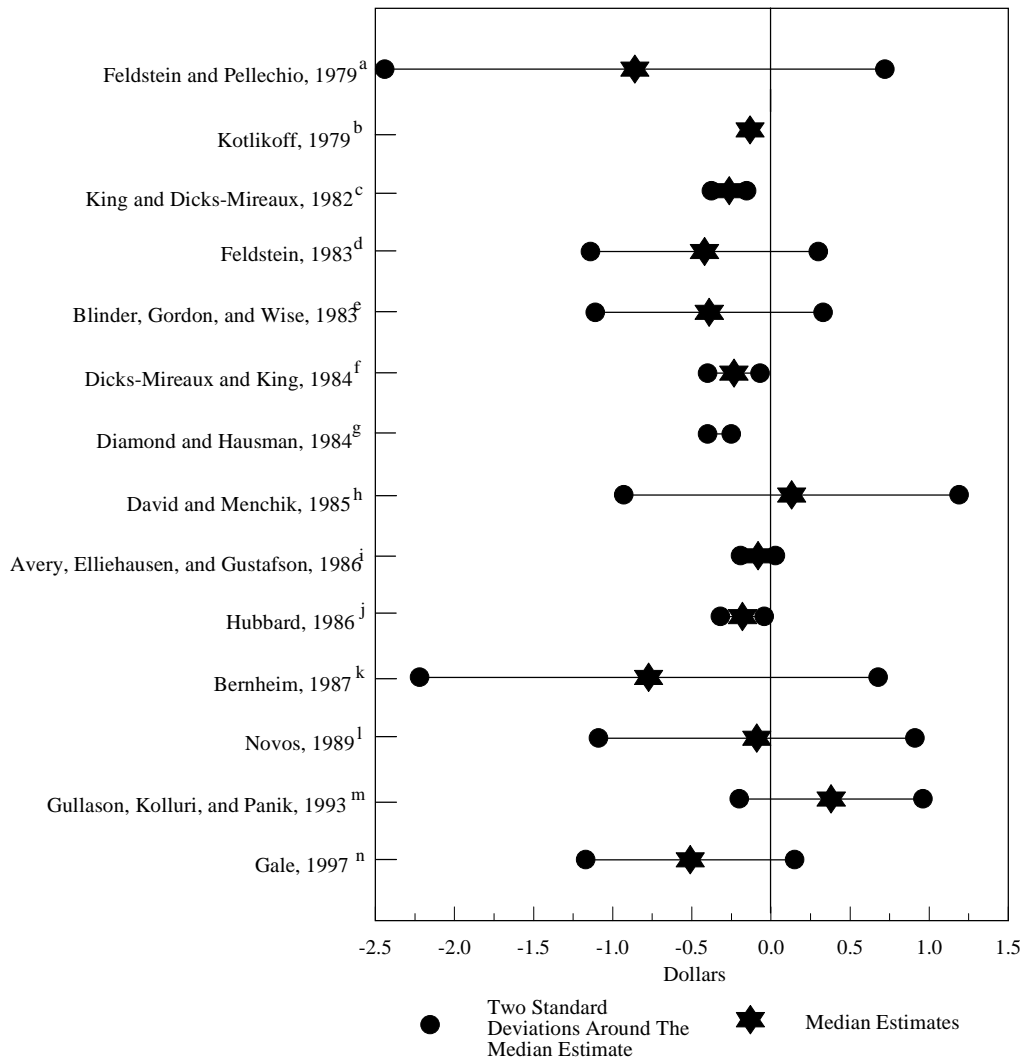
a. Table 1 from Feldstein and Pellechio, p. 366.

b. Estimate calculated using Kotlikoff's Table 2, p. 404. Coefficients for ASST and LWI_x were multiplied by the means of those variables and then divided by the sum of the means.

(Continued)

FIGURE 1. CONTINUED

Estimated Uncertainty of Median Estimate in Each Study (Two-Standard-Error Band)



- c. Tables 5 and 6 from King and Dicks-Mireaux, pp. 261 and 262.
- d. Tables 1.1 and 1.2 from Feldstein, pp. 16 and 19.
- e. Table 4.3 from Blinder, Gordon, and Wise, p. 114.
- f. Table 1 from Dicks-Mireaux and King, p. 128.
- g. From the text of Diamond and Hausman, p. 110. Only a rough range was estimated so no median is shown.
- h. Table 2 from David and Menchik, p. 428.
- i. Table 6-2 from Avery, Elliehausen, and Gustafson (estimate for families with married heads, dependent variable nonpension net worth).
- j. Table 2 from Hubbard, p. 173.
- k. Table 4 from Bernheim, column 1, p. 299.
- l. Tables 1, 2, and 3 from Novos, pp. 169, 170, and 171 (not including the four estimates replicating equations by Feldstein and Pellechio, labeled "F-P's eq.>").
- m. Equation 2 from Gullason, Kolluri, and Panik, p. 549.
- n. Text from Gale, p. 12.

BOX 3.

DIFFERENT MEASURES OF THE UNCERTAINTY OF REGRESSION ESTIMATES

Regression analysis produces not only estimates of the correlation between variables but also estimates of the precision with which the correlations are measured. Those estimates of precision are known as standard errors. The accuracy of the standard errors depends on several assumptions, among them that the sample being analyzed (such as the group of people included in a study) was randomly selected and that the regression is specified properly, with all of the appropriate variables included in the equation in the correct form. Given those assumptions, the standard errors provide an unbiased estimate of how far from the estimated value the true correlation could reasonably be expected to be. For a given regression that has been properly specified, one can be 95 percent confident that the true value lies within two standard errors of the estimated value. The standard error is therefore one measure of the confidence that can be placed in an estimate.

However, other factors must also be considered in determining how much weight to put on an estimate. For example, some studies include several regressions, often with only minor changes differentiating them. The standard error of one estimate may indicate that it is very precisely measured, but another estimate resulting from a minor and reasonable change in the regression may result in a very different estimate. In that case, the estimates are likely to be more uncertain than the standard errors of each individual estimate would indicate.

In addition, thoughtful consideration of the regression strategy is required. An estimate from a regression equation missing important variables, or including them in an improper form, could be biased and is also likely to be more uncertain than the standard errors would indicate.

This review attempts to illuminate each type of uncertainty. The first panels of Figures 1 and 2 present the range of results from different regressions in each study. For studies that include a number of regressions, it provides some sense of one type of uncertainty. However, many studies include only one or two estimates and thus appear as circles in the figures. Those estimates are not necessarily any more or less uncertain than those from studies that present a number of estimates. Indeed, several of those studies indicate that additional estimates, which were not presented, varied widely.

The second panels of the figures present the statistical uncertainty as measured by the standard error for the median estimate of the effect of Social Security in each study. The bars in the figures span two standard errors on each side of the median estimate and thus, in theory, include the range in which the true value lies with 95 percent confidence.

at death regardless of Social Security wealth at age 65. In that case the effect on wealth, as measured by David and Menchik, would be zero, even if Social Security did crowd out saving during the working years.

Other studies stand out for different reasons. Kotlikoff's study uses a different formulation from any of the other studies.¹³ He subtracts not only the present discounted value of future payroll taxes but also past payroll taxes from his net Social Security wealth variable, yielding a measure of the "windfall" to a recipient—the value of benefits in excess of total taxes. Kotlikoff also includes the present value of payroll taxes paid in the past as an additional variable. He finds that Social Security windfalls increase private wealth rather than reduce it, as predicted by the simple life-cycle model with a fixed age of retirement (although the estimate is not statistically significant). However, he also finds that past payroll taxes reduce private wealth. Because the overall effect of Social Security on other wealth combines the impact of windfalls and taxes paid in one number, the results from Kotlikoff's study must be combined to arrive at an estimate of the effect on wealth. Evaluating Kotlikoff's results at the mean values of windfalls and taxes paid in his data suggests a total effect of -0.132; however, that rough estimate does not necessarily correspond to those from other studies because of the unique formulation of his equation. Moreover, it is difficult to reconcile a positive effect of windfalls with a negative effect of past taxes under consistent behavioral assumptions.

The studies by Diamond and Hausman and by Bernheim are the only studies that follow the same people over time.¹⁴ That strategy allows them to use several different observations of income in constructing Social Security variables and (in the case of Diamond and Hausman) several observations of assets in constructing the wealth variable. The multiple observations per person should lead to smaller data errors and more accurate estimates.

Diamond and Hausman do not, however, calculate an explicit Social Security wealth variable; instead they base their empirical estimates on the projected level of Social Security benefits. They then roughly estimate an effect of Social Security wealth on private wealth of between -0.25 and -0.40 (see Figure 1).

Bernheim uses the more common formulation, with a variable for Social Security wealth, and finds that one dollar of Social Security wealth reduces private wealth by

13. Laurence Kotlikoff, "Testing the Theory of Social Security and Life Cycle Accumulation," *American Economic Review*, vol. 69, no. 3 (June 1979), pp. 396-410.

14. Peter A. Diamond and Jerry A. Hausman, "Individual Retirement and Savings Behavior," *Journal of Public Economics*, vol. 23, no. 1/2 (February/March 1984), pp. 81-114; and B. Douglas Bernheim, "The Economic Effects of Social Security: Towards a Reconciliation of Theory and Measurement," *Journal of Public Economics*, vol. 33, no. 3 (August 1987), pp. 273-304.

77 cents.¹⁵ However, Bernheim uses a relatively small number of variables in his regression equation. Furthermore, a statistical measure indicates that his equation does not explain much of the variation in wealth in his sample.¹⁶ Those two facts suggest that his regression equation may be missing important variables, which could bias his results in an unknown direction.

Calculation of Social Security Wealth. The studies calculate Social Security wealth in different ways, but they share the same general strategy. First, future benefits must be forecast both for retirees and for those still working. Researchers generally make the forecast by taking the information available about earnings (and other variables such as education that might affect earnings) and using it to estimate past and future earnings. Then they project future benefits using the estimated earnings together with the current formulas for determining Social Security benefits. Although the cross-section studies are fairly uniform in that general strategy, different methods of projecting future earnings or other variables could lead to different estimated benefits.¹⁷

Social Security wealth is then calculated using the estimated benefits. That requires discounting future benefits to an equivalent lump-sum amount paid today. A dollar 30 years from now is worth less than a dollar today even without inflation, because a dollar today could potentially earn interest for 30 years and grow to a much greater amount. How much greater depends on the interest rate (or “discount rate”) used in the calculation. A higher discount rate will tend to result in a lower calculation of Social Security wealth. Although many of the studies use a 3 percent real (inflation-adjusted) discount rate, several do not specify the rate used. The studies by Dicks-Mireaux and King use a 2.5 percent discount rate; Avery,

15. This estimate uses a Social Security wealth variable that has been discounted by both an interest rate and a mortality rate, the method used in most studies. Bernheim argues that the proper method is to discount only by an interest rate—“simple discounting”—but there are opposing arguments. Using simple discounting he estimates an effect on wealth of -1.37.

16. The R^2 (a measure of the degree to which a regression equation accounts for the variation in the dependent variable) for Bernheim's regression that yields the median estimate is .014. That contrasts with values such as .33, .15, .42, .44, .17, and .33 for some of the other studies' regressions. Only Feldstein's 1984 study has comparably low measures of R^2 .

17. For example, research using time-series data indicates that the method used to calculate future benefits can have a large impact on the estimated effect on saving. However, there has been no comparable investigation into the effect of different methods of calculating benefits on estimates for cross-section estimates.

Elliehausen, and Gustafson use a 6.85 percent rate in calculating their measure (which is also used by Gullason, Kolluri, and Panik).¹⁸

The discount rate used to calculate Social Security wealth can have an important impact on the estimate of the effect of Social Security on private wealth. In general, one would expect that lower discount rates would lower the estimate because they result in higher estimated values of Social Security wealth without changing private wealth. However, different discount rates alter the ratio between the Social Security wealth held by different people (especially the young and the old) and therefore could influence the results in unpredictable ways.¹⁹

Most studies discount future benefits by mortality rates as well as by an interest rate, because a person's benefits end at death. Douglas Bernheim argues that such an approach may not be appropriate. He suggests calculating Social Security wealth by discounting benefits and taxes using only the interest rate ("simple discounting") rather than the interest rate plus the mortality rate ("actuarial discounting"). Bernheim argues that simple discounting provides a better approximation of the true value of Social Security if private annuities are not available.

However, calculating the theoretically proper discount rate would require knowing people's preferences (for the time path of consumption, among other things). Private annuities, though expensive, are available on the open market; in addition, there are offsetting reasons for annuities to be valued less than other types of wealth (see Box 2). Therefore, this memorandum cites estimates based on Social Security wealth calculated with actuarial discounting whenever possible. Nevertheless, use of that measure in empirical studies may bias the results either up or down, and the results should be interpreted cautiously.

Theoretical Difficulties with Cross-Section Estimation. A difficulty faced by all the cross-section studies is that almost everyone is covered by the same Social Security system. (Workers who are not covered—for example those in state and local

18. Louis Dicks-Mireaux and Mervyn King, "Pension Wealth and Household Savings: Tests of Robustness," *Journal of Public Economics*, vol. 23, no. 1/2 (February/March 1984), pp. 115-139; Mervyn King and Louis Dicks-Mireaux, "Asset Holdings and the Life-Cycle," *Economic Journal*, vol. 92, no. 366 (June 1982), pp. 247-267; Robert B. Avery, Gregory E. Elliehausen, and Thomas A. Gustafson, "Pensions and Social Security in Household Portfolios: Evidence from the 1983 Survey of Consumer Finances," in Gerard F. Adams and Susan M. Wachter, eds., *Savings and Capital Formation: The Policy Options* (Lexington, Mass., and Toronto: Heath, Lexington Books, 1986); and Edward T. Gullason, Bharat R. Kolluri, and Michael J. Panik, "Social Security and Household Wealth Accumulation: Refined Microeconomic Evidence," *Review of Economics and Statistics*, vol. 75, no. 3 (August 1993), pp. 548-551.

19. For example, in the study by Bernheim, regressions using a lower discount rate (which does not include the mortality rate) estimate a larger effect on wealth.

retirement programs—are generally excluded from the data samples used in the studies.) Thus, most of the variation in Social Security wealth results from differences in earnings history, age, and marital status. But those variables also influence wealth holdings. For example, someone with a high income can probably expect relatively high Social Security benefits, but that person would also most likely have higher-than-average wealth with or without Social Security. That type of correlation makes it very difficult to disentangle the effects of Social Security from those of other variables.

Studies attempt to control for those other factors by including them in the regression equation: private wealth is estimated to be a function not only of Social Security wealth but also of age and income level. But unless the researcher uses exactly the right equation for wealth, containing all the relevant variables, what looks like the effect of Social Security wealth may actually be the effect of variables that are not included or appear in the wrong form.

One example is the treatment of the relationship between wealth and income. Some regression equations include only a linear term in income. If that were the correct specification, wealth would rise linearly with income, other things being equal.²⁰ However, some data indicate that wealth rises more than linearly.²¹ Because the Social Security system is progressive and benefits are capped at a maximum level, the wealthy have low Social Security benefits relative to their income. Thus, an equation with only a linear term in income will give the impression that high-income individuals are more wealthy than expected, given their income, and may ascribe some of that extra wealth to their relatively low Social Security wealth. In other words, such an equation could estimate that Social Security wealth reduces saving simply because the relationship between wealth and income was not specified correctly.

Social Security wealth may also differ for people with the same average income if the pattern of their earnings is different. Those whose income tends to fluctuate a great deal from year to year could have lower Social Security wealth than those whose income is more stable, even if the average income is the same (because of a cap on the earnings used to calculate benefits). However, people with fluctuating

20. The simple life-cycle model with identical individuals predicts that wealth should rise linearly with income. However, precautionary or bequest motives, borrowing constraints, and individual differences (such as differing rates of time preference) could all lead to a nonlinear relationship.

21. Diamond and Hausman, “Individual Retirement and Savings Behavior,” find that wealth rises with permanent income “in a sharply non-linear fashion.”

income may also wish to save more to tide them over lean periods.²² Once again, high private wealth might be correlated with low Social Security wealth even if Social Security had no effect on saving.

That type of problem is not unique to research on Social Security and saving; it is common to almost all empirical research in economics. However, the problem of identifying the effects of a particular factor on some behavior (such as saving) is particularly severe when, as in the case of Social Security wealth, the factor varies from person to person almost exclusively along with other factors that most likely influence the same behavior. That argues for caution in interpreting the results of empirical studies.

A more specific difficulty with cross-section estimation is the timing of gifts and bequests. If those who receive Social Security compensate their heirs through private transfers for the Social Security taxes the heirs pay, Social Security should have no effect on the capital stock. However, if some people in a study had not yet received those transfers, it would look as if Social Security had decreased their wealth.

William Gale argues that estimates of the effect of private pensions on private wealth may be biased downward, and the same point may apply to some estimates of the effect of Social Security on private wealth.²³ Gale notes that many studies on private pensions do not include employer contributions to pensions in their measures of workers' income and pension wealth. Excluding those contributions results in an underestimate of the effect of pension wealth on private wealth. However, the importance of that critique to studies of Social Security is unclear. The effect on the regression results is more complicated in the case of Social Security because there is no significant control group that lacks Social Security (as there is in the case of pensions). Furthermore, if the critique applies, the bias is likely to be smaller for Social Security estimates because employers "contribute" only half of payroll taxes; in private pensions, the employer tends to contribute a higher percentage. Moreover, it is difficult to evaluate whether Gale's critique is at all relevant to the studies reviewed in this paper because few of the studies specify whether the employer share of the payroll tax is included in the measure of income used.²⁴ Therefore, the most

22. Although economic theory predicts this type of behavior, Browning and Lusardi find that empirical evidence on the subject is inconclusive.

23. William G. Gale, "The Effects of Pensions on Household Wealth: A Reevaluation of Theory and Evidence" (draft, Brookings Institution, Washington D.C., 1997).

24. The study by Kotlikoff is the only one that explicitly states that it uses an income measure that includes the employer share of the payroll tax. As a practical matter, estimation of the employer share of payroll tax would be trivial in any study using net Social Security wealth because the employee share of taxes, which is equal to the employer share, would already be calculated. Most of the studies that this memorandum reviews use a net concept of Social Security wealth.

one can conclude is that in some studies the estimates of the effect of Social Security on private wealth may be biased toward zero by an unknown amount.

A final criticism leveled at cross-section analysis is that it may not be valid to extend results based on comparisons between households to an effect on the economy as a whole. Social Security can be seen as a transfer from children, in the form of payroll taxes, to their parents, in the form of benefits. That transfer could be offset by gifts and bequests from the old to the young. If such an offset were complete, Social Security would have no impact on overall saving and wealth in the economy.

However, because different people earn different rates of return from Social Security (based on differences in income, life span, and family structure), Social Security also represents a transfer from some extended families (who earn lower returns) to others (who earn higher returns).²⁵ Families that stand to gain more resources through that type of transfer might spend more and end up with lower assets; those who expect to lose resources could spend less and end up with more assets. That could lead to a negative relationship between Social Security wealth and private wealth even if, for example, parents and children used gifts or bequests to completely offset the intergenerational transfer represented by Social Security within their own family. Thus, a cross-section regression could find that Social Security reduced private wealth even if it actually had no effect on aggregate saving and the capital stock.²⁶

Despite all the difficulties, however, cross-section studies provide some evidence that Social Security wealth tends to reduce holdings of other wealth.

EVIDENCE BASED ON CHANGING SOCIAL SECURITY WEALTH OVER TIME

Time-series studies begin by calculating total Social Security wealth in the economy as a whole over a number of years and then test whether, as that total wealth changes over time, aggregate saving (or, more often, consumption) also changes.²⁷ If consumption is higher in years when Social Security wealth is higher, the conclusion

25. See Robert J. Barro and Glenn M. MacDonald, "Social Security and Consumer Spending in an International Cross Section," *Journal of Public Economics*, vol. 11, no. 3 (June 1979), pp. 275-289.

26. Transfers between families stemming from Social Security could, however, decrease saving if the transfers took resources from families that tended to save more and gave them to families that tended to save less.

27. Because consumption plus saving equals income, for a given income an increase in consumption implies a decrease in saving.

could be drawn that a higher level of expected Social Security benefits was leading people to consume more of their income rather than save it for retirement.

Because time-series studies examine the effect of Social Security on consumption rather than on private wealth, as in cross-section studies, the results are not directly comparable. However, the effects on consumption can be translated into an effect on saving, and in the long run the effect on wealth holdings should be proportional to the effect on saving.

Results of Time-Series Studies

The results of time-series research appear to be extremely sensitive to the precise regression formulation used in the analysis. Furthermore, the results of time-series studies do not translate directly into long-run effects on aggregate savings because they depend on the time period covered in the regression. Time-series evidence therefore provides little additional information about the effect of Social Security on saving.

There are only a limited number of time-series studies on Social Security and private saving that are based on accurate data, and for that reason, no illustrative figures are presented. Two studies by Martin Feldstein found strong negative effects of Social Security on saving.²⁸ However, another pair of studies by Leimer and Lesnoy find that those results depend on the way the Social Security wealth variable is calculated.²⁹ Using several alternative strategies, they find positive effects on saving in most cases. Because analysts have yet to agree upon the proper method for calculating Social Security wealth, the fact that the estimated effect of Social Security appears to depend on the method used suggests that less confidence can be placed in any of the time-series estimates.

A number of additional time-series studies dating from the 1970s used a Social Security wealth variable that was later found to be constructed improperly. Because of that, the estimated effects on saving found in those studies are likely to be inaccurate. Those studies do, however, indicate that relatively minor changes in

28. Martin Feldstein, "Social Security and Private Saving: Reply," *Journal of Political Economy*, vol. 90, no. 3 (June 1982), pp. 630-642; and Feldstein, "Social Security and Saving: New Time Series Evidence," *National Tax Journal*, vol. 49, no. 2 (June 1996), pp. 151-164.

29. Dean R. Leimer and Selig D. Lesnoy, "Social Security and Private Saving: New Time Series Evidence," *Journal of Political Economy*, vol. 90, no. 3 (June 1982), pp. 606-629; and Selig D. Lesnoy and Dean R. Leimer, "Social Security and Private Saving: Theory and Historical Evidence," *Social Security Bulletin*, vol. 48, no. 1 (January 1985), pp. 14-30.

regression formulation can lead to divergent results, even when identical measures of Social Security wealth are used.

Why Do the Time-Series Results Differ?

Leimer and Lesnoy provide convincing evidence that the calculation of Social Security wealth has a great influence on the estimated effect on saving. In the case of time-series studies such as those, the wealth measure calculated is for the economy as a whole rather than for an individual (as is the case for cross-section studies). In either case, however, the researcher must decide how to project future Social Security benefits. As a starting point, the researcher must estimate future wages and then estimate benefits based on those estimated wages.

Several methods could be used to estimate benefits. On the one hand, researchers might assume that future benefits will be determined by the Social Security law on the books at the time—a “current-law” assumption. That would take account of future changes in benefit formulas now in the law, such as the rise in the retirement age beginning in 2000. Most of the cross-section studies reviewed in the previous section use the current-law method.

On the other hand, they might assume that the ratio of benefits to earnings (the replacement rate) will remain constant at its current rate (“current replacement rate”) or at its long-run average (“average replacement rate”). The argument for the latter two assumptions is that people may not fully understand the complexities of the Social Security benefit structure and therefore may not know what benefits they are legislatively entitled to. However, they may be aware of the benefits earned by their parents or grandparents and calculate their own future benefits on the same basis.

Alternatively, researchers could assume that people will alter their estimate of the future replacement ratio as the current ratio changes, but only slowly (“slowly changing replacement ratio”). That could happen if people believed the current replacement ratio carried some implication for the future level but because of frequent legislative changes it did not make sense to fully adjust estimates of the future level with each current change.

Finally, researchers might use the actual benefits for the historical period in cases in which that is possible (“perfect foresight”). That approach would be appropriate if people had a great deal of foresight and could predict changes not specified in current law.

The differences between the above measures of Social Security wealth are substantial. Ideally, researchers should use the same method to project benefits that

people use in making their saving decisions. Unfortunately, that method is not known.

In their 1985 paper Leimer and Lesnoy estimate the effects on saving of Social Security wealth calculated by each of the five methods mentioned above (current law, current replacement ratio, average replacement ratio, slowly changing replacement ratio, and perfect foresight).³⁰ Using data from 1930 to 1976 (excluding the war years from 1941 to 1946) they find that three of the five methods (current replacement ratio, average replacement ratio, and perfect foresight) imply that Social Security increased saving by a small amount; that one (slowly changing replacement ratio) implies that Social Security decreased saving by a small amount; and that one (current law) implies that it hardly changed saving. Using data from 1947 to 1976, all their estimates imply that Social Security increased saving.

In his 1982 and 1996 papers, Feldstein uses a variant of the average-replacement-rate method with two long-term averages of the replacement rate (for pre- and post-1972), and finds a large negative effect on saving.³¹ However, the justification for a single adjustment in 1972 is not clear. Although there was a major revision to the Social Security program in that year, Leimer and Lesnoy argue that there were equally large changes in prior and succeeding years. Their results cast doubt on whether a negative effect would be found if other methods of calculating Social Security wealth were used.

Results from earlier studies indicate that results are also sensitive to the precise formulation of the regression equation. For example, in his groundbreaking 1974 study, Feldstein finds a large negative effect on saving.³² Robert Barro includes the government deficit as a possible influence on saving; most of his estimates indicate that Social Security wealth decreases saving, but in some cases he estimates a positive effect.³³ When he uses the current replacement rate directly in the estimation rather than converting it into Social Security wealth, he finds a uniformly positive effect on saving. Michael Darby includes the money supply and relative price of durable goods in his regression; he also finds a negative effect in most cases but a

30. Lesnoy and Leimer, "Social Security and Private Saving: Theory and Historical Evidence."

31. Feldstein, "Social Security and Private Saving: Reply" and "Social Security and Saving: New Time Series Evidence."

32. Martin Feldstein, "Social Security, Induced Retirement and Aggregate Capital Formation," *Journal of Political Economy*, vol. 82, no. 5 (September/October 1974), pp. 905-926.

33. Robert J. Barro, *The Impact of Social Security on Private Saving: Evidence from U.S. Time Series* (Washington, D.C.: American Enterprise Institute, 1978).

positive one in some.³⁴ Research by Alicia Munnell differs from the other studies reviewed in estimating the effect on saving directly (the other studies estimate the effect on consumption and convert that into an effect on saving).³⁵ She finds a negative effect of benefits on saving that is almost entirely canceled out by a positive effect from earlier retirement as a result of Social Security.

All of the studies published in the 1970s that are mentioned above used the Social Security wealth measure calculated in Feldstein's 1974 study, which Leimer and Lesnoy discovered was incorrect. So although for the most part those studies found a negative or zero effect on saving, that evidence is not useful.³⁶ Those studies illustrate, however, the variability of estimates using time-series data.

Results also differ depending on the time period over which the equations are estimated. A difficulty facing all the time-series studies is that there are few years with reliable data covering the period before Social Security existed, and those years include part of the Great Depression, which may have led to atypical saving behavior. Some estimations include the Depression years and exclude the years during World War II, while others rely only on postwar data. Equations estimated on postwar data tend to find a smaller negative (or a more positive) effect on saving than those that include the earlier years. That could imply, among other things, either that the earlier years are required to obtain an accurate estimate or that unusual saving behavior during the Depression years, together with the low Social Security wealth during that period, combine to produce a biased estimate of the effect on saving when those years are included.

The results of time-series studies must be interpreted carefully. Those studies estimate the effect of Social Security wealth on consumption. However, consumption would change the most for people who had retired soon after Social Security was instituted and thus had received benefits without having paid equivalent taxes—those who had received a “windfall.” Estimates based on the behavior of that generation could substantially overstate the ultimate effect on aggregate saving, because succeeding generations would raise consumption much less (see Box 4). For example, Feldstein's 1974 estimate that Social Security has reduced saving by 38 percent does not imply that the capital stock will ultimately be 38 percent lower than it would otherwise be because his estimate covers a period when some people were

34. Michael R. Darby, *The Effects of Social Security on Income and the Capital Stock* (Washington, D.C.: American Enterprise Institute, 1979).

35. Alicia H. Munnell, “The Impact of Social Security on Personal Savings,” *National Tax Journal*, vol. 27, no. 4 (December 1974), pp. 553-567.

36. Unfortunately, none of the time-series studies, except that of Feldstein, have been repeated with corrected and updated data.

BOX 4.

THE VARYING EFFECT ON SAVING AT DIFFERENT POINTS IN THE HISTORY OF SOCIAL SECURITY

Social Security's effect on saving and consumption has changed from when the program was introduced to the mature system of today. That change arises because the first generation of retirees covered by Social Security—those who received benefits but did not pay payroll taxes for all of their working lives—received a “windfall” of Social Security wealth. (Later recipients also received some windfalls as benefits increased.)

To the extent that the recipients of windfalls chose to increase their consumption, the flow of national saving during the time they were retired would be much lower. The young, having to pay payroll taxes and anticipating Social Security benefits, would save less. The first generation of retirees would spend the relatively larger wealth built up during the time the program did not exist, creating a large amount of dissaving. The economy would finish that initial period of low saving with a permanently lower capital stock. In essence, the recipients of the windfall would have consumed some of the nation's capital. However, the capital stock would not have declined by as much (in percentage terms) as national saving during that initial period.

The flow of saving would rebound to some degree when the next generation retired, because that cohort would have a lower level of assets to dissave. In the long run, with both the saving of workers and the dissaving of retirees reduced, the flow of national saving would be lower because younger workers outnumber retirees and earn more (a result of growth in population and economic output). Therefore, the reduced saving by the young outweighs the reduced dissaving by the old.

The long-run reduction in saving will match the decline in U.S.-owned assets. However, that long-run drop in saving would not be as great as during the earlier period, when the saving of workers falls without a corresponding decline in the dissaving of retirees. An estimate of the effect on saving, based on the period during which the first generation retired, could therefore overstate the long-run effect.

receiving windfall benefits. The ultimate reduction in saving, and therefore in the capital stock, would most likely be smaller once succeeding generations replaced those who had received windfalls.

In addition to those issues, a study by Alan Auerbach and Laurence Kotlikoff casts doubt on the efficacy of time-series studies in general.³⁷ They constructed computer model in which people behave strictly according to the life-cycle theory. (Because the model assumes life-cycle behavior, under it Social Security will

37. Alan J. Auerbach and Laurence Kotlikoff, “An Examination of Empirical Tests of Social Security and Savings,” in Elhanan Helpman, Asaff Razin, and Ephraim Sadka, eds., *Social Policy Evaluation* (New York: Academic, 1983).

unambiguously reduce saving and, ultimately, the stock of productive capital.) Using data generated by a computer simulation of a Social Security system, they carried out a time-series analysis much like many of the studies discussed above. They found that, depending on the time period used for the estimation, the regression results could indicate that Social Security had a positive, negative, or close-to-zero effect on consumption. The estimates of the effect of a \$1 increase in Social Security wealth on national saving ranged from plus \$11 to minus \$11. The extreme variability in the estimates in a case in which the true effect on saving is clear suggests that the time-series method may not be appropriate for estimating the precise level of the effect on saving.

The bottom line is that the results from time-series studies are inconsistent and suffer from some significant theoretical problems. As a result, they provide little additional information on the effects of Social Security on saving.

STUDIES BASED ON DIFFERENCES IN SOCIAL SECURITY SYSTEMS AMONG COUNTRIES

A final method of investigating the effect of Social Security on saving is to examine different countries with public pension systems of varying generosity to determine whether national saving (or consumption) varies systematically among those countries. Those studies are referred to as cross-country studies. (Some of the studies also include the effect of the changing generosity of pension systems over time in each country.)

It would be very difficult to construct measures of public pension wealth for a set of different countries. Therefore, most studies use a simple measure to summarize differences in the programs—in most cases, the average ratio of initial benefits to earnings. That measure, however, misses the potential effects of demographics on aggregate pension wealth. (For example, a country with the same benefit-to-earnings ratio but a greater percentage of the population on the brink of retirement would have greater total Social Security wealth and, potentially, a greater effect from Social Security on saving.) That short coming of the data could lead to inaccurate estimates.

Figure 2 illustrates the results of cross-country studies. Many of the estimates cluster around zero. In most cases, the sign of an estimate varies depending on the formulation of the regression equation. Studies by Martin Feldstein and by Sebastian Edwards find a consistent negative effect of benefit generosity on the private saving

rate.³⁸ However, studies by Robert Barro and Glenn MacDonald, John Graham, Erkki Koskela and Matti Viren, and Franco Modigliani and Arlie Sterling, which use different equations or data in their estimations, find both positive and negative.³⁹ In addition, in most cases, the effect is not statistically significant (that is, the two-standard-error band shown in the second panel of Figure 2 includes zero).

There is no clear pattern to explain the different results. A careful examination by Charles Horioka of the differences between Feldstein's 1977 work and Barr's and MacDonald's 1980 study concludes that differences in the variables, the countries and time period included in the regression, the form of the equation used, and the sources of the data all contribute to the differing results.⁴⁰ Divergent results within studies confirm the influence of all those factors. Some studies also note a large influence of individual countries, notably Japan, on the results.

A particular concern with the Edwards study is that it uses the percentage of government spending devoted to Social Security and all other welfare programs as its Social Security variable.⁴¹ That measure is not as theoretically desirable as the Social Security replacement rate used in other studies, and using it could affect the results.

One general difficulty with cross-country studies is that saving habits in different countries could influence the design of public pension programs rather than vice versa. For example, if policymakers in countries with low saving rates observed that many people were retiring with insufficient resources as a result of inadequate savings, they could address that problem by increasing the generosity of the pension system. That would mean that countries with high pension benefits might have low saving even if pension benefits had no influence on saving.

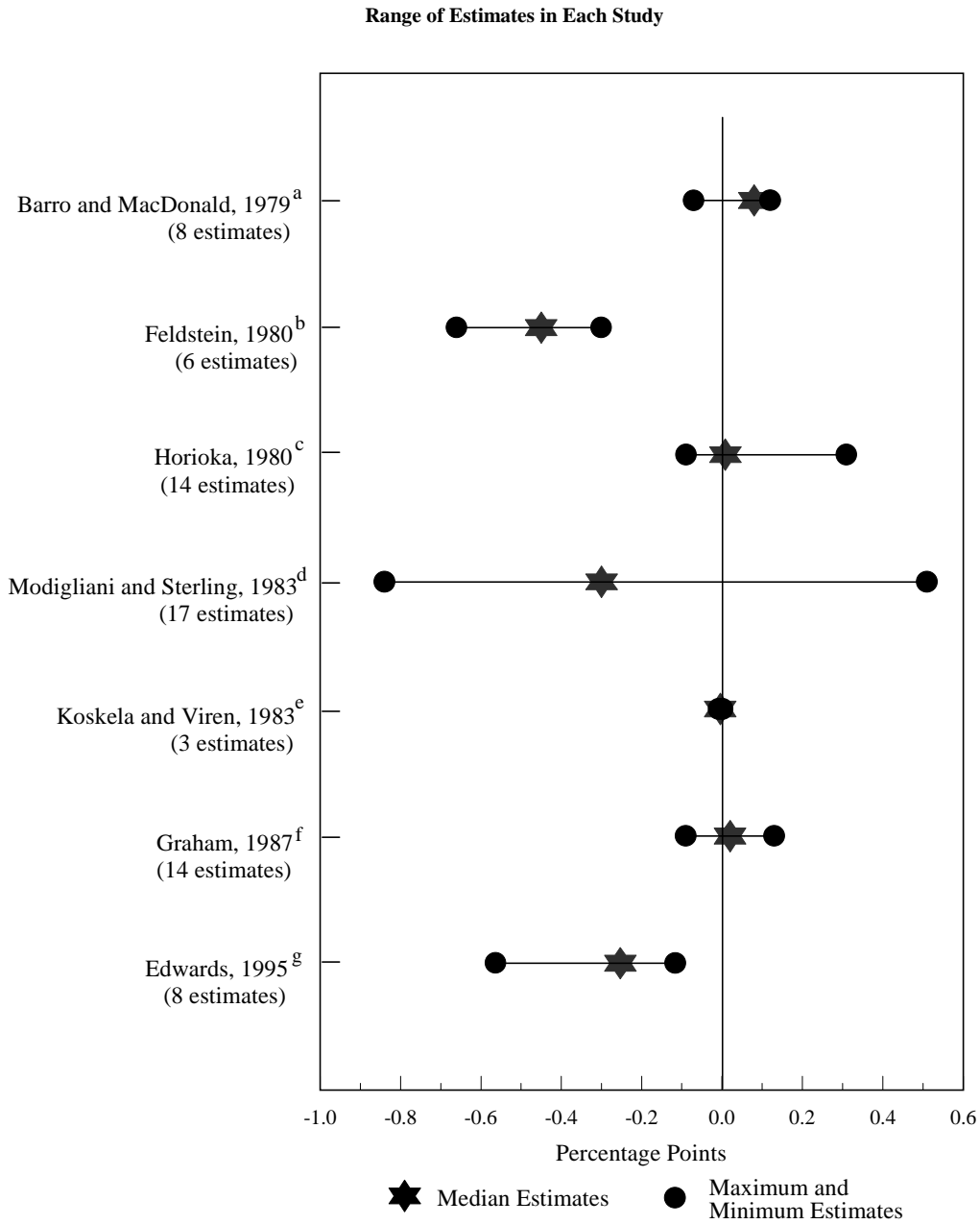
38. Martin Feldstein, "International Differences in Social Security and Saving," *Journal of Public Economics*, vol. 14, no. 2 (October 1980), pp. 225-244; and Sebastian Edwards, *Why Are Saving Rates So Different Across Countries? An International Comparative Analysis*, Working Paper No. 5097 (Cambridge, Mass.: National Bureau of Economic Research, April 1995).

39. Robert J. Barro and Glenn M. MacDonald, "Social Security and Consumer Spending in an International Cross Section," *Journal of Public Economics*, vol. 11, no. 3 (June 1979), pp. 275-289; John W. Graham, "International Differences in Saving Rates and the Life Cycle Hypothesis," *European Economic Review*, vol. 31, no. 8 (December 1987), pp. 1509-1529; Erkki Koskela and Matti Viren, "Social Security and Household Saving in an International Cross Section," *American Economic Review*, vol. 73, no. 1 (March 1983), pp. 212-217; and Franco Modigliani and Arlie Sterling, "Determinants of Private Saving with Special Reference to the Role of Social Security—Cross-country Tests," in Franco Modigliani and Richard Hemming, eds., *The Determinants of National Saving and Wealth* (London: MacMillan, 1983).

40. Charles Y. Horioka, "International Differences in Social Security and Saving: A Comparison of the Barro and Feldstein Estimates," *Journal of Public Economics*, vol. 14, no. 2 (October 1980), pp. 238-244.

41. Edwards, "Why Are Saving Rates So Different Across Countries?"

FIGURE 2. ESTIMATED IMPACT OF A ONE PERCENTAGE-POINT INCREASE IN THE BENEFIT-TO-EARNINGS RATIO ON THE PRIVATE SAVING RATE IN CROSS-COUNTRY STUDIES

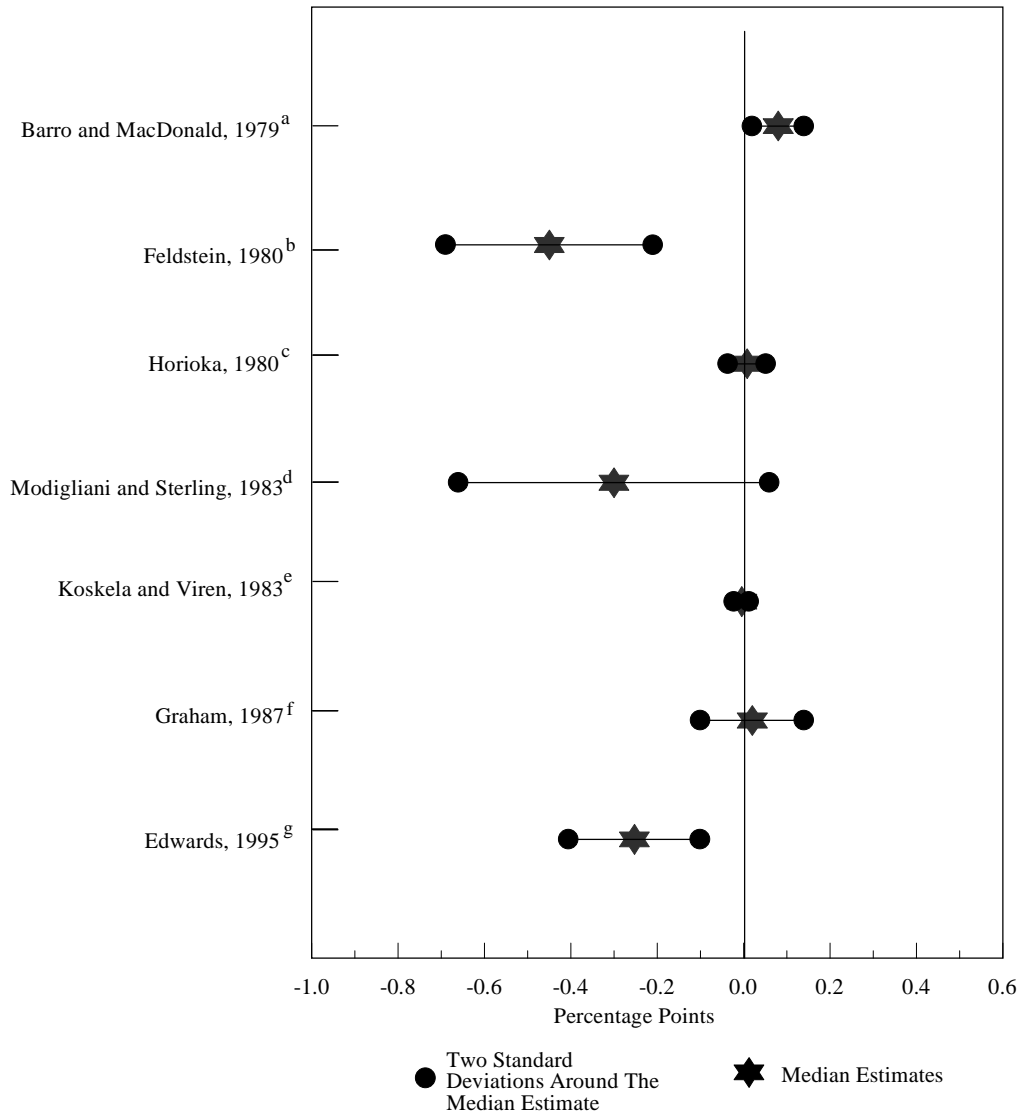


SOURCE: Congressional Budget Office based on various studies (see the bibliography for full citations).

(Continued)

FIGURE 2. CONTINUED

Estimated Uncertainty of Median Estimate in Each Study (Two-Standard-Error Bands)



NOTE: When there were an even number of estimates, the lower of the two central estimates was chosen as the median.

- a. Table 1 from Barro and McDonald, p. 284.
- b. Table 2 from Feldstein, p. 235.
- c. Table A-2 from Horioka, p. 242.
- d. Table 2.3 from Modigliani and Sterling, p. 38.
- e. Table 1 from Koskela and Viren.
- f. Tables 1, 2, and 3 from Graham, pp. 1517, 1518-1519, and 1524.
- g. Table 2 from Edwards, p. 24.

Given the wide range of results and the imprecision of many of the estimates, few conclusions can be drawn from the cross-country analyses.

CONCLUSIONS

The Social Security system most likely has had a negative impact on private saving. The best empirical estimates, those utilizing cross-section data, indicate that each dollar of Social Security wealth reduces other assets by between zero and 50 cents. However, those estimates are very uncertain, and higher or lower values cannot be ruled out.

Estimates of the effect of the current Social Security system on private saving are at best only a rough guide to the effects of any proposed changes in the system. The impact of changes will depend on the details of the proposals as well as their influence on confidence in the Social Security system.

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