University of Wisconsin-Madison

Institute for Research on Poverty

Discussion Papers

Martin David
Paul L. Menchik

THE EFFECT OF SOCIAL SECURITY ON LIFETIME WEALTH ACCUMULATION AND BEQUESTS

DP #671-81

The Effect of Social Security on Lifetime Wealth
Accumulation and Bequests

Martin David
Department of Economics
University of Wisconsin-Madison

Paul L. Menchik
Department of Economics
Michigan State University

December 1981

This paper, originally prepared for presentation at the Workshop in Public Economics, Queens University, Kingston, Ontario, September 1981, is a revision of an earlier paper in the Institute for Research on Poverty Discussion Paper Series, DP-519. The research was financially supported by the National Science Foundation (#SOC 77-17358), by funds granted to the Institute for Research on Poverty at the University of Wisconsin-Madison by the Department of Health and Human Services pursuant to the provisions of the Economic Opportunity Act of 1964, and the Michigan State University.

ABSTRACT

The effects of Social Security on private saving has been one of the more hotly debated issues in recent years. Using the zero bequest variant of the life-cycle model of saving, Feldstein and Munnell argue that our pay-as-you-go system reduces private retirement savings and hence depresses macro saving. Barro and others have argued that individuals will offset the forced intergenerational transfer component of the system by increasing their bequests, and that macro saving will not be reduced.

Using a sample of Wisconsin Income Tax records and probate records for Wisconsin males born 1890-1899, we attempt to test both of these hypotheses. Barro's hypothesis is tested by relating the lifetime wealth increment received by participants of the Social Security System to their actual bequests. The presence of the Feldstein-Munnell effect is tested by comparing the hypothetical age-wealth profile that <u>would</u> be observed in the absence of social security to that which <u>is</u> observed, conditional upon the subjects' <u>gross</u> social security benefits. Our data fail to support either of these hypotheses, and in addition they cast doubt on the validity of the life-cycle model of accumulation. In other words, Social Security does not appear to depress or displace private saving, and people do not deplete their private assets in old age as is commonly assumed.

The Effect of Social Security on Lifetime Wealth Accumulation and Bequests

INTRODUCTION

Whether the Social Security System discourages private saving has become one of the more hotly debated issues in recent years. Using traditional life-cycle models, Feldstein (1974) and Munnell (1974) argue that social security's pay-as-you-go system reduces private retirement savings, and hence macro saving. Barro (1974) and Miller and Upton (1974) have argued, however, that saving is done not only for retirement but for private transfers. Individuals, according to these authors, will attempt to undo what the Social Security System does by adjusting their private transfers so as to offset perfectly social security's forced intergenerational transfers. If, in the absence of the program, parents receive transfers from their children (negative bequests), imposition of the program will reduce these transfers in a dollar-for-dollar fashion. Alternatively, if parents plan to leave positive bequests to their progeny, they will bequeath an additional amount, the present value of their "lifetime wealth increment," LWI (the difference between anticipated benefits and their own taxes paid), to their children.[1] The analysis fails in the case of neither positive nor negative bequests. It also fails to apply to the so-called "free lunch" case, in which the economy-wide growth rate exceeds the real rate of return on assets. In this case there are potential efficiency gains in reducing saving and the capital stock to the Golden Rule level (the level at which the growth rate equals the real interest rate).

Unfortunately the analysis of aggregate time-series data has not resolved the debate (see, for example, Barro, 1978; reply by Feldstein, 1979; Esposito, 1978; Leimer and Lesnoy, 1980; Feldstein, 1980).[2] It would seem that this issue is one in which the attribution of causality is particularly difficult when using time-series data. It is certainly true that growth in consumption (at the cost of saving) has accompanied the growth in social security wealth. However, other important changes in the twentieth century offer a competing explanation for the trend in consumption. Some of these are the rapid growth in private pensions, the reduction in the share of income received by the top quintile, the increase in importance of other government transfer payments, changes in the demographic structure, and the increase in the share of the population not psychologically affected by the Great Depression.[3]

In our view it is necessary to use micro data to resolve the issue of the effect of social security on saving.[4] One problem in the use of micro data is that most of the data bases used to measure private wealth-holding rely on self-reported responses to surveyors' questions. Validation studies show response errors and the problems of nonresponse bias to be enormous.[5] Our data rely on administratively determined estate values available in probate records. Although there may be incentives and opportunities for families in the top percentiles of the wealth distribution to understate certain assets, e.g., consumer durables, for estate tax avoidance, this problem is minor in a study of the overall population and presents less of a problem than the one found in the validation studies.

The theoretical underpinning of the models of Feldstein and Munnell is the life-cycle model of saving with no bequest motive. The central notion is that individuals allocate their lifetime budgets over their life span, saving for later consumption in earlier years and dissaving in later years. The economywide stock of capital can therefore be generated by this pattern without any reliance on bequests, which may be seen as the difference between lifetime resources and lifetime consumption. Analysis of macro data has been invoked (Modigliani, 1966; Tobin, 1967) to support the no-bequest model as the sole explanation of the capital stock.

In the last few years, research relying on micro data has cast some doubt upon the validity of the zero-bequest prediction of the model. Indeed, there are findings that conventional net worth <u>increases</u> with age among the elderly.[6] A simulation study by White (1978) finds that saving for future consumption accounts for at most 60% of aggregate personal saving.

If these findings are true, savings that are eventually bequeathed constitute an important component of the capital stock. Darby (1979) separates net worth into two components: life-cycle assets (earnings saved but consumed later in the life cycle), and bequests (net worth at death). He finds that life-cycle assets constitute only 13% to 29% of total assets. Kotlikoff and Summers (1981) also divide capital accumulation into a life-cycle and an intergenerational transfer component. They find that the major share, approximately 80% of the total, is due to intergenerational transfers.

If bequests constitute a major component of total accumulation, saving responses to the Social Security System should be less than under the strict life-cycle model.

LIFE-CYCLE MODELS WITH PLANNED BEQUESTS

The life-cycle model with bequests allowed has been studied by Yaari (1964) and Blinder (1974), among others. Individuals derive utility from their lifetime consumption stream and (the anticipation of) bequests made in the final period of life. Discounted lifetime utility (U) for individuals dying at a certain age of T years is assumed as the additive sum of utility from consumption at time t and utility of bequests:

$$U(T) = \int_0^T u[c(t)]e^{-\rho t}\,dt + V[B(T)], \tag{1}$$

where c(t) is consumption at age t, B(T) is bequests at age T, ρ is the subjective rate of time preference in consumption, and $u(\cdot)$ and $V(\cdot)$ reflect the strength of preference. Individuals are presumed to maximize their utility function subject to their lifetime resources constraint, with consumption and bequest demands a consequence of this process. Lifetime resources is

$$W = I_0 e^{rT} + \int_0^T E(t)e^{r(T-t)}dt, \tag{2}$$

where r is the rate of interest, T the length of life, I_0 is the inheritance or gift received and discounted back to the initial period, and E(t) the earnings stream over the life cycle.[7] This model implies that an optimal consumption profile is

$$\dot{c} = (r - \rho)\,\frac{U'(c)}{U''(c)}.$$

The Imposition of Social Security

Let us now assume that a social insurance scheme is introduced. A combined employer-employee tax (assumed to be fully shifted) of $\theta E(t)$ per period finances benefits of $BN(t)$. Total lifetime tax payments, assuming that $E(t)$ is unaltered by the program, are

$$SST \equiv \int_0^T \theta E(t) e^{r(T-t)} dt, \tag{3}$$

while lifetime benefits are

$$GSS \equiv \int_0^T BN(t) e^{r(T-t)} dt. \tag{4}$$

The lifetime budget constraint facing the individual can be written

$$\int_0^T c(t) e^{r(T-T)} dt + B(T) = I_0 e^{rt} + \int_0^T E(t) e^{r(T-t)} dt$$
$$+ \int_0^T [BN(t) - \theta E(t)] e^{r(T-t)} dt. \tag{5}$$

If the last term on the right-hand side is zero, implying that the benefit received equals the taxes paid, lifetime resources are unaltered by the program, optimal bequests should remain unchanged, and the desired consumption profile should not be altered. If benefits are paid late in life when the worker is retired, and taxes are paid during the working life, social security taxes would replace life-cycle saving dollar for dollar until the retirement date, and private saving would be reduced (Kotlikoff, 1979, p. 397).

If, on the other hand, the program is financed not by intertemporal transfers but intergenerational transfers, behavioral responses to the system may be quite different. If retirement benefits are financed by taxes largely paid by the workers of the next generation, as originally was the case in the United States, the budget constraint is expanded by the last term on the right hand side. If bequests are a normal good (i.e., have a positive income elasticity), some of the differences between benefits received and taxes paid (the lifetime wealth increment, or LWI), will not be consumed but bequeathed to the next generation. This is a pure "wealth effect" on the lifetime allocation described earlier. In the polar case in which benefits equal the LWI (i.e., taxes paid by the recipients in the start-up generation are zero) it is conceivable that all of the LWI is bequeathed (either in the form of financial or in human bequests) and consumption and saving remain unaltered when compared to the no-social-security world. This is the case argued by Barro (1978).

In the Barro characterization of the economy, generations are linked by transfers. When social security is introduced, the start-up recipient generation recognizes that the benefits each member receives impose a liability on the younger, working generation, i.e., their children. Since the bequests the parents would have made in the absence of social security constituted an equilibrium situation, parents will not increase their consumption but increase their bequests (human or financial) to offset this forced intergenerational reallocation of resources. (If the parents were making net negative bequests to their children--i.e., receiving support from their children--before the imposition of the system, these negative bequests will be reduced as a consequence of it.)

Our paper seeks to determine if social security augments positive bequests (as the Barro model predicts it should) among members of the start-up generation.

There is a feature of our Social Security System that may result in less than the complete offset envisaged by Barro. If the program is redistributive within as well as between generations (as has in fact been shown by Burkhauser and Warlick, 1979), and parents in the start-up generation expect their LWI to be paid for, not by their children, but by other people's children, the Barro effect may not occur. If parents care less (or not at all) about the welfare of the "future generation" in general than about their own progeny, the Barro prediction of complete offset would not be observed. This argument, of course, works both ways. If parents expect their children to pay more than they themselves receive in net social security benefits, they might bequeath more than their LWI to attenuate the "excess" burden the system has exacted from their children. We have no way of knowing parents' perceptions of their children's tax burden relative to their own LWI. We can only observe their actual bequest behavior, to determine if variations in bequests accompany variations in LWI among the populace.[8]

What Should the Bequest Function Look Like?

> A man can have no stronger stimulus to energy and enterprise than the hope of rising in life, and leaving his family to start from a higher round of the social ladder than that on which he began.
>
> (Alfred Marshall, 1949, p.228)

Yaari (1964) and Blinder's (1974) model of bequests offers little insight into the shape of the bequest function. In the spirit of

Marshall's quote we assume that bequests can be generated in a model which includes both the conventional consumption of parents and the income of children as arguments in the parents' utility function. Parents bequeath because they want to augment the resources available to their children. The utility function of the g^{th} generation can be written:

$$U_g = U_g(C_g, W_{g+1}), \tag{6}$$

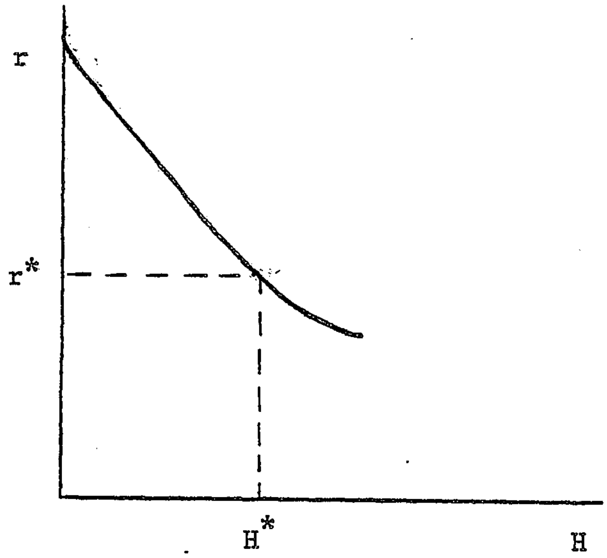
where C_g is the lifetime consumption of parents and W_{g+1} the lifetime resources of their children. W_{g+1} is the sum of two components, an inframarginal part and a marginally relevant part. The inframarginal part is what the children's earning capacity would be in the absence of parental investments.[9] Presumably this component would be determined by luck and genetic endowment. The second and marginally relevant part is the value to the recipient of parental investments. This type of utility function has been used most recently by Becker and Tomes (1976, 1979) and Tomes (1981) to analyze the quantity and quality of children. It is argued that parents expend resources to improve the "quality," i.e., the lifetime income, of their children and derive utility from doing so <u>regardless</u> of what the children decide to do with their enhanced income.

If the Marshallian model allows for two types of bequests, human and financial, it may be possible to predict the shape of the financial bequest function from theory. Assume that human bequests (schooling, health care, etc.) are financed by parents and initially provide a higher rate of return than the financial market yields.[10] As the amount expended on each child increases, however, the marginal rate of return falls. When the rate of return on human investments falls below the financial market return on assets, all subsequent investments will be in the form of financial bequests (which conceptually include both *inter vivos* and testamentary transfers).

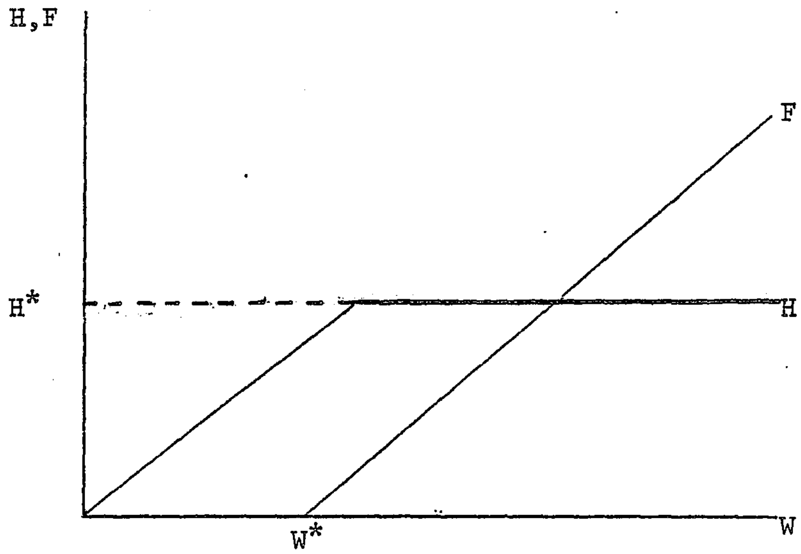
In Figure 1, H and F are human and financial bequests, r indicates the varying rate of return on human bequests, and r^* is the market return on financial capital. Panel a relates the marginal return on human bequests to the amount invested. Parents will invest up to, but not greater than, H^* in human bequests since additional investments would yield less than r^*, the return yielded by financial bequests. All subsequent bequests will be in the financial form. Consequently, the intended or planned bequest function will appear as presented in panel b under the assumption that transfers to children are normal goods. Human bequests will rise with parental resources, W, until H^*, and will then become flat. Beyond W^*, planned financial bequests, F, become positive and increase with W.

THE DISTINCTION BETWEEN PLANNED AND UNPLANNED BEQUESTS

The foregoing characterization of the bequest process yields predictions about optimal or planned bequests--i.e., bequests when lifetime is certain. Since in the real world the date of death is a random variable not known to the decedent and capital markets for annuities may be less than perfect, actual bequests may depart from planned or optimal bequests. Consequently it might be useful to distinguish between planned and unplanned bequests even though such a distinction may be an oversimplification.



Panel a: Marginal Return
on Human Investment



Panel b: Planned Financial and
Human Bequests (Engel Curve)

Figure 1

For a death occurring at age s, actual bequests B are equal to planned bequests B_p plus accidental or unplanned bequests (an error term) B_u, or

$$B \equiv B_p + B_u. \tag{7}$$

Planned bequests constitute the amount an individual would leave to his heirs if he knew the date of his death at the start of the planning period. If individuals are risk-averse, wanting to avoid running down their wealth too quickly, the expected value of unplanned bequests would be positive, and actual bequests should exceed planned bequests. Unplanned bequests include resources held for precautionary purposes, resources held for future consumption, and certain durable goods that yield consumption services. Imperfections in annuity markets due to adverse selection can be invoked to explain the existence of substantial unplanned bequests.[11]

Unplanned bequests can be somewhat more rigorously defined by extending the Tomes (1981) model. Decision-making consists of a two-part process: (1) the selection of a planning horizon, and (2) optimization of utility within that horizon to maximize utility. The model has the advantage of placing greater weight on consumption in years in which the decision-maker is unlikely to survive than the maximization of expected utility. It also operates within a fixed rather than a stochastic budget constraint. We formulate the model for an unmarried person, for the sake of simplicity. The same ideas apply to couples, although the analytical results are considerably more complex.

Choice of a planning horizon requires information on the probability of survival of the decision-maker. Define $s_j(A)$ as the probability that a person aged A will survive j years. U_j is the utility associated with the suboptimization of a consumption and bequest plan over the period j; L_j is the utility loss experienced during years of pauperization beyond j. Choice of the optimum horizon entails the choice of j to maximize U^*:

$$U^* = U_j s_j(A) + [1 - s_j(A)]L_j \ . \tag{8}$$

Call the optimizing value of j, J.

Optimization of a consumption plan within the horizon J entails an initial division of resources between those allocated to <u>certain</u> bequests and those allocated to a certain consumption plan for the period to J. Recognition of an uncertain lifetime implies that the random value of unconsumed lifetime wealth can also be considered to increment utility via an "unplanned bequest." Assume that each dollar of bequests increases utility at a constant rate λ, reflecting the marginal valuation of the lifetime wealth constraint of the heirs. (See equation 6, above.) Then the optimal plan maximizes

$$U_J[(C_t),B] = \sum_{t=0}^{J}(1 + r)^{J-t}U(C_t)$$

$$+ \ \lambda \left[B + \sum_{t=0}^{J}[1 - s_t(A)C_t(1 + r)^{J-t}\right], \tag{9}$$

subject to the resource constraint

$$W = \sum_{t=0}^{J}C_t(1 + r)^{J-t} + B. \tag{10}$$

The principal value of this formulation is that it highlights the possibility that life-cycle savings, reserved to meet a consumption plan in later life, may be bequeathed. If a pattern of accumulating life-cycle savings in early life is followed by decumulation in retirement, that pattern should be incorporated into observed bequests as the unplanned bequests insofar as death is not anticipated. (See below, Figure 3, panel a.)

These ideas have been explicitly modeled by the F(AGE) function. AGE is the age of the person at death. We assume that individuals prepare for retirement by accumulating a capital amount through equal annual payments earning interest. Accumulation is assumed to begin at age 45. After retirement at age 65, the accumulated sum is assumed to be paid out in equal annual installments until age 90. Although the capital amount allocated by any individual is not known, the equal payment assumption and equal contribution assumption imply that the proportion of the capital amount in a bequest will depend only on the age of the person at death:

$$
\begin{aligned}
F(\mathrm{AGE}) &= 0 && \mathrm{AGE} < 45 \\
&= \left(\sum_{t=0}^{\mathrm{AGE}-45} (1+r)^{t}\right)\left(\sum_{t=0}^{25} (1+r)^{-t}\right)\left(\sum_{t=0}^{20} (1+r)^{t}\right)^{-1} && 45 \leq \mathrm{AGE} < 65 \\
&= \sum_{t=0}^{90-\mathrm{AGE}} (1+r)^{-t} && 65 \leq \mathrm{AGE} < 90 \\
&= 0 && \mathrm{AGE} > 90.
\end{aligned}
$$

F(AGE) constrains the age-wealth profile to either an inverse V-shape (in accordance with the life-cycle model) or (if the data require it) a V-shape. We also try a less restrictive function of age--a linear spline with a node at age 65. This technique does not force the end points to zero at age 45 and 90 and "lets the data decide" the age-wealth profile:

$$\begin{aligned} AGE1 &= AGE && \text{if } AGE < 65 \\ &= 64 && \text{if } AGE \geq 65 \\ AGE2 &= 0 && \text{if } AGE < 65 \\ &= AGE - 64 && \text{if } AGE \geq 65 \end{aligned}$$

Either accumulation or decumulation is possible for both younger and older persons using the spline.

THE EFFECT OF SOCIAL SECURITY ON PLANNED AND UNPLANNED BEQUESTS

Among those planning to make a financial bequest, it is hypothesized that the larger the LWI, other things constant, the larger will be the bequest (bequests being normal goods). Consequently, the planned bequest function in the presence of social security, B_p(LWI), as shown in Figure 2, should lie above the planned bequest function in the absence of social security, $B_p(0)$. The shift should be parallel unless, among those planning bequests, those with higher lifetime resources have higher marginal propensities to bequeath their LWI.[12] We can write a linear expenditure equation for the planned bequest function (for those of the same age) as

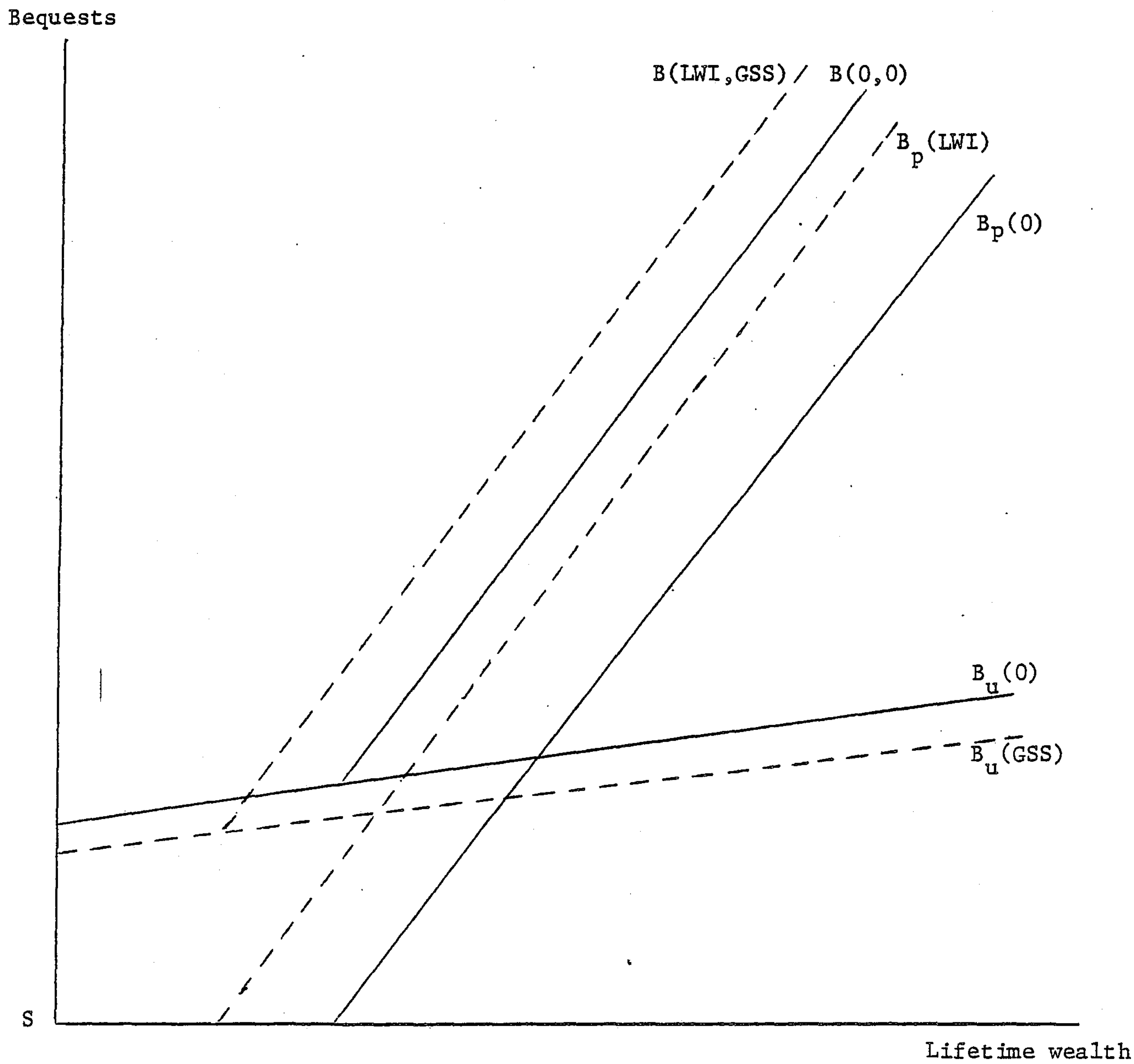


Figure 2

The Effect of Social Security Benefits on Planned and Unplanned Bequests

$$B_p = \alpha_0 + \alpha_1 W + \alpha_2 LWI$$

$$= 0, \qquad \text{if } \alpha_0 + \alpha_1 W + \alpha_2 LWI < 0. \tag{11}$$

Under Barro's (1978) hypothesis, α_2 should certainly exceed α_1. If *inter vivos* transfers were included in B_p and human bequests were inefficient relative to financial bequests in the positive B_p range, α_2 should equal unity.[13] If Barro is correct, the start-up generation bequeaths its LWI to the subsequent generation, whose future social security benefits constitute its own LWI (since it has already been compensated by its parents for taxes paid). That LWI would be bequeathed to the third generation, . . . ad infinitum. In this scenario, social security would not alter consumption or accumulation; it would only redirect intrafamily wealth transfers.

Unplanned bequests (B_u) should be an increasing function of lifetime resources among those of the same age (see Figure 2). Under the line of reasoning expounded by Feldstein (1974) and Munnell (1974), the greater one's gross social security benefit level, GSS, the less is needed for retirement saving. Hence for those at the threshold of retirement (say 65), B_u(GSS) should lie below B_u(0) by exactly GSS. Unless liquidity constraints or differences in rates of time preference exist across income classes, the B_u(GSS)'s shift below B_u(0) in a parallel fashion in Figure 2. For those of the same age we can write

$$B_u = \gamma_0 + \gamma_1 W - \gamma_2 GSS. \tag{12}$$

The magnitude and statistical significance of γ_2 constitute a test of the Feldstein-Munnell wealth replacement hypothesis. As Figure 3 indicates, the reduction in unplanned bequests due to GSS depends upon the age of the subject. The wealth replacement effect of social security would be greatest among those at the threshold of retirement and would be smaller for those much older or younger. If the age profile of unplanned bequests in the absence of social security can be represented by the function F(AGE), we should add it along with its interaction with GSS to the B_u equation,

$$B_u = \gamma_0 + \gamma_1 W - \gamma_2 GSS + \gamma_3 F(AGE) + \gamma_4 F(AGE) \cdot GSS. \tag{13}$$

($\gamma_2 > 0$ implies a downward shift in unplanned bequests, unrelated to age, an effect not sketched in Figure 3.) Since $B = B_p + B_u$, our basic equation for total bequests is

$$B = \gamma_0 + \gamma_1 W - \gamma_2 GSS + \gamma_3 F(AGE) + \gamma_4 F(AGE) \cdot GSS + \max[0, \alpha_0 + \alpha_1 W + \alpha_2 LWI]. \tag{14}$$

For those planning to leave bequests the coefficient of W is $(\alpha_1 + \gamma_1)$, which, of course, exceeds γ_1 as long as $\alpha_1 > 0$.

REQUIREMENTS FOR THE DATA BASE

The theory sketched above makes it clear that a test of the Barro effect requires data in which variation in the lifetime wealth increment (LWI) occurs. For this purpose it is ideal to have data on the "start-up" generation of individuals receiving social security. In some cases this generation was able to obtain entitlement to benefits on the basis of periods of contribution that were extremely short--six quarters of coverage are sufficient to entitle survivors to insurance benefits (paid to survivors); and in many cases persons reaching retirement age

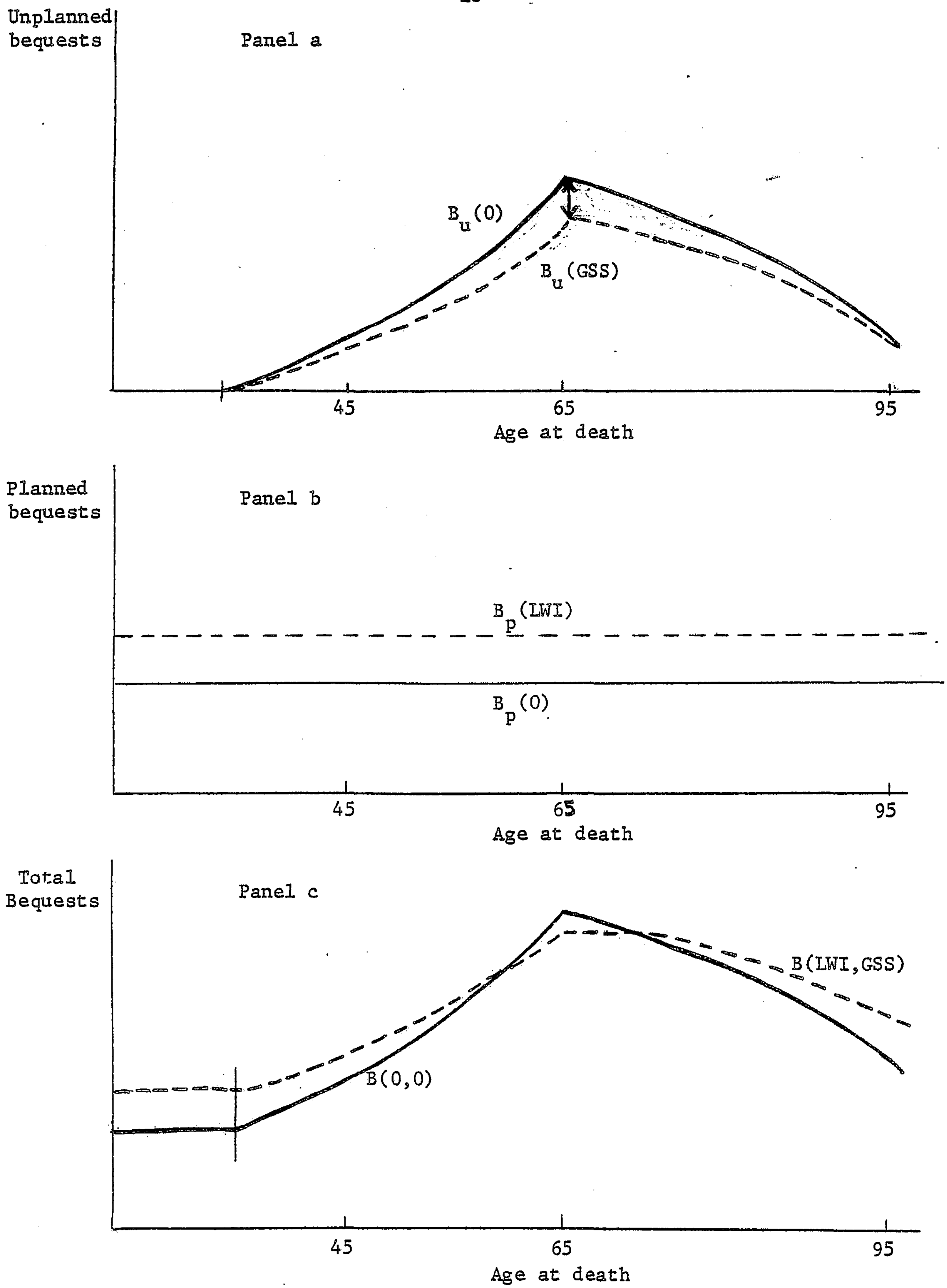


Figure 3: Social Security and Bequests in Relation to Age at Death

shortly after 1950 could obtain full retirement benefits (i.e., pensions) with only a few additional quarters. One quarter of coverage for each year after 1950 and prior to the year in which a man reached age 65, or a woman reached 62, qualified the contributor to the system for a pension.

Need for variation in lifetime wealth increments made it appear useful to focus on persons retiring in the 1950s and early 1960s. This generation benefited from the enormous increases in social security coverages that accompanied the 1950, 1958, and 1964 amendments and were able to collect benefits on the basis of the minimal contributions just cited. At the same time some of the individuals in this generation had been paying FICA since the 1930s or 1940s and made proportionately greater contributions toward their retirement benefits. A few individuals remained entirely outside the OASDI system and therefore received no lifetime wealth increment. For all these reasons the generation born during the period 1890-1899 appears particularly germane to an investigation of the Barro hypothesis.

A second reason for focusing on this birth cohort is that a large part of their benefits from the OASDI system is captured in three types of benefits--retirement, wife (husband), and widow (widower) benefits, whereas for younger cohorts the present value of benefits paid to spouses with children and disability benefits is significantly larger than it is for the older cohorts such as ours.[14] The model developed thus far focuses on bequests as a mechanism for intergenerational transmission of wealth rather than an insurance motive to cover the costs of raising children, so that it appeared wise to concentrate on a group of individuals for whom the former was a dominant motive for lifetime wealth accumulation, i.e., decedents who are likely to have no minor children.

A second requirement for testing the theories presented is that individuals exhibit variance in the level of gross social security benefits received, for any given level of lifetime wealth. Thus it is necessary to observe variation in the impact of the OASDI system in reducing the accumulation of wealth for consumption during retirement years. This type of variation is assured by the factors that assure variability in the lifetime wealth increment and concomitant job mobility. Some individuals could achieve eligibility by working in a low-paying job after moving from a high-paying occupation that was not covered (e.g., municipal employees) while others could achieve eligibility by working for short periods in newly covered, high-paying employments. A wide range in the proportion of average earnings covered by FICA for the start-up generation of 1890-1899 results. This variation is translated into differences in primary insurance amount (PIA), the basic multiplier for all types of benefits paid.

Figure 1 makes clear that a third requirement for the data base is that it is possible to control on the level of lifetime resources (lifetime earnings plus inheritances received).

The three requirements—variance in LWI, variance in GSS, and control on the level of lifetime resources—are largely met by the data available in the Wisconsin Assets and Incomes Study (WAIS). Earnings data are reported on Wisconsin state income tax forms for the period from 1947 to 1964; FICA and PIA can be obtained or estimated from Social Security Earnings Records (ER) and data on beneficiaries linked to the tax record panel data. Wealth passing into estate is reported from probate records examined for persons in the tax record sample who died between 1947 and 1978. This is the basis for our measure of bequests: the sum of gross assets passing into estate, life insurance (if in excess of $10,000) paid directly to beneficiaries, and, as required by our theory, inter vivos gifts reported in connection with inheritance tax assessment. In the next section the method for estimating LWI and GSS is discussed. Readers interested in more detail on the data base are referred to David, Gates, and Miller (1974) and Menchik and David (1979).

COMPUTING THE VALUE OF SOCIAL SECURITY WEALTH

In principle, computation of social security wealth, GSS, and the lifetime increment, LWI, would appear to involve a simple algebraic sum of benefits received and taxes paid appropriately discounted and summed over years. Several conceptual problems, intricacies of the law, and limitations of the data available imply a more involved procedure.

Conceptually it is not clear what is meant by the value of LWI. Lifetime wealth increment depends on the marital status and number of dependents of the person. It depends on the stage in the life cycle when LWI is being valued. Since individuals respond to changes in their lifetime wealth and make dynamic adjustments in their lifetime consumption-bequest plan, it appears that some additional structure must be applied to reach a determinate value for LWI. We assume that the individual plans bequests *ex ante* from the perspective of recognizing his prospective LWI and GSS computed at age 65.[15]

For the period 1948-1978, during which the men in the sample at hand died, further complications affect the expectations for GSS and LWI. Some persons were not covered for nearly all of their working life, and then were granted the privilege of receiving benefits on the basis of short periods of contribution. These individuals may well have planned their savings on the basis of no social security benefits. The converse is that persons who were employed in occupations covered by the Social Security System faced an uncertain prospect of a job change accompanied by movement into a position that was not covered by social security. Such a change could lower the benefit after eligibility for retirement benefits had been established, or it might foreclose the possibility of obtaining eligibility. Lastly, it is clear that persons whose health is poor would impute a different value to survivors' insurance than those who are healthy. These complications imply that the measure of anticipated social security wealth used in this paper may fall short of the basis on which individuals make lifetime consumption and bequest plans.

Nevertheless the algorithm that we have used encompasses actuarial risk, and attempts to deal with an *ex ante* view of social security wealth that could relate to rational behavior, rather than an *ex post* view of social security that indicates how earnings and inheritance have been augmented by government transfers. This prospective view of the LWI also dictates that we are concerned with *potential* benefits. Effectively, the government offers the individual a social contract that alters the budget constraint, and our measure of its value should be the compensating variation associated with that relaxation, not the actual benefits paid, which will reflect adjustments made in the amount of leisure taken.

Lastly, LWI must be the legal entitlement of the individual concerned. It would not be an aggregate of payments on behalf of a household, in which case it would be possible to "double-count" the LWI of members of the household when separately considering their individual decisions to bequeath wealth. To avoid double-counting, benefits have been computed on an individual basis, even though eligibility for the payment may derive from the spouse of the individual. This idea can easily be explained by introducing variable names to denote the relationship of a person and spouse to the Social Security System:

	Person	Spouse
Primary insurance amount	PIAP	PIAS
actuarially discounted and transformed equals		
Gross social security benefits	GSSP	GSSS
less		
Amount of FICA taxes paid	AMT	SPAMT
equals		
Lifetime wealth increment	LWIP	LWIS

The primary insurance amount is the key legal construct used to determine the value of monthly benefit payments. For each person, PIA determines three categories of benefits: retirement benefits R, husband (wife) benefits C, and survivor benefits S. Then monthly benefits, BN, are

$$BN = R + C + S.$$

Each of the components of BN is a function of PIAP and PIAS as follows:

$$R = PIAP,$$

$$C = \max(.5\ PIAS - PIAP,\ 0)$$

$$S = \max(.825\ PIAS - PIAP,\ 0).$$

It follows that a person may have positive social security benefits (and wealth) even though he has never been a contributor to the system!

GSSP and GSSS are computed from the above formulae by discounting the amount of the annual benefit by the rate of interest and the actuarial probability of survival conditional on reaching the age of 65. While these mechanical manipulations of the PIAP and PIAS are straightforward, some subtle assumptions are required to calculate a value for PIA (PIA refers to both PIAP and PIAS). Three kinds of conceptual problems must be dealt with: (1) legal formulae for PIA, (2) the endogeneity of work effort, and (3) endogeneity of the retirement date. In addition, some empirical problems had to be solved in cases where (4) earnings records were truncated at ages less than 65, (5) the algorithm for estimating PIA was incomplete, or (6) earnings records were not obtained. We deal with problems (1)-(3), explain the algorithm for computing GSS, and return to (4)-(6) at the end of this section.

Legal formulae. The formulae relating the level of earnings on which FICA taxes were paid to the PIA were changed every two years or so during the 1950s and early 1960s. The revisions provided a technique for raising benefits of those who were already retired and adjusting the benefits for newly retiring persons. These adjustments offset inflation, which had the effect of reducing the proportion of earnings that were covered from the peak of 96.9% in 1937 to a low point of 63.9% in 1965. The many changes raise the questions of what benefits covered workers might anticipate. We choose the 1964 law as the basis for computing PIA. This level overstates the wealth of many in the cohort who retired in years as early as 1955, and whose initial PIA may have been lower. Nonetheless, the political climate was such that most covered workers could expect regular adjustment of benefits due to recurring legislation on Social Security, and for that reason an estimate that incorporates some indexing for inflation is in order. The principal advantage to using the 1964 law is that actual PIA (APIA) were available for some of the members of the cohort in that year.

Work effort. Anticipation of a retirement benefit has been theorized to have two effects on work effort during a year of working life, which may operate in opposite directions. The income effect of a LWI > 0 would operate to reduce work effort if leisure is a normal good. Reduced net wages due to the FICA tax should also reduce work effort. Opposite to these textbook effects we have the effect of increased earnings on the level of PIA and, more importantly, on eligibility for benefits (Gordon and Blinder, 1980). For most of the men in the cohort under study the latter effect is likely to dominate. Each additional year of earnings could produce a substantial increase in the PIA, because a year of zero earnings could be cast out of the average earnings computation, and relatively few years of earnings were required to be entered in that computation (only years since 1950). We have not attempted to purge the reported earnings record of induced (or reduced) earnings from these causes. Any computation would depend on secure knowledge of the net wage elasticity of labor supply (see Atkinson and Stiglitz, 1980) and on knowledge of the income elasticity of leisure. Moreover, the computation would also depend on the individual's ability to form expectations about GSS and LWI, which are in doubt because of the initially limited, and subsequently growing, coverage that was alluded to earlier.

Retirement age. In addition to effects on the intensity of work effort, the Social Security System may affect the length of working life. In particular, age at retirement may be altered. Gordon and Blinder (1980) and Burkhauser (1979) reach diammetrically opposite conclusions on the value of deferring retirement beyond the age at which one first becomes eligible for social security benefits. The disagreement need not concern us; what is important is that age retirement is endogenous and any earnings after the date of entitlement to benefits reflects a choice that the expected income associated with continuing work effort is superior to the benefits foregone. The easiest way to eliminate such endogeneity in the computation of PIA is to calculate the value of PIA on the date of entitlement. The value of the PIA on that date is exogenous to choices about the length of work effort. This value is referred to as PIA1.

Calculating PIA. These conceptual underpinnings provide the framework for the calculation of PIA. Earnings reported to the Social Security Administration after 1950 and up to the year in which the person becomes 65 were averaged, omitting up to five years, providing that a sufficient number of quarters of coverage had been earned. The resulting Average Monthly Earnings (AME) were inserted to the formula for PIA set in the Social Security Act as amended in 1964.[16]

To validate the averaging procedure from which PIA1 was calculated we extended the averaging computation to years after the date of entitlement and selected the resulting maximum average monthly earnings. When this number was inserted into the formula for PIA we obtained PIA2, a value that reflects the enhanced benefits available to those who deferred retirement. PIA3 was determined from the AME in the year in which the person died if he died before reaching the date of entitlement. The actual PIA (APIA) was then regressed on max(PIA2, PIA3) to determine whether the single averaging procedure encompassed in our algorithm adequately simulates the results of a large number of computational procedures actually available in the Social Security Act for persons in different circumstances. The algorithm explained 88% of the variance for the men in the cohort and 85% for their spouses, in those cases where APIA was known and PIA2 or PIA3 were calculable:

$$\begin{array}{llll} \text{Person} & \underset{}{\text{APIAP}} = \underset{(13.0)}{20.87} + \underset{(52.3)}{.8389}\ \max(\text{PIA2, PIA3}) & \bar{R}^2 = .877 & N = 368 \\ \text{Spouse} & \text{APIAS} = \underset{(1.33)}{7.042} + \underset{(14.6)}{.9312}\ \max(\text{PIA2, PIA3}) & \bar{R}^2 = .854 & N = 36 \end{array} \quad (15)$$

(t-ratios are shown in parentheses)

These regressions make clear that PIA2 is somewhat biased, particularly for those men with APIA close to the minimum. We suspect that this deficiency is largely due to the "disability freeze" provisions of the Social Security Act. Under this procedure a person who has been determined to be sufficiently disabled to qualify for disability insurance prior to age 65 may ask that the years during which the disability is in effect may be stricken from the earnings record, for the purposes of calculating AME.[17] We elected not to purse this correction, and simply adjusted the output of our algorithm to eliminate the bias. The value of PIA used to compute GSS was therefore calculated from the regressions in equation 15. We call this value EPIA.

Truncation of earnings records. A significant data problem is implied by these computations. We attempt to calculate a proxy for expected social security wealth at retirement. Persons who die before they reach the date of entitlement leave a record of earnings that is truncated as compared to any expectations that extended to the date of entitlement. In these instances we computed the value of AME at the time of death and used that value to calculate a PIA3. This value was also corrected for bias using equation 15.[18]

A similar problem arises for women who are born after 1899. Their date of entitlement is after 1963, the last year for which we have earnings data. For these women PIA is estimated on the basis of all the data available and no attempt is made to extrapolate for additional years of earning.

Incomplete algorithm. Some persons were entitled to benefits on the basis of law prior to 1951 or a transitional benefit effective in the early 1950s. The ER available includes too little information to calculate benefits for either of these cases with precision. In fact, the algorithm for computing PIA is predicted on contributions under FICA being reported for a minimum number of quarters required to achieve eligibility after 1950. A number of persons are eligible for benefits without meeting this requirement for calculating AME. Fifty-seven men and 5 women reported an APIA on the benefit record, but did not have PIA computed by the algorithm. In these cases APIA was directly substituted for EPIA. This procedure avoids losing cases earning their eligiblity for benefits by little-used provisions of the Social Security law. It is not wholly satisfactory as APIA is endogenous to leisure choice, as was explained earlier.[19]

No earnings record. The last data problem which had to be resolved was the absence of earnings records for the person or his spouse. Two alternatives were available: Such cases could be ignored, or a value of PIA = 0 could be assigned. Neither alternative is without problems. Sample censoring would be the result of excluding cases from the analysis. Including cases results in measurement error in those cases in which the absence of an earnings record reflects a failure in the linkage of social security data to the sampled persons. To allow for this latter effect, a dummy variable (X) was defined to indicate the lack of earnings records. For men, 89.7% of those with probate data also had ER. For the spouses of those men, a much higher proportion had no ER. However, in the case of a non-working wife, this situation was to be expected as many wives in this cohort did no work at any point in their lifetime, and taxpayer indentification numbers were not common in 1962 and 1963, when the ERs were obtained. Hence a less inclusive measure of failure in the linkage was used for the spouse. Only women with a social security number and no reported FICA earnings were assigned a dummy variable (Y) to indicate linkage problems. Of all men, 88.7% had spouses with no known social security number (and no ER) or reported earnings on the spouse's ER.

Inclusion of the dummies X and Y in our regression models allows the estimation of the model using all probate information and at the same time permitting a distinction between persons with no eligiblity for social security benefits (and EPIA ≡ 0) and those for whom the lack of benefits is imputed from the absence of ER data.

Computation of GSSP. Pulling the elements of the foregoing discussion together, the reader can see how GSSP is determined. Using calculated or imputed values of EPIAP and EPIAS, the values of R, C, and S can be obtained. BN is their sum. Twelve times BN is an annual benefit which can be actuarially discounted and added to the benefit for each year of survival. The sum of these actuarially discounted amounts is GSSP. Subtracting the amount of FICA taxes paid, including interest to age 65, gives LWIP.

Computation of LWIP and GSSP does not, however, imply that the corresponding values for LWIS and GSSS should be ignored. Wealth available to the spouse and concomitant changes in her lifetime resources may induce a substitution effect in the husband's behavior. Social security variables for the spouse have been introduced into the subsequent analysis to investigate the extent of such substitution effects.

THE CONTROL VARIABLES

The dependent variable in our model is net estate at death, plus the face value of life insurance, plus the value of any gifts made by the decedent before death that appear in the probate or state inheritance tax records. Inter vivos transfers were accumulated and added to net estate and insurance using a real rate of return of 1% per annum. The dependent variable reasonably measures lifetime saving (see Blinder, 1974). Since the population studied is male individuals, not households, our dependent variable does not fully capture the intergenerational transfers relevant to the Barro hypothesis. Bequests of women must also be considered. A more precise dependent variable is the sum of the net estates of husband and wife (in the case of ever-married people) less the interspousal transfer. We should not concede too much on this score, however, since the dependent variable considered here includes both intergenerational transfers and interspousal transfers. A part of the latter is intergenerational because the spouse acts as a conduit and guardian for child beneficiaries.[20]

Since members of the Wisconsin (1890-1899) male cohort under study died in different years, we denominate all dollar values in 1967 dollars using the Consumer Price Index (CPI). Further, we discount all bequests (with a 1% rate) to their value at a fixed point in each individual's life—age 65. We have done this because equal estates constitute different economic magnitudes in the case of individuals born the same year and dying at different ages. The estate of the cohort member dying first is worth more, since it can grow to exceed the value of the second estate if the real interest exceeds zero.

Our data contain 720 male decedents in the 1890-1899 cohort, 531 of whom (about 74%) held estates at or above the filing requirement according to Wisconsin probate inheritance records. The remaining 26%, we deduce, were "too poor to file."[21] We used the method proposed by Heckman (1976) to correct for sample selection bias in the estimating equations. If we assign zero estate values to the nonfilers, the mean estate (in 1967 dollars) is about $17,960 and the standard deviation is about $34,120. Among the 531 filers the mean and standard deviations are $24,350 and $39,730 respectively.

Although the model requires that we use the sum of lifetime earnings and inheritance received, only earnings information is available in our data.[22] We have individual earnings data for an extended period (up to 18 years with an average of about 14 years) from Wisconsin income tax returns for the period 1947 to 1964. Income reported on the tax return was dichotomized into returns from property income and earned income. The former includes rent, interest, dividends, and capital gains; earned income includes wage and salary and self-employment income. Earned income was cumulated during the period for which returns were available, compounded by the appropriate discount factor and deflated by the CPI (base 1967 = 100). To convert this sum into a number that was comparable for individuals who filed tax returns for different numbers of years, the sum was divided by the number of years filed. Thus, earned income is given by the equation

$$E_i = \frac{1}{N_i} \sum_{t=F_i}^{L_i} \frac{[E_i(t)(1+r)^{(BYR_i + 65 - t)}]}{CPI(t)},$$

where F_i is the first year in which tax returns were filed, L_i is the last, N_i is the total number of tax returns for the i^{th} individual; $E_i(t)$ is the amount of earned income reported for the t^{th} year; and BYR_i is the birth year of the i^{th} person.

The model displayed in Figure 1b shows a kink. Since we did not know a priori at what level of earnings the kink occurs, we employed a linear spline with one node at the 80th percentile.[23]

Consequently earnings assume the form:

$$\begin{aligned} E_{12} &= E_i && \text{if } E_i < E_{80} \\ &= E_{80} && E_i \geq E_{80} \\ E_3 &= 0 && \text{if } E_i \leq E_{80} \\ &= E_i - E_{80} && E_i \geq E_{80} \end{aligned}$$

where E_{80} is the earnings level at the 80th percentile (approximately \$5,665 in the period studied).[24]

Since those who are self-employed may leave a larger estate than others with the same measured earnings, due to tax avoidance or a greater desire to save, the existence of self-employment income is taken into account in this model. For those who report any self-employment income, D_S is unity, and zero otherwise. The variable Z represents the relative share of self-employment income in the individual's aggregate of earnings and self-employment income.

Z is constrained to be both positive when earnings (which include self-employment income) are negative, and to be in the unit interval.

$$Z = \frac{S_i^{\,2}}{(E_i - S_i)^2 + S_i^{\,2}}$$

with S_i self-employment income of the i^{th} individual.

Sample Censoring

Reports on probated wealth were not available for all the decedents identified. For such persons "data on bequests" are missing. The independent variables are, however, observed, and the statutes governing the probating of estates give us upper bounds to the level of the gross estate of the decedent. This implies that the method proposed by Heckman (1976) can be used to estimate unbiased values for the coefficients of our model.

The procedure is as follows. Let H be gross estate. Therefore,

$$H \equiv B + L$$

where L is the liabilities of the decedent. The Wisconsin statutes provide that estates must be probated if

$$H \geq 3000/CPI(\tau^*) \qquad \text{for persons dying before May 1973, and}$$
$$H > 10{,}000/CPI(\tau^*) \qquad \text{for persons dying after April 1973.} \qquad (16)$$

τ^* is the date of death. Let $g[CPI(t)]$ represent the right-hand side of (16). Then it is clear that

$$\Pr\text{ (Probate record)} = \Pr(H-g[CPI(t^*)] > 0). \tag{17}$$

Assuming that the expression in (17) can be modeled by a normal distribution, we can estimate a multiple variable probit equation using the explanatory variables appearing in our model to give values of the expected probability for filing a probate record for every sample member. Heckman has shown that if the stochastic error term in the probit equation ε_2 is bivariate normally distributed with the error in the bequest equation, ε_1, then adding the variable

$$\gamma = \frac{f(s)}{1-F(s)}$$

to the model gives unbiased estimates of the parameters $\{A_j\}$. $-s$ is the standardized value of the product of the independent variables and their coefficients estimated for each observation from the probit (17); $f(s)$ and $F(s)$ are the standard normal density and the normal distributions respectively.

RESULTS

In Table 1 we have presented three models of the bequest function that do not take into account the effects of social security. As theorized, there is a sharp difference in the profile of bequests with respect to earnings at the two earnings intervals. The slope of the function, which can be considered the "marginal propensity to bequeath," out of average earnings is about six times higher in the top 20 percentiles of the earnings distribution than in the bottom 80 percentiles. The direction of the effect of self-employment on bequests depends on the

Table 1

Regression Models of Bequests of Wisconsin
Males Born 1890-1899
(Bequests discounted to age 65, monetary values in
1967 dollars, t-ratios in parentheses)

N = 531

Variable[a] (Mean Values)	Regression Model 1	2	3
E_{12} (\$3790)	1.460 (1.637)	1.433 (1.595)	1.547 (1.721)
E_3 (\$751)	8.812 (17.172)	8.807 (17.136)	8.823 (17.185)
Z (.278)	15,590 (3.516)	15,542 (3.500)	15,636 (3.525)
D_S (.463)	-1,470 (0.394)	-1,453 (0.390)	-1,786 (0.479)
F(AGE) (16.3)	--	86.46 (0.264)	--
AGE1 (63.3)	--	--	880.6 (1.170)
AGE2 (7.82)	--	--	101.6 (0.389)
λ (.222)	-1,734 (0.492)	-1,621 (0.456)	-2,455 (0.687)
Constant	8,927 (2.050)	7,608 (1.148)	-47,684 (1.018)
R^2	.420	.419	.421

Source: Tax records, 1947-1964, and probate data for persons who died between 1947 and 1978.

[a]See text for definitions of variables.

relative share of earnings due to self-employment. Based upon Model 1, values of Z above .095 increase bequests. In Model 2, the coefficient of F(AGE) is positive (supporting the inverse V priors on the age-wealth profile) but not statistically significant. The magnitude of the coefficient, 86.45, yields a profile that is very flat, with wealth accumulating and decumulating, before and after age 65, at rates of less than 100 dollars per year.

In Model 3, the age-wealth profile estimated by a linear spline does not support the predictions of the life-cycle model. Wealth rises by $880 per year up to age 65 and continues to rise, albeit at a lower rate, by $101 per year after age 65. The coefficients, however, are not statistically different from zero at conventional levels of significance. (In a more extensive study of Model 3, including other birth cohorts, these age spline effects are confirmed at significant levels, which warrants use of this functional form in this study. Note that since we use discounted bequests, the undiscounted age-wealth profile we would observe for an individual would be even steeper.)

The results of the social security wealth computation need to be reported next, before studying the impact of social security wealth on bequest behavior. Looking at the entire cohort, average social security wealth can be estimated as an amalgam of those with no eligibility and no benefits and those with real benefits. This is done in row 1.A of Table 2. The $17,000 of gross SSW accruing to our cohort is substantially smaller than the $34,000 reported by Blinder, Gordon and Wise (1981). They are studying a younger cohort and compute PIAs in 1971, according to a more generous legal formula. However, one is inclined to regard their esti-

Table 2

Mean Social Security Wealth

(sample size in parentheses)

		Legally accruing to	
1.	Expected gross social security wealth	Self	Spouse[a]
A.	All men born 1890-1899	10,450	6,755
		(722)	(722)
B.	Persons with positive benefits	13,210	9,852
		(571)	(495)
C.	Persons with probated estates	10,570	6,950
		(531)	(531)
2.	Taxes paid[b]		
A.	All men born 1890-99	1,691	221
		(722)	(722)
B'.	Persons with some tax	1,926	761
		(634)	(210)
C.	Persons with probated estates	1,743	200
		(531)	(531)
3.	Lifetime wealth increment		
A.	All men born 1890-1899	8,759	6,534
		(722)	(722)
C.	Men with probated estates	8,830	6,750
		(531)	(531)
4.	Actual 1964 Primary Insurance Amount (APIA) used to estimate gross Social Security wealth		
D.	Men whose PIA is known, and whose spouse PIA is known or zero by virtue of no known Social Security record	12,911	9,048
		(218)	(218)

Source: See text.

[a]If decedent had no spouse, this amount will be zero.

[b]The sum of employer and employee payroll taxes paid including interest compounded to age 65.

mate as an upper bound, because of their use of an assumed full-time work year in estimating annual contributions.

Row 1.B of Table 2 shows that 6/7 of men are determined eligible for some gross benefit, while 5/7 of their spouses are qualified. The average benefit is, of course, proportionately higher than that in row 1.A. Persons with probated estates show average benefits remarkably similar to the sample as a whole, as shown in Row 1.C. This suggests that the censoring of the sample is not particularly selective of persons with unusual GSS.

The wealth estimated is offset by taxes paid. The second panel of Table 2 reports average FICA taxes for groups A and C. Group B' differs from group B: some persons who paid no tax have GSS > 0 and some persons who paid taxes have no eligibility and GSS = 0. Comparison of those with positive taxes and positive benefits is not possible. The LWI can be computed for groups A and C by subtraction. The result is shown in the third panel of Table 2.

The final panel in the table may be compared with the first, to gain a better understanding of the combined effects of calculating PIA from ER and eliminating the truncation of the sample for persons where APIA were unavailable. In row D, GSS is calculated for persons whose APIAP is known and whose wife's APIAS is also known (or who is known not to have a spouse with income). Clearly the gross wealth of this subgroup is higher than for the sample as a whole. Both extended work life, beyond the date of entitlement, and a selection towards the younger members of the cohort whose wives have had careers are responsible for the difference. The difference indicates that it is not a matter of indifference as to how social security wealth is measured, and that inferences from partial samples can be misleading.

In Table 3 we present a set of simple models using the social security wealth data. Suppose for the moment we completely disregard the Feldstein-Munnell wealth replacement hypothesis. In Model 4 we address the question, What is the effect of the lifetime wealth increment of social security (looking only at the husband's, not the wife's, benefits) on bequests? The coefficient of LWIP implies that bequests rise, but only for about 6 cents for each dollar transferred. Although bequests are only one possible type of intergenerational transfer, this response, which is not statistically significant, is far less than that envisaged by Barro since so small a part of the transfer is bequeathed.

Pursuing the opposite polar extreme, let us for the moment assume that bequests do not at all respond to LWIs. In Model 5 we only allow for the wealth replacement effect of gross social security benefits of the male (GSSP) to be measured. Contrary to expectations, the coefficient is positive (though statistically insignificant) implying that a one dollar increase in benefits augments bequests by 13 cents. Note that inclusion of the social security variables does not change the shape of the splined earnings bequest relationship. In Models 6 and 7 we incorporate measures of the wealth increment and gross social security wealth of the spouse category into the equation. Among the 60 cases with no reported contributions by the spouse in the system (Y = 1), the data indicate greater bequests by the male. Looking only at marginal effects, we see that one dollar of LWIP and LWIS increase bequests by the male by 4.9 cents and 10.4 cents respectively. In Model 7 we see, contrary to

Table 3

Regression Models of Bequests of Wisconsin Males Born 1890–1899, Including Lifetime Wealth Increment and Gross Social Security Wealth Data
(Bequests discounted to age 65, monetary values in 1967 dollars, t-ratios in parentheses)

N = 531

	Model			
Variable	4	5	6	7
E_{12}	1.415 (1.548)	1.346 (1.456)	1.275 (1.395)	1.206 (1.304)
E_3	8.820 (17.092)	8.823 (17.103)	8.671 (16.705)	8.673 (16.715)
Z	15629 (3.517)	15765 (3.541)	16428 (3.687)	16.547 (3.709)
D_S	-1507 (0.404)	-1498 (0.402)	-1453 (0.390)	-1453 (0.390)
X	131.1 (0.027)	905 (0.181)	655 (0.135)	1406 (0.282)
LWIP	0.0649 (0.247)	--	0.049 (0.158)	--
Y	--	--	9275 (2.182)	9364 (2.203)
LWIS	--	--	0.105 (0.337)	--
GSSP	--	0.131 (0.531)	--	0.135 (0.468)
GSSS	--	--	--	0.066 (0.228)

Table 3 (continued)

	Model			
Variable	4	5	6	7
λ	-1761 (0.498)	-1780 (0.504)	-1586 (0.420)	-1765 (0.469)
Constant	8518 (1.723)	7848 (1.567)	7205 (1.427)	6635 (1.302)
$\bar{R}^2$	.481	.418	.421	.422

theory, positive effects of gross benefits, both husband's and wife's benefits, on the terminal wealth of the male.

In Table 4 we present models conforming to the structure of equation 14. Recall there are three effects of social security in this specification. According to the theory, gross social security wealth should reduce the level of bequests and interact with age to reduce in absolute value the slope of the age-wealth profile. Lifetime wealth increments should increase bequests for those planning bequests (which we hypothesize to be those in the top quintile). The variable LWIP × D_3 is the product of the male's lifetime wealth increment and a dummy variable, equal to unity for those in the top earnings quintile and zero for all others. Although the models have been estimated both with the linear age spline and F(AGE), we will concentrate discussion on age spline (Model 9) since this specification is both more general and appears to fit the data better. In both Models 9 and 10 the only coefficients among the social security variables approaching statistical significance are the coefficients of LWIP × D_3, and they have the "wrong" sign. Keeping the imprecision of these estimates in mind, however, we will discuss our findings. The results presented in Model 9 indicate that gross benefits reduce the slope in both segments of the age-wealth profile.

As values of GSSP approach the sample mean, the profile becomes approximately flat, with no sharp decumulation after age 64. (In fact, with the mean value of GSSP, the age-wealth profile increases after age 64.)

What is the marginal effect of the male's gross social security wealth on bequests? The answer, of course, is that it depends upon the age of the subject. The partial derivative in Model 9 of bequests with respect

Table 4

Regression Models of Bequests of Wisconsin Males Born 1890-1899,
With Interactions of Social Security and Other Variables
(Bequests discounted to age 65, monetary values in
1967 dollars, t-ratios in parentheses)
N=531

	Model		
Variable (mean)	8	9	10
E_{12}	1.967 (1.987)	2.474 (2.444)	1.538 (1.599)
E_3[a]	9.097 (16.961)	9.076 (16.953)	8.606[a] (16.818)
Z	16894 (3.760)	16848 (3.757)	15193 (3.396)
D_S	-2057 (0.548)	-2285 (0.610)	-1281 (0.341)
X (.107)	1968 (0.391)	2218 (0.442)	713 (0.142)
F(AGE)	-166 (0.264)	-	-
AGE1	-	935 (0.869)	916 (0.847)
AGE2	-	651 (1.257)	575 (1.104)
F(AGE)*GSSP ($171,310)	.0247 (0.479)	-	-
AGE1*GSSP ($673,910)	-	-.0994 (0.632)	-.0831 (0.526)
AGE2*GSSP ($91,242)	-	-.0474 (1.136)	-.0415 (0.989)

Table 4 (continued)

	Model		
Variable (mean)	8	9	10
GSSP ($10,572)	−.0841 (0.0950)	6.862 (0.694)	5.513 (0.554)
LWIP*D3 (2234)	−.642 (1.937)	−.682 (2.057)	−
λ	−1739 (0.487)	−2213 (0.617)	−1915 (0.530)
Constant	7293 (0.646)	−59218 (0.898)	52820 (0.796)
$\bar{R}^2$	.4196	.4223	.4147

[a]E_3* is the regressor in Model 10. The mean is $815.3.

to GSSP is 6.862 - .0994 AGE1 - .0474 AGE2. For subjects dying before they reach 74.5 years of age, the marginal effect of GSSP is to increase bequests, and to decrease them for those dying after that age. Using the mean age at death--71 years--we find that a marginal dollar of GSSP increases bequests by 16.8 cents.

The response to the lifetime wealth increment appears to be opposite to that which was hypothesized by Barro. Those in the top quintile reduce bequests in response to an increase in LWI and do not increase them. Perhaps the best way to present the findings is to ask what net response results from an unfunded increase in benefits, i.e., a one dollar increase in both GSSP and LWIP. At age 65 the subject would bequeath 22.9 cents less if he were in the upper quintile of earnings and 45.3 cents more if he were in the lower 80th percentile. If he died at the mean age in this sample he would bequeath an additional 16.8 cents if he were in the lower 80th percentile and reduce bequests by 51.4 cents if he were in the top 20th percentile.

The next question to ask is what effect the social security system, taken as a whole, exerts on average bequests. In order to answer this question, we compare actual mean bequests B with the level of bequests B* that prevails in the absence of gross benefits and a reduction of taxes to zero. B* is estimated from model 9 and

$$B - B^* = -[\beta_1(\overline{AGE1*GSSP}) + \beta_2(\overline{AGE2*GSSP}) + \beta_3(\overline{GSSP}) + \beta_4(\overline{LWIP \times D_3}) + \beta_5(\overline{X})].$$

The betas are the estimated coefficients and the independent variables are valued at the sample mean. Since we assume the payroll tax is fully shifted on to wages, we need not change earnings in the simulation. We calculate that B - B* is equal to \$50, hence the net effect of the imposition of social security has increased average bequests by \$50.

In Model 10 we constrain the effect of LWIP to the marginal effect of increased lifetime earnings. This is done by adding to E_3 an annual flow that is equivalent to LWI, $E3^* \equiv E_3 + \frac{LWI}{35}$. In the specification of Model 10 we are searching for the response to gross social security benefits under the assumption that bequests are a normal good and that no Barro effects are operative. None of the social security variables are statistically significant in the constrained model. GSSP does not significantly alter the age-wealth profile or the level of bequests. Taken at face value, the marginal effect of a one dollar increase in benefits is to reduce bequests by 9½ cents for a male who dies at the mean age. Once again, however, the marginal effect of social security on bequests depends on the age at death. For people dying before age 68.5, gross social security benefits increase bequests, but they reduce them for those dying after that age.

Since economic theory seldom implies a particular functional form (except in the vacuous case when an arbitrary utility function is chosen), we also present the constrained model in logarithmic form. The dependent variable in Models 11 and 12 (Table 5) is the log of discounted bequests. We regress this on the log of earnings, retaining the spline formulation as required by our theory. The other independent variables are entered in linear form. Note that the coefficient of the age

Table 5

Regression Models of Bequests of Wisconsin Males Born 1890-1900, Constraining the Effect of the Lifetime Wealth Increment-Logarithmic Form
(t-ratios in parentheses)

Variable (Mean Values)	Model 11	Model 12
$\ln E_{12}$ (7.960)	0.00699 (0.135)	0.0199 (0.355)
$\ln(\frac{E^*}{E_{12}})$ (0.914)	1.660 (6.483)	1.608 (6.280)
Z	0.556 (2.731)	0.592 (2.900)
D_S	-0.0389 (0.225)	-.0186 (0.107)
AGE1	.0112 (0.320)	-.0212 (0.424)
AGE2	.0286 (2.357)	.0602 (2.500)
AGE1*GSSP	-	$-.488 \times 10^{-6}$ (0.0670)
AGE2*GSSP	-	$-.300 \times 10^{-5}$ (1.545)
GSSP	-	$.758 \times 10^{-4}$ (0.165)
X	-	.427 (1.790)
λ	-0.925 (5.580)	-.883 (5.311)

Table 5 (continued)

Variable (Mean Values)	Model 11	Model 12
Constant	8.250 (3.747)	9.689 (3.138)
$\bar{R}^2$	.1571	.1624

Note: Dependent variable is log of discounted bequests, mean is 9.3241.

variable is the annual rate of growth (or decumulation) of discounted bequests. Since a one percent discount rate is used, the age-wealth slope that would be observed for the representative consumer should be steeper by exactly .01. Hence the coefficients of AGE1 and AGE2 in Model 11 imply that discounted bequests rise by annual rates of .0112 and .0286, and undiscounted wealth increases at rates of .0212 and .0386 respectively. What is particularly noteworthy is that wealth significantly increases, not decreases, with age after 65, a finding that is at odds with the positive prediction of the life-cycle hypothesis of saving. Model 11 reveals that bequests are quite inelastic with respect to earnings for the lower 80 percentiles and elastic (and estimated quite precisely) for the top 20 percentiles of the earnings distribution among the cohort. This finding is at odds with proportionality hypothesis embedded in the life-cycle model.

In Model 12 we introduce the effects of the husband's gross social security wealth on accumulation and bequests. The three coefficients (of GSSP, AGE1*GSSP, and AGE2*GSSP) fail to attain statistical significance. Taking the coefficients at face value, we find the effect on bequests of a one dollar increase in gross benefits, all other variables held constant, depends on age at death. At age 71, bequests increase by 27 cents; at age 65 bequests are higher by 47 cents. After age 79, a one dollar increase in GSSP reduces bequests. This pattern arises because gross benefits both shift up the level of bequests and reduce the slope of the age-wealth profile, with the effects offsetting each other at age 79. After age 64, discounted bequests rise with age at a rate of about 6% per year for the man with zero gross benefits and at about 3% per year for the man with mean benefits.

CONCLUSIONS

This study of a cohort of males in an early generation of recipients of social security benefits fails to reveal a significant response to sizable gross benefits and lifetime wealth increments. One cannot distinguish between the bequeathing behavior of beneficiaries of the social insurance system and the behavior of persons who were ineligible. One cannot distinguish a response of those who contributed heavily to their old age benefits from those who did not.

This absence of response does not <u>in itself</u> disprove the hypothesized effects of social security on life-cycle savings. Other cohorts may exhibit substantially different behavior. Nonetheless, one would expect to find evidence of the microeconomic behavior imputed to individuals in the controversy over social security and its impact on saving among the men in this particular cohort. They were the beneficiaries of large social insurance benefits to which they contributed little in their working lifetimes. They also lived at a time when more than one out of twenty men and the vast majority of women had no eligibility, so that one would expect to see differences in bequests of the eligible and the ineligible.

Furthermore, this body of data is without a doubt the richest source of information from which a Barro effect might be estimated. LWI is large. The algorithm for GSS has been validated against actual PIA. And the use of administrative records avoids bias found in direct survey methods for evaluating assets. Finally, this cohort retired before the value of private pension wealth assumed a role comparable to social insurance--for younger cohorts, private pension wealth becomes increasingly important.[25]

Our findings pertaining to the age-wealth profile at the end of the life-cycle are of independent importance. As a positive theory of accumulation and decumulation, the life-cycle hypothesis appears inconsistent with the evidence presented. One might argue that the value of one component of wealth, gross social security wealth, must fall with a person's age after 65 for the simple reasons that life expectancy diminishes with age. Though this mechanical relationship is certainly true, the relevant question is how people respond, in asset holdings they can control, to the presence of gross social security wealth. Our results indicate no significant effect of social security wealth on the age-wealth profile, a finding at odds with the life-cycle hypothesis. In other words, we find that social security does not depress or displace private saving and that people do not deplete their private assets in old age as is commonly assumed.

We recognize that these results are partial, for one cohort of males. The experience of their spouses needs to be similarly modelled, and the experience of younger cohorts with smaller LWI must also be incorporated. Despite the need for further confirmation of these results, we emphasize again that nothing in the theory concerning the impact of social security on saving hints that micro effects posited here would not be strong, and of predictable sign. We interpret our negative findings as a mandate to the profession to have second thoughts about the life-cycle hypothesis of saving.

NOTES

[1]Bequests may also come in human, as well as financial, form, e.g., augmenting the human capital of one's children.

[2]Turner's (1977) analysis of the aggregate data reveals that social security in fact increases saving, arguing that an increase in labor supply at younger ages is responsible for the increase.

[3]This last reason follows from the proposition that income instability directly influences precautionary saving.

[4]Feldstein and Pellechio (1979) use micro survey data in their analysis of the issue, but the construction of their social security wealth variable is based on imputation, using a very short period of earnings. Kotlikoff (1979) finds that the savings of the young have been reduced by social security, but also that "the savings of the old may have increased to offset the reduced savings of the young leaving zero net impact on aggregate savings" (p. 408).

[5]See, e.g., Ferber (1965), Ferber et al. (1969a), and Ferber et al. (1969b).

[6]See Mirer (1979) and the references cited therein. Menchik's (1979) and Menchik and David's (1980) findings support the notion that terminal wealth is at or near the lifetime peak. Darby (1979) also finds an increasing age-wealth profile. Van der Gaag and Smolensky (1981) find that the elderly save.

[7]Cowell (1979) discusses variants on this measure in situations in which capital markets do not permit free borrowing against anticipated earnings.

[8]There is in addition the econometric issue of whether cross-section data yields enough variation to estimate the effect of LWI on Bequests. We argue that this sample contains enough variation to estimate the theorized effect.

[9]In its broadest context, parental investments would be the sum of many forms of parental transfers, e.g., expenditures on education, health care, etc., as well as financial bequests.

[10]See, e.g., Blinder (1976), Drazen (1978) and Ishikawa (1974) for discussions of this portfolio choice model.

[11]Kotlikoff and Spivak (1981) present a scenario in which the family partially assumes the roles of an annuity market. Tomes (1981) develops a simple one-period model of bequests in a world without annuity markets.

[12]Note that it is the independent variation between lifetime resources and LWI that allows us to econometrically identify the effect of LWI on bequests.

[13]Subject to the final caveat that the intragenerational redistributive component of the Social Security System may alter bequeathing behavior in ambiguous ways.

[14]In the early years of disability insurance, eligibility for payments was administered in an extremely restrictive fashion. The discounting of retirement benefits, even at low rates of interest, for forty years also implies that for young people the value of payments to the wife and children of the few individuals who die early in their working lifetime dominates the value of social security wealth of persons in their twenties and thirties.

[15]Our analysis ignores the value of survivor's insurance paid to mothers and dependent children under eighteen, an appreciable portion of the social security wealth of persons who become eligible for such benefits within six quarters of entering the work force.

The use of benefits associated with retirement at a fixed age also avoids problems of endogenous choice or retirement age, which is simultaneously determined with the level of benefits.

[16]This procedure does not attempt to adjust covered earnings to a full-time work year, as was done by Blinder, Gordon, and Wise (1981). Their procedure may be criticized as overstating the level of AME since it makes no allowance for involuntary unemployment.

[17]A refinement of our averaging algorithm would be to simulate this casting out of years during a period of disability. Unfortunately disability status is known only for persons with active claims in 1964 and 1965. Any person who became disabled earlier (and died or recovered) could only be detected by a sequence of low or null earnings. Such a sequence could not be distinguished from sequences of low earnings for persons working in non-covered employments, or persons retiring early without disability pensions.

The upshot is that some improvement in the algorithm could be effected by adding data on disability; but some cases of disability could not be detected.

[18]An alternative would be to calculate an estimated earnings stream for the additional years to the data of entitlement and estimate a PIA from that longer earnings stream. While this procedure is more consistent with the conceptual structure for our model, it seemed a secondary refinement that could be omitted for initial studies of the cohort.

[19]APIA overstates PIA1; choice of retirement date will determine these actual values and contributes to a higher PIA when retirement is deferred.

[20]Suppose parents are concerned about the welfare of their genes, as the sociobiologists argue. One's mate is the person having the most genes in common with one's offspring (50%) and on that account can be expected to be the optimal "agent" in protecting the interests of one's progeny.

[21]Although the possibility exists that some of those 26% should have legally been filers, but weren't always.

[22]In a previous investigation of the bequest function (Menchik and David, 1979) we used proxies for inheritance to identify any bias in the earnings coefficients. We found no difference in our results.

[23]In earlier work (Menchik and David, 1979) we placed an additional node at the 50th percentile. We found no significant difference in slope between the first and second segments. Between the second and third segments, however, the slope increased dramatically, so we decided to place the single node of the spline at the 80th percentile of the cohort earnings distribution.

[24]The earnings includes the employer share of the FICA tax.

[25]Pension coverage would have been rare among members of this cohort (see President's Commission on Pension Policy, 1980).

REFERENCES

Atkinson, A. B., and J. E. Stiglitz. 1980. Lectures on Public Economics. New York: McGraw Hill. Lecture 2.

Barro, R. 1974. Are government bonds net wealth? Journal of Political Economy, 82, 1095-1117.

Barro, R. 1978. The impact of social security on private saving: Evidence from the U.S. time series. Washington, D.C.: American Enterprise Institute.

Becker, G., and Tomes, N. 1976. Child endowments and the quantity and quality of children. Journal of Political Economy, 84, (4), part 2, S143-S162.

Becker, G., and Tomes, N. 1979. A theory of the distribution of income and intergenerational mobility. Journal of Political Economy, 87, 1153-1189.

Blinder, A. 1974. Toward an economic theory of income distribution. Cambridge, Mass.: MIT Press.

Blinder, A. 1976. Intergenerational transfers and life cycle consumption. Papers and Proceedings of the American Economic Association, 66 (2), 87-93.

Blinder, A. S., Gordon, R. H., and Wise, D. E. 1981. Social Security bequests, and the life cycle theory of saving: Cross sectional tests. Cambridge, Mass.: NBER. Working Paper no. 619.

Burkhauser, R. 1979. The pension acceptance decision of older workers. Journal of Human Resources, 14, 63-75.

Burkhauser, R. and Warlick, J. 1979. Disentangling the annuity from the welfare costs of Social Security. Discussion Paper #562-79. Institute for Research on Poverty, University of Wisconsin-Madison.

Cowell, F. 1979. The definition of lifetime income. Discussion Paper #566-79. Institute for Research on Poverty, University of Wisconsin-Madison.

Darby, M. 1979. The effects of social security on income and the capital stock. Washington, D.C.: American Enterprise Institute.

David, M., Gates, W., and Miller, R. 1974. Linkage and retrieval of microeconomic data. Lexington, Mass.: Lexington Books.

Drazen, A. 1978. Government debt, human capital, and bequests in a life-cycle model. Journal of Political Economy, 86, 505-516.

Esposito, L. 1978. Effect of social security on saving: Review of studies using U.S. time-series data. Social Security Bulletin, 41 (5), 9-17.

Feldstein, M. S. 1974. Social security, induced retirement, and aggregate capital accumulation. Journal of Political Economy, 82, 905-926.

Feldstein, M. S. 1979. Social Security and private savings: Another look. Social Security Bulletin, 42 (5), 36-39.

Feldstein, M. S. 1980. Social security induced retirement and aggregate capital accumulation: A correction and updating. Cambridge, Mass.: NBER. Working Paper no. 579.

Feldstein, M. S., and Pellechio, A. 1979. Social security and household wealth accumulation: New microeconomic evidence. Review of Economics and Statistics, 61, 361-368.

Ferber, R. 1965. The reliability of consumer surveys of financial holdings: Time deposits. Journal of the American Statistical Association, 60, 148-163.

Ferber, R., et al. 1969a. Validation of consumer financial characteristics: Common stock. Journal of the American Statistical Association, 64, 415-432.

Ferber, R., et al. 1969b. Validation of a national survey of consumer financial characteristics: Savings accounts. Review of Economics and Statistics, 51, 436-444.

Gordon, R. H., and Blinder, A. S. 1980. Market wages, reservation wages and retirement decisions. Journal of Public Economics, 14, 277-308.

Heckman, James. 1976. The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models. Annals of Economic and Social Measurement, 5, 475-492.

Ishikawa, T. 1974. Imperfection in the capital market and the institutional arrangement of inheritance. Review of Economic Studies, 41, 383-404.

Kotlikoff, L. 1979. Testing the theory of social security and life cycle accumulation. American Economic Review, 69, 396-410.

Kotlikoff, L., and Spivak, A. 1981. The family as an incomplete annuities market. Journal of Political Economy, 89, 372-391.

Kotlikoff, L., and Summers, L. 1981. Dividing capital accumulation into its life cycle and intergenerational transfer components. Journal of Political Economy, 89, 706-732.

Leimer, D., and Lesnoy, S. 1980. Social security and private saving: A reexamination of the time series evidence using alternative social security wealth variables. (Presented at the A.E.A. Meetings, September 6, 1980.) Social Security Administration, Office of Research and Statistics, Working Paper no. 19.

Marshall, A. 1949. _Principles of Economics_ (8th ed.). New York: Macmillan.

Menchik, P. 1979. Intergenerational transmission of inequality: An empirical study of wealth mobility. _Economica_, _46_, 349-362.

Menchik, P., and David, M. 1979. The effect of income distribution and redistribution on lifetime saving and bequests. Discussion Paper #582-79. Institute for Research on Poverty, University of Wisconsin-Madison.

Miller, M., and Upton, C. 1974. _Macroeconomics: A neoclassical introduction_. Homewood, Ill.: R. D. Irwin.

Mirer, T. 1979. The wealth-age relationship among the aged. _American Economic Review_, _69_, 435-443.

Modigliani, F. 1966. The life cycle hypothesis of saving, the demand for wealth, and the supply of capital. _Social Research_, _33_, 160-217.

Munnell, A. 1974. _The effect of social security on personal savings_. Cambridge, Mass.: Ballinger.

President's Commission on Pension Policy. 1980. An Interim Report--May 1980. Washington, D.C.: U.S. Government Printing Office.

Tobin, J. 1967. Life cycle saving and balanced growth. In _Ten economic essays in the tradition of Irving Fisher_, William Fellner, ed. New York: John Wiley.

Tomes, N. 1981. Uncertain lifetimes, imperfect capital markets and the altruistic motive for bequests. Oxford English Papers, forthcoming.

Turner, J. 1977. Social security, saving and labor supply. Paper presented at the Western Economic Association Meetings, June 1977.

Van der Gaag, J., and Smolensky, E. 1981. True household equivalence scales and characteristics of the poor in the United States. Forthcoming in Review of Income and Wealth.

White, B. 1978. Empirical test of the life cycle hypothesis. American Economic Review, 68, 547-560.

Yaari, M. 1964. On the consumer's lifetime allocation process. International Economic Review, 5, 304-317.