University of Wisconsin-Madison

Institute for Research on Poverty

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Paul L. Menchik
Martin David

THE EFFECT OF INCOME DISTRIBUTION AND REDISTRIBUTION ON LIFETIME SAVING AND BEQUESTS

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ABSTRACT

The unknown relationship between resources garnered during a lifetime and the amount transferred to others is quite important in inter- and intra-generational models, and its character has implications in several areas. Some of these areas are: the relationship between income distribution and aggregate consumption; the burden of alternative forms of taxation and their effects on saving; the distribution of income and wealth both in the current and in future generations; and the degree of intergenerational economic mobility exhibited in an economy.

Despite its importance, the relationship between lifetime resources and transfers has only recently been the subject of empirical investigation. However, the few studies that do exist have relied upon proxies for bequests, or proxies for lifetime earnings, or both. We have assembled a data base that provides actual bequests and actual income and earnings. Our data do not rely on prospective or retrospective questions about income or questions about the respondent's net worth at a point in time. Instead we use income tax and probate record data.

Earnings histories and probate records were matched for a sample of Wisconsin males. Regression analysis of over 1900 cases (including the 30% whose estates fell short of the probate filing requirement) yields the bequest-earnings profile predicted by the Marshallian model. At low earnings levels actual bequests are slightly positive and gently rising with earnings until the 80th percentile of the lifetime earnings distribution. At that

point bequests rise quite sharply with earnings. It is also found that the self-employed bequeath more than others and that net worth does not decline (in fact it appears to increase) with age.

This paper demonstrates that income redistribution from the top quintile to others will reduce conventional savings, but may augment human capital. Only the wealthiest 20% have a strong financial bequest motive; the remainder of the population make bequests only in the human form. It is calculated that a one dollar increase in lifetime earnings will increase the financial bequests of those in the top quintile by twenty five cents, and by five cents or less for all others. This analysis suggests why wealth is so much more unequally distributed than annual or lifetime labor earnings; those who inherit wealth, for instance, also earn more than others. Finally, if the Marshallian model is correct, as it appears to be, it follows that a proportional lifetime consumption tax is not only inequitable but inefficient as well. Since parents derive satisfaction from their children's income, and bequests augment that income, the omission of bequests from the tax base distorts the lifetime allocation process in its favor.

The Effect of Income Distribution and Redistribution on Lifetime Saving and Bequests

1. STATEMENT OF THE PROBLEM

The unknown relationship between resources garnered during a lifetime and the amount transferred to others, quite important in inter- and intragenerational models, has implications for several areas, some being: the relationship between income distribution and aggregate consumption; the burden of alternative forms of taxation and their effects on saving; the distribution of income and wealth both in the current and in future generation; and the degree of intergenerational economic mobility exhibited in an economy.

The relationship between lifetime resources and transfers has only recently been the subject of empirical investigation. However, the few studies that do exist have relied upon proxies for bequests, or proxies for lifetime earnings, or both. We have assembled a data base that provides actual bequests and actual income and earnings. Our data do not rely on prospective or retrospective questions about income or questions about the respondent's net worth at a point in time. Instead, we use income tax and probate record data. Although tax evasion may bias these sources, the errors are small compared with known biases in the reporting of assets in conventional surveys.

Distributional Effects on Saving

Does aggregate consumption vary with the degree of income inequality in an economy? Do the average or marginal propensities to consume vary with income? While it was first thought that equalizing the income distribution would increase consumption, the models of Friedman, and Modigliani and Brumberg indicate no such distributional effect. Blinder (1975) recasts the debate into a lifetime perspective. In Blinder's model each consumer allocates his lifetime resources (the sum in present value units of labor earnings and transfers, gifts and inheritances received) between lifetime consumption expenditures and bequests.[1] Since bequests constitute the lifetime saving of the consumer, a critical question is how bequests vary with lifetime resources. If the elasticity of bequests with respect to resources is constant, an elasticity in excess of unity implies that the share of one's resources not spent, and consequently bequeathed, rises with lifetime resources. It follows that redistribution from the lifetime rich to the lifetime poor (holding constant all other attributes that might influence saving, e.g., age, sex, family size, etc.) will reduce saving in the economy. If bequests are elastic, there will tend to be a trade-off between equality and capital accumulation.[2]

It is sometimes asserted that this trade-off can be avoided due to certain feedback effects. If the capital stock is augmented and as a consequence its rate of return drops, an elasticity of substitution between capital and labor of less than unity implies that a diminished factor share will go to rentiers. It is therefore argued that income distribution will not become more unequal since the income of rentiers exceeds that of workers. This second round effect may not work as just hypothesized for two reasons. First, in an open economy like that of the United States, the domestic and international rates of return (properly adjusted for differential risk) should be equal. Consequently, the additional capital should migrate abroad instead of fetching a lower domestic return. Second, even if the rate of return falls at home, the income distribution need not be equalized. Say we have a model in which there are two kinds of labor, high skill and low skill. If high skill labor and capital are complements in production while low skill labor and capital are substitutes, augmenting the capital stock will increase the inequality of labor earnings.[3] If individuals with high property income are also high earners (as seems to be the case), increasing the capital stock may also increase the inequality of income, even in the presence of falling rates of return.

Are Bequests Quantitatively Important?

One might well accept Blinder's qualitative findings but question whether the magnitude of distributional effects are worth considering. Are bequests a significant determinant of total accumulation? According to recent research by Darby (1979) and work in progress by Kotlikoff and Summers, the answer is a resounding yes. Darby finds that life cycle savings, earnings saved and spent in a later period, explain only 13 to 29 percent of total accumulation; the remainder is bequest saving. Kotlikoff and Summers (1979) estimate only about 20 percent of accumulation to be life cycle as opposed to transfer wealth.[4]

The Burden of a Lifetime Consumption Tax

Economists have proposed the consumption tax as a replacement for the income tax. An annual tax on consumption, with a lifetime averaging scheme in which each year's tax is based on the average of present and past years, is tantamount to a lifetime consumption tax. If transfers (bequests) are an untaxed good, the relationship between lifetime resources and transfers is critical in determining the burden of the tax. If, for example, transfers were a luxury good having a resource elasticity in excess of unity, a proportional consumption tax would be regressive with respect to lifetime economic resources. In fact, without knowledge of the relationship between transfers and total resources, we cannot say a priori what the rate schedule would have to be to insure progressivity or even proportionality.[5]

Tax Effects on Saving

The nature of the relationships between bequest and lifetime resources has important implications for the effect of alternative tax structures on saving in the economy. If bequests are luxury goods, the income effects of progressive income taxation should reduce conventional saving. Price effects may also reduce saving.[6] Furthermore, if the marginal and average propensities to bequeath rise with lifetime resources, the taxation of capital or income from capital should also reduce saving. This is because the ownership of capital and its income increases disproportionately as we move up the lifetime income distribution. Consequently, even a proportional tax on capital or its yield would be progressive with respect to lifetime income and therefore reduce macrosaving.

The Distribution of Income and Wealth in Current and Future Generations

The relationship between lifetime saving and lifetime resources may help us to understand why the distribution of privately held wealth and property income is so much more unequal than lifetime earnings.[7] Suppose lifetime saving (terminal wealth) is generated by the following mechanism:

$$A_i = \gamma_o (E_i + I_i)^{\gamma_1} e^{\varepsilon_i} \qquad (1.1)$$

A_i is the material wealth at death of individual i. E_i and I_i are the present values of lifetime earnings and inheritance received, and is the elasticity of lifetime saving with respect to lifetime resources (the sum of E_i and I_i). If we take logs and variances, we can write,

$$\sigma^2_{LA} = \gamma_1^2 \sigma_{LY} + \sigma_{\varepsilon i}^2 \qquad (1.2)$$

The variance of the log of terminal wealth is equal to the squared savings elasticity multiplied by the variance of the log of lifetime resources, Y, plus the variance of the error term.[8] Hence, if $_1$ is elastic and large, say 2.5, the explained variance of the log of terminal wealth is 6.25 (2.5 squared) times the log variance of lifetime resources.

The distribution of income and wealth in future generations is also influenced by the bequest function. If wealthy parents leave a proportionately greater share of their resources to their children than poorer parents, and at the same time children of wealthy parents earn more than other children,[9] human and financial inheritance interact to produce more wealth inequality than either alone would generate. The disequalizing effect of nonproportional transfers is shown formally in the intergenerational model presented by Meade (1964) and discussed in detail in Chapter 8 of Atkinson and Harrison (1976).

Pryor (1973) simulates the distribution of income in a multi-generational context. He specifies an "intergenerational saving function" which relates bequests to lifetime resources. Two forms of the function are used: one function assumes that the elasticity of bequests with respect to resources is unity, and the other assumes that bequests are luxury goods, having an elasticity in excess of unity. His results show the second function will yield a substantially greater degree of income inequality than the first function.

Intergenerational Mobility

In addition to the study of factors that determine the size distribution of income and wealth, economists should also be interested in the degree of intergenerational mobility that is exhibited in an economy: the extent to which there is equal opportunity for children whose parents' lifetime resources are dissimilar. For any degree of inequality we can have either a relatively static society in which children always assume their parents' position, or a highly mobile society in which the positions of children are unrelated to those of their parents. In a recent paper, Menchik (1979) shows that the more resource elastic the bequest function is, the greater the degree of wealth and resource immobility there will be. Consequently, there may be a trade-off between increased saving and equal opportunity in the choice among tax and expenditure policies.

The Distinction Between Planned and Unplanned Bequests

In Blinder's (1975) characterization of the lifetime allocation problem, one's date of death is known with certainty. Each consumer has a lifetime budget constraint of

$$W = I_o e^{rt} + \int_o^T E(t) e^{r(T-t)} dt \qquad (1.3)$$

with r the rate of interest, T the length of life, I_o the inheritance or gift received and discounted back to the initial period, and E(t) the earnings stream over the life cycle. Each individual allocates W between a stream of lifetime consumption and bequests according to his utility function. However, it could be argued that since in the real world the date of death is a random variable not generally known in advance to the decedent, actual bequests may depart from planned or optimal bequests. For a death occurring at age s, actual bequests

$A_B{}^s$ are equal to planned bequests $P_B{}^s$ plus unplanned bequests (an error term) $U_B{}^s$, or

$$A_B{}^s = P_B{}^s + U_B{}^s. \qquad (1.4)$$

Planned bequests constitute the amount I would leave to my heirs if I knew the date of my death at the start of the planning period. If individuals are risk averse about running down their wealth too soon, the expected value of unplanned bequests would be positive, and actual bequests should exceed planned bequests. On the other hand, if people are free to buy and sell life insurance in Yaari perfect markets, the lifetime path of consumption under certainty will be the same as that under risk. Consequently, use of insurance and annuities will allow consumers to leave an estate similar in size to that which would be left if their age of death were known in advance.[10]

In any case, whether or not the distinction between planned and unplanned bequests is important depends upon the question that is being asked. For example, even if all bequests were unplanned, econometric estimates of a bequest-resources function would yield robust estimates for future forecasts as long as the world did not change in either of the following ways.[11] First, if members of future cohorts are better at predicting their longevity than past cohorts, they could economize on unplanned bequests and consume more of their resources themselves. Second, if financial institutions become better at predicting longevity as determined by personal characteristics, market failure due to adverse selection will be attenuated; unplanned bequests will fall as people increase their purchases of annuities.

For other issues, i.e., the welfare cost of inheritance taxation, the distinction between planned and unplanned bequests is quite important.[12] Bevan and Stiglitz (1978) state that "to the extent that inheritances are unplanned, the imposition of an inheritance tax will have no incentive effects (e.g., on work effort or risk taking) and such taxes are non-distortionary" (italics in original).

The distinction may also be important in the debate over the effect of social security on bequests. If bequests are largely unplanned, Barro's hypothesis of complete offset is less likely to be observed.[13]

We must conclude this section with an important caveat. Our analysis should indicate the distributional effects on saving and consequently the supply of conventional physical capital. Even if bequests are resource-elastic, it may be possible to redistribute income from rich to poor in ways that augment people's productive abilities, and hence, the rate of increase of total capital, both physical and human, need not be diminished. For example, if, as a consequence of income inequality, children born to low income parents are less likely to achieve their earnings potential than other children, income redistribution in cash or in kind may augment human capital, and offset the reduction in the growth of nonhuman capital.[14]

2. THEORETICAL MODELS THAT GENERATE BEQUESTS

> And, what has had a far greater effect on the growth of wealth, it has rendered it far easier to provide a secure income for his wife and children after his death: for, after all, family affection is the main motive for saving. . ."
>
> But were it not for the family affections, many who now work hard and save carefully would not exert themselves to do more than secure a comfortable annuity for their own lives; either by purchase from an insurance company, or by arranging to spend every year, after they had retired from work, part of their capital as well as all their income. In the one case they would leave nothing behind them: in the other only provision for that part of their hoped-for old age, from which they had been cut off by death. That men labour and save chiefly for the sake of their families and not for themselves, is shown by the fact that they seldom spend, after they have retired from work, more than the income that comes in from their savings, preferring to leave their stored up wealth intact for their families; while in this country alone twenty millions a year are saved in the form of insurance policies and are available only after the death of those who save them.
>
> 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.[15]

Although Alfred Marshall placed a heavy emphasis on the bequest motive of saving, recent writers have tended to ignore this potentially important factor, perhaps due to data limitations.

There are several classes of models that will generate bequests. We will discuss four models, and, for want of better designations, we will refer to these as: (1) the bequests as final consumption, (2) Marshallian, (3) interdependent welfare, and (4) wealth preference models.

Bequests as Consumption in the Final Period

In work done by Yaari, Blinder and others it is hypothesized that individuals derive utility from bequests per se, not from the lifetime income or utility of their heirs. Hence, bequests can be likened to (the anticipation of) consumption in the final period. Discounted lifetime utility for individuals dying at a certain age of s years can be written

$$U(s) = \int_0^s u[c(t)]e^{-\rho t} dt + V[B(s)] \qquad (2.1)$$

where c(t) is consumption at age t, B(s) is bequests at age s, and ρ is the subjective rate of time preference in consumption. Individuals are presumed to maximize their utility function subject to their lifetime resources constraint, with consumption and bequest demands a consequence of this process. Note that under this specification of the utility function a conventional lifetime consumption tax will tend to distort the consumption-bequest decision since bequests are an untaxed, yet utility-bearing, good.[16] A lifetime resources tax or a consumption tax in which bequests are defined as consumption would not create such distortionary tax-price incentives.

The model above does not predict how the share bequeathed varies with lifetime resources. In Blinder's (1975) isoelastic parameterization of the utility function, the share of resources bequeathed rises with resources if the marginal utility of consumption falls with consumption faster than the marginal utility of bequests falls with bequests. Of course, either condition is possible.

The Marshallian Model

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. This follows in the spirit of the Marshall quotation appearing above. Parents bequeath because they want to augment the resources available to their children. Their utility function can be written,

$$U_t = U_t(C_t, W_{t+1}), \tag{2.2}$$

with C_t the lifetime consumption of parents and W_{t+1} the lifetime resources of their children. W_{t+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.[17] Presumably this windfall component would be determined by luck and genetic endowment. The second and marginally relevant part is the value to the recipient of the investments themselves. This type of utility function has been used most recently by Becker and Tomes (1976, 1979) to analyze several issues, one being the quantity-quality of children decision. 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. Note that a conventional consumption tax will distort the consumption-bequest decision since utility-augmenting bequests are not taxed. Note also that if some forms of

Figure 1

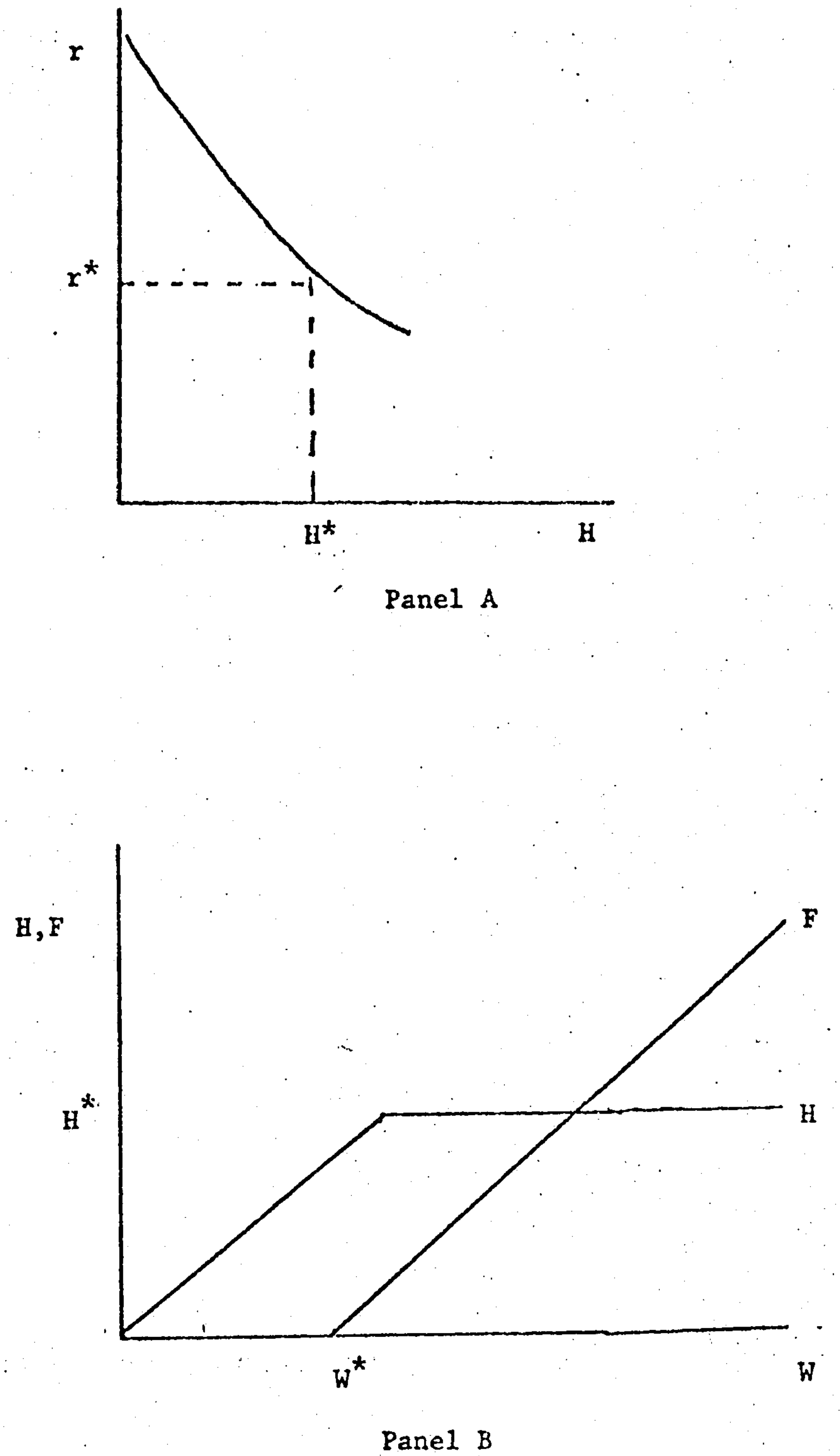

Figure 1: Marginal Efficiency of Human Capital Schedule

productive (income-increasing) transfers are taxed (i.e., expenditures on education, music lessons, food, etc.), while financial gifts and bequests are not, serious equity and efficiency problems may arise. Say, for example, parents rationally invest in activities that first yield the highest rates of return for children and, based on their preferences and resources, proceed to lower return investments. Suppose we can rank these investments in decreasing order of productivity as, say, food, clothing, health care, schooling, books, and financial bequests. If a consumption tax base includes all but the last item, we would be taxing the most efficient and not taxing the least efficient investments.

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.[18] Say human bequests (schooling, health care, etc.) initially provide a higher rate of return than the financial market yields. However, as the amount expended on each child increases, the marginal rate of return falls. When the rate of return on human equals the market return financial on assets, all subsequent investments will be in the form of financial bequests.

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 planned bequest function will appear as presented in panel B. Human bequests will rise with parental resources, W, until H^* and will then become flat. Beyond W^* , planned financial bequests become positive.

If individuals who have resources below W^* leave positive unplanned bequests, perhaps due to a precautionary demand to hold wealth, the ratio of actual bequests to lifetime resources may very well be U-shaped over the range of lifetime resources.

The Interdependent Welfare Model

In contrast to the preceding model, parental utility can be posited as a function of children's perceived welfare, not their resources. Though welfare can be a function of many things, it is standard to write parental utility as a function of parental consumption plus their children's utility. Assuming children's utility functions have the same arguments as their parents, we can write dynastic utility starting from generation t as

$$U_t = u_t + \sum_{s=t}^{\infty} \frac{1}{1+\delta} U_{s+t} = \sum_{s=t}^{\infty} \frac{u_s}{(1+\delta)^{s-t}} \qquad (2.3)$$

with U_t the utility derived from the own consumption of the t^{th} generation and the generational discount rate.[19] Under certain assumptions about the form of U_t Bevan and Stiglitz (1978) argue that this model will generate bequests, but only from parents whose children will earn less than themselves. In an economy that features real per capita growth across the generations, it is argued that only parents with very high earnings can expect to have children poorer than themselves, and they will be the parents making planned bequests.[20] Consequently, the planned bequest-resources relationship should lie along the origin through most of resource distribution and then flare up, starting at a sufficiently high level of lifetime parental resources.

If consumption is correctly measured for tax purposes, a consumption tax would not tend to distort the bequest-consumption decision since the children's tax liability would be internalized into the parents' utility function.

However, it has been argued that wealth yields consumption benefits, e.g., power and security, that would not be included in a standard consumption tax and would therefore distort the consumption-bequest decision in favor of bequests.

The Wealth Preference Model

A final class model that will generate bequests is represented in the writings of Keynes, Clower, Thurow and of course, Alfred Marshall. In this model individuals derive consumption benefits from the stock of wealth itself. For example, wealth yields power, security and status. As Marshall has stated:

> There are indeed some who find an intense pleasure in seeing their hoards of wealth grow up under their hands, with scarcely any thought for the happiness that may be got from its use by themselves or by others. They are prompted partly by the instincts of the chase, by the desire to

> outstrip their rivals; by the ambition to have shown ability to acquire power and social position by its possession. And sometimes the force of habit, started when they were really in the need of money, has given them, by a sort of reflex action an artificial and unreasoning pleasure in amassing wealth for its own sake. [Marshall, 1949, p. 228]

Keynes saw one aspect of wealth accumulation as a psychological outlet, i.e., as a form of therapy.

> dangerous human proclivities can be canalised into comparatively harmless channels by the existence of opportunities for money-making and private wealth, which, if they cannot be satisfied in this way, may find their outlet in cruelty, the reckless pursuit of personal power and authority, and other forms of self-aggrandisement. It is better that a man should tyrannise over his bank balance than over his fellow-citizens; and whilst the former is sometimes denounced as being but a means to the latter, sometimes at least it is an alternative.[21]

Clower (1968) has presented a model in which wealth appears in the utility function, while Thurow (1975) says that wealth is acquired for the power it yields to the wealth-holder. Under these wealth-preference theories, bequests are accidental unplanned events. Note that net worth need not decline with age, in contrast with the strict life cycle model. Note also that a conventional consumption tax, unless accompanied with a property income or wealth tax, would distort lifetime consumption-bequest choices since wealth would be an untaxed source of utility.

Thurow has argued that since wealth is power and power is not subject to diminishing returns while consumption is, we can expect wealth (and unplanned bequests) to rise in proportion to income as we move up the income distribution. Of course, merely asserting that wealth preference is not subject to diminishing returns does not constitute its proof.

3. PREVIOUS EMPIRICAL STUDIES

Regardless of how utility is determined, the bequest-resources relationship is important for the reasons cited in Section I. However, this function has been difficult to estimate due to serious data limitations. Attempts have been made by a number of economists viz. Adams (1978), Tomes (1978), Kotlikoff (1979), and Menchik (1978), using proxies in place of the dependent or independent variables.

Tomes and Adams use the same data and reassuringly get similar results. They use a sample of estates probated in Cayuga County in Ohio and therefore have net worth at death.[22] The basic problem with these studies is that they do not have a measure of lifetime or even annual income and rely heavily upon income proxies. Years of education and a number of demographic characteristics are used to impute earnings to the decedents. In spite of the substantial measurement error embodied in the income variable, statistically significant coefficients are estimated and the income elasticity of bequests is found to exceed unity.

Kotlikoff (1979) uses a data base, the Retirement History Survey of the Social Security Administration, that includes both self-reported labor earnings and net worth. Though his study uses the wealth (including life insurance) of the living, not bequests, he shows how his wealth-earnings relationship might be the same as a bequest-earnings function if data existed to estimate it directly.

One potential problem is failure to correct for the costs of dying. Another potentially more serious problem results from errors in response to questions concerning one's net worth. If it is true (as seems to be the case) that low asset holdings are overstated and high holdings are understated, the regression coefficient of earnings would be biased toward zero if no correction is made for response error.[23] Furthermore, if high income and high wealth individuals are less likely to respond to financial questions than others, further bias is introduced.[24] Hence, the finding of generally smaller than unity elasticities should be taken with a degree of caution.

The findings of Menchik (1978) should also be considered with some caution. In this study of the children of wealthy parents, bequests and life insurance are determined from probate records. The data base includes the net amount the parents of these children bequeathed to the children. Using data from another sample that includes both the inheritance received, the earnings of heirs, and other demographic information, the resource elasticity of bequests is estimated to be about 2.5. Although this elasticity is significantly greater than unity at conventional levels of statistical significance, the results should be viewed with caution for two reasons. First, two different, though overlapping, data sets were used. Second, all the children had wealthy parents, and most of the children were wealthier than average. If the bequest function is not of the constant elasticity class, these results may not be representative of populationwide behavior.

4. THE SAMPLE

Technique

Although the conception underlying our data base is simple, the execution is not. The original data collection of income tax returns is an alphabetic surname cluster sample of the persons filing tax returns in Wisconsin between 1946-1964 (David et al., 1974). In the years 1960-64 the list of names was supplemented by spouses of taxpayers and beneficiaries (prior to 1964) of Social Security Accounts established for taxpayers. Studying estate wealth of these persons entailed: (1) identifying the decedents, and then (2) locating probate records containing measures of the size of the estate. Step 1 was accomplished by searching records of the Social Security Administration for sample members who were marked deceased and then confirming the death through Vital Records kept in the state of death.[25] Those taxpayers who do not have social security numbers were matched to the death certificate index of the State of Wisconsin. Virtually all of the persons searched through the death certificate index were successfully matched to the death index or produced information inconsistent with the Wisconsin Assets and Income Study (WAIS) data. Both the Social Security record check and the screen of Wisconsin death certificates revealed that some individuals were not residents at the time of death, and that probate records in other states would need to be consulted.

Step 2 of the data collection entailed visits to county courthouses to locate probate records and the associated inheritance tax reports. Records associated with the decedent's wealth were located in 68.0% of the cases in which the taxpayer resided in Wisconsin at the time of his death. In another 0.4% of the cases search probate records were known to be missing or open; the residual matched cases (31.5%) are presumed not to have a probate record, as they were presumed not legally required to filed.[26] Estates of such persons are likely to be small, as those with gross estates of over $2999 ($9,999) were required to file prior to 1973 (after May of 1973).

Definition of the Population Studied

Three types of information were deemed essential to the analysis: date of death, county of death, and verification of the match. If any of these items were missing, the case was excluded from the analysis (22 cases).[27] The universe of analysis was then limited to taxpayers resident in Wisconsin at the time of death, to taxpayers with three or more returns in the WAIS archive, and to males. Table 1 indicates how the linkage of probate information to the WAIS archive succeeded in producing a data base for the study of lifetime accumulation of private assets. Slightly over a quarter of the matched information (rows 1-2) was discarded to limit the universe to taxpayers with three or more returns and those whose residence at death was Wisconsin. An additional 17 percent were excluded in order to analyze males only.

Table 1

Characteristics of Decedents Associated with the WAIS Income Tax Archive (as of October, 1979)

	Residence at Death							
	Wisconsin					Not Wisconsin		All
	(1) All	(2) 3+ Tax Returns		(3) Other		(4)		(5)
	%	No.	%	No.	%	No.	%	
Matched probate records	68.0	2047	71.8	572	58.2	31	51.7	2650
Confirmed deaths and no probate records	31.5	804	28.2	411	41.8	29	48.3	1244
Total 1-2	99.5	2851	100.0	983	100.0	60	100.0	3894
Probate records missing or still open	.4		14				—	14
No match of Probate to Vital or WAIS identifiers; death not confirmed	.1		4 or more				35 or less	39
Total 1-4	100.0		3852				95	3947
Records to be searched;[a] probate data not yet obtained								614
Linkage problems in the income tax archive	?		?				?	48
								4609

[a]Approximately 50% Wisconsin probates.

The population studied differs from the universe of decedents. Firstly, persons died during the period of observation without entering our taxpayer sample; secondly, some decedents entering our sample were not linked to probate or wealth information. The first problem arises because some persons who died during the period 1947-78 did not file a tax return in Wisconsin from 1946-64. This group includes minors, retired and other persons whose income was primarily nontaxable transfers, and spouses of taxpayers prior to 1960.[28] The spouses may be gainfully employed as family workers in a farm or business, or they may have provided income-in-kind at home. One measure of the extent of this problem is that men constitute 65.8% of all decedents identified in Table 1 and 76.6% of the persons identified in column 2 of that table.

The second problem with the data arises because persons migrating out-of-state are systematically excluded from the analyses presented. Hence, any differential pattern of wealth-holding associated with migration can not be detected. These decedents constitute a small proportion of the sample. It is clear from Table 1 that data remain to be collected on out-of-state migrants, and a report on their behavior must wait until that search is completed.

To summarize, the analysis proceeds on a sample of men who filed a sufficient number of tax returns in Wisconsin and died as residents. The search process was successful in identifying wealth transfers at death for most of these persons, and the analysis will incorporate corrections for the missing data resulting from non-filing.

5. MODELLING TRANSFERS AT DEATH

The Lifetime Resource Constraint

The aggregration of the budget constraint facing an individual over his lifetime forms the accounting framework for our model of lifetime accumulation.[29] Lifetime consumption, lifetime taxation, and bequests exhaust the resources of lifetime earnings and inheritances:

$$C + T + B = E + I_0 \qquad (5.1)$$

The individual is free to choose either C or B to maximize his utility. We find it convenient to think of utility as $U(C, I_1)$ where I_1 is the inheritance received by the beneficiaries of the bequest B, and the size of I_1 is some function of the amount bequeathed, the number of beneficiaries, and the taxation of transfers at death:

$$I_1 = \phi_0(B, N, K) \qquad (5.2)$$

This model abstracts from all forms of lifetime saving and dissaving which are captured in the instantaneous differences between consumption rates and rate of receipt of earnings, all of which have been summarized in 5.1 as the total amount of consumption and earnings computed at a suitable rate of interest r. It also oversimplifies the investment decision as there is only one known rate of interest (and one corresponding real asset), and the taxes are functions of the lifetime amounts, not instantaneous rates. (All values in the model are expressed in real terms.)

While the lifetime framework presented is a caricature of the complexities facing real saving choices, it is adequate to address one question: How does behavior with respect to net lifetime accumulation vary in relation to differences in resources?[30]

Elaborations of the Bequest Choice Model

Two points should be emphasized about this simple model: (1) the definition of consumption in this model is so broad that it includes a number of activities creating capital, especially expenditures for the education of children, (2) the ratio $(B - I_0)/(E + I_0)$ is a lower bound on net savings activity by the individual. The $B - I_0$ that results from a lifetime of activity has necessarily resulted in net capital formation to the extent that it is greater than zero and dissolution of capital to the extent that it is negative. The model encompasses bequests that pass to beneficiaries who hold the inheritance for short periods (such as aged spouses) and bequests that pass to persons who hold the inheritance for long periods (such as grandchildren). $B - I_0$ is net lifetime accumulation in either case.[31]

Transfers to other individuals are not limited to bequests. Intervivos gifts G also serve to increase the inheritance of others:

$$I_1 = \phi_0(.) + \phi_1(G, N, K, r) \qquad (5.3)$$

Allocation of lifetime resources to gifts implies that the resource constraint must be elaborated:

$$G + B + C + T = E + I_0 \qquad (5.4)$$

Two routes for transferring resources to others are redundant in the simple world of certainty that has been posited. In reality several characteristics distinguish B from G. B provides a mixture of utility-producing qualities. Assets held for later bequest may serve as instruments of power yielding direct utility (Thurow); they may provide a contingency balance that will finance random consumption needs, particularly health care in old age (Darby, 1979); they may provide in-kind income as is the case for consumer durables and housing. Gifts do not produce these qualities. We do not postulate an explicit utility function incorporating these characteristics but observe that because several characteristics exist, the individual may wish to allocate lifetime resources to both gifts and bequests.

None of the foregoing discussion implies uncertainty of the lifetime. Two additional modifications of the lifetime resource constraint must be added to deal with insurance and annuities (or pensions). Insurance implies that premiums are pooled to generate transfers to the beneficiaries of persons who die in advance of the time that they are able to accumulate a desired bequest. The premiums P_I and the proceeds would be reflected in the lifetime resource constraint as follows:

$$P_I + G + B + C + T = E + I_0$$
$$I_1 = \phi(.) + \phi_1(.) + \phi_2(P_I, A, r) \tag{5.5}$$

where A, for age, enters the function ϕ_2 to remind us that the amount of insurance paid will be an actuarial function of the mortality experience of the cohort of the buyer at the time that the insurance is purchased.

The availability of insurance markets creates no problems for the analysis. The trade off between insurance and other transfers will be determined by administrative loadings and lags in the adjustment of policies to actuarially fair ratios. Both imply a tax on the use of insurance for transfers. Accumulation of assets over the lifetime imply a reduction in the demand for transfers through the insurance channel, as the relative price of gifts and bequests becomes cheaper than insurance.

The availability of annuity and pension options creates more difficult problems. In general, contributions to a pension or annuity fund P_A finance a stream of annuities R. The amount of contributions does not equal the amount of the annuities, as those who die early finance annuity payments for survivors. Hence

$$P_A + P_I + G + B + C + T = E + R + I_0 \tag{5.6}$$

This relationship is ex post. Ex ante, providing that the pension arrangement is actuarially fair, the resource constraint would still be viewed as in 5.5 and the planned amounts of gifts and bequests would be independent of R.[32]

Implementation

The system in 5.5 comes closest to our implementation. We attempt to estimate a reduced form of an expenditure system in which P_I, G, and B are the decision variables (with C being a residual choice). B is estimated as the amount of net estate in 1967 dollars. G is the value of gifts reported on the probate records with interest compounded from the date of gift to the date of death at a real rate of 3%. P_I is not observed, but insurance proceeds are observed so the $\phi 2(P_I, A, r)$ in 1967 dollars is included in the dependent variable.

Lifetime earnings. A measure of the lifetime resources of the decedent poses great conceptual and measurement problems. Conceptually, the measure is the sum of the amount of lifetime earned income and the value of the inheritances received. Both are suitably discounted to permit the aggregation of receipts in different periods. The discounting raises two questions: what is the appropriate real rate of interest?, and what date should be chosen as the reference date? We choose to use age 65 as the reference date. Thus the measure of earnings calculated is the prospective cumulative total that could be anticipated by a younger man.[33] No particular advantage attaches to age 65, other than the fact that it pertains to a period of life when decisions about retirement dissaving are also made. For the particular sample of data available, it also implies that large adjustments to amounts reported on tax returns only characterizes the youngest group of persons (born in 1910-1924).

Choice of an interest rate is more difficult. Studies of macroeconomic rates of return on the nation's wealth suggest an average rate that varies by years, and which was negative in recent years. However, the average is not the rate affecting individual decisions. The combination of credit rationing and demonstrated correlations between the rate of return and the level of portfolio wealth lead us to be wary of calculations that are not based on the actual market facing individuals. At the same time we recognize that we could not make such adjustments. The problem has been finessed by using an arbitrary one percent real rate of interest and dividing the analysis into ten year cohorts.[34] In this way cumulative differences in return for persons of widely different ages do not affect the estimation procedure, while a scalar interest factor adjusts the different earnings profiles of different cohorts so that regression coefficients on earnings for different cohorts may be given similar interpretations.

A more serious problem arises because observations on earnings for the whole of the individual's lifetime are not available. In fact, the measurements available for the WAIS archive span a long period, and, on average, twelve years of data are available for each person studied. Nonetheless, this falls short of encompassing the lifetime earnings profile. Two approaches can be taken to solve this problem. A model of lifetime earnings can be constructed (Cf. Lillard and Willis, 1978; Plantes, 1979), and observations in years other than the period of tax return reports can be extrapolated from the model to give and comprehensive measure of lifetime earnings. Alternatively, a simple measure of the earnings reported for tax purposes can be developed and elaborations of that measure can be made after some gross tests of the framework within which our theoretical model was developed. The second approach has been used here, although we are eager, in further work, to improve upon our lifetime income measure.

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.[35] 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 number of years, the sum was divided by the number of years filed. Thus, earned income is given by the equation:

$$E_i = \frac{1}{N_i} \sum_{t=F_i}^{L_i} \frac{\left[E_i(t)(1+r)^{(BYR_i + 65 - t)}\right]}{CPI(t)} \qquad (5.7)$$

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.[36]

Use of E_i as a measure of lifetime earnings is appropriate if experience in years where earnings were not observed are some constant multiple of the measure for the observed years across individuals. The presence of a curvilinear relationship between earnings and age during the working lifetime implies that no such scalar applies across individuals who differ widely in their experience in the labor market. For that reason, the population of decedents was divided into six cohorts, and independent analyses were conducted for each cohort.

Table 2 displays information about the earned income measure and the analogous average of total income for four of the six cohorts. Persons born prior to 1880 were excluded from the analyses as we felt measures of earned income were likely to be atypical of a lifetime; in addition, earlier work has shown that such persons are less representative of their cohort than later cohorts, because many persons in that cohort did not file tax returns after 1946 (David, 1970). The youngest group, born after 1924, was excluded for similar reasons. Some members of the cohort were in school at the beginning of the period, yet entered the labor force at high salaries not actually comparable to the salary levels of more experienced workers in the cohort. It was felt that a more sophisticated measure of lifetime income would be necessary to obtain useful results from this young cohort.

Differences in the level of earned income reported for the cohorts in Table 2 reflect actual differences in earnings and the one percent interest factor. The intercohort rate of growth of the mean of earnings is 1.8 percent. Thus, 0.8 percent reflects differences in the level of mean earnings, a difference that may be attributed to a life cycle earnings pattern or differences in human capital. Since we maintain these cohorts in the subsequent analysis, differences in the

Table 2

Percentiles and other Statistics for E_i and Total Income
(Wisconsin Male taxpayers 1946-1964; Amounts in 1967 dollars)

	Birth Year Cohort			
	5	4	3	2
	1910-1924	1900-1909	1890-1899	1880-1889
Wage, salary, self-employment income, E_i (r=.01)				
Median	5740	5056	3540	2416
Mean	5705	5311	4074	2700
80th percentile	7520	7115	5346	4013
Ratio: 80th percentile / median	1.31	1.41	1.51	1.66
N	239	466	704	529
Mean number of tax returns 1946-1964	13.6	14.6	13.9	11.1
Total income (r = .01)				
Median	5875	5200	3704	2851
Mean	5897	5573	4482	3163
80 percentile	7572	7356	5723	4259
Ratio: 80th percentile / median	1.29	1.41	1.55	1.49

mean level are only of importance in making comparisons of model estimates across cohorts.

Inheritances received. Constructing a measure of inheritances received is the most difficult aspect in constructing the estimate of lifetime resources. Earlier work by Menchik (1978) shows the bias associated with omission of the variable altogether and places some bounds on the lower limit to the value of the income elasticity derived from a misspecified model. In this paper, we prefer an alternative approach. Assuming that inheritances are saved and that they are received prior to the period in which we observe earnings, the level of income from sources other than earned income can be used as a proxy for return from the inheritance received. This value is subject to error due to lifetime savings out of earnings and dissavings of inheritances previously received, but it still appears relevant. In order to eliminate the effect that saving during the period of observation may have on the level of income from property, only reports on the first three years' tax returns were included in the measure of property income constructed. The bequest model was estimated both including and excluding this proxy available.

The Bequest Function

The theoretical development to this point justifies the following model:

$$B^* \equiv B + G + \phi_2(P_I, A, r) = F(E + I_0) \qquad (5.8)$$

This model corresponds to the resource constraint in 5.5. Inability to measure the amount of net pension wealth implies that the model is incomplete.[37] We add A^*, age at death, both to control for an age-wealth profile and to proxy for the increased pension wealth received by the longer-lived members of society *ex post*. A linear specification is posited. We tried a quadratic term in some preliminary work and found no nonlinear effects.

It also seems reasonable to test the level of bequest against variable that may indicate a taste for leaving wealth to others. The principal contenders are measures of marital status. It may be hypothesized that there will be smaller levels of bequests for persons who never married; conversely, somewhat larger bequests may be left by men whose wives are living at the time of their death, on grounds that interspousal bequest motives as well as intergenerational motives are operative.

To test for these demand factors, dummy variables were defined for persons who were never indicated as married on either tax returns or the death certificates (D_N), and for persons whose spouses were living at the time of death (D_M).

The Marshallian model in section 2 indicates that response to higher levels of lifetime resources will be nonlinear, with positive responses to increased resources present after some threshold value is exceeded. We implemented a test for this type of behavior by fitting a spline to the data, permitting the coefficient on earnings to change at the median level of earnings and at the 80th percentile. This specification implies that bequest-leaving behavior is a function of the relative level of resources of persons in the same birth cohort, as the values of the median and 80th percentile are larger for persons born in more recent years (see Table 2). Thus we define:

$$
\begin{array}{llll}
E_1 & = E_i & \text{If} & E_i < E_{50} \\
 & = E_{50} & & E_i \geq E_{50} \\
 & & & \\
E_2 & = 0 & & E_i \leq E_{50} \\
 & = E_i - E_{50} & & E_{50} \leq E_i \quad E_{80} \\
 & = E_{80} - E_{50} & & E_i > E_{80} \\
 & & & \\
E_3 & = 0 & & E_i < E_{80} \\
 & = E_i - E_{80} & & E_i \geq E_{80}
\end{array}
$$

where E_{50} is the median and E_{80} the 80th percentile of earned income for the cohort.

The remaining modification of 5.8 was to permit the function to reflect differential bequeathing behavior for the self-employed. Reports of income for tax purposes by the self-employed are likely to understate their true lifetime resources. So long as self-employment activity is continued, assets used in the trade or business are not easily liquidated. Both reasons suggest that the level of bequests of individuals in self-employment may be higher than for persons with no self- employment. A dummy variable is set equal to one, and zero otherwise, for any individual reporting some self-employment in income (D_s). The importance of that income in the total of earned income is measured by

$$Z = \frac{S_i^2}{(E_i - S_i)^2 + (S_i)^2} \qquad (5.9)$$

This oblique variable was chosen since S_i was sometimes less than zero and the transformation assures that Z lies in the unit interval.

The discussion above makes it clear that the following function was estimated:

$$B^* = a_0 + a_1E_1 + a_2E_2 + a_3E_3 + a_4D_N + a_5D_M + a_6D_S + a_7Z + a_8A^* + \varepsilon_1 \qquad (5.10)$$

(ε_1 will be explained below).

Sample Censoring

Table 1 indicates clearly that reports on probated wealth were not available for all the decedents identified. For such persons data on B^* is missing. However, the independent variables are 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 5.10.

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

$$H \equiv B + L \qquad (5.11)$$

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

$$H \geq 3000/CPI(\tau^*) \quad \text{For persons dying before May 1973}$$
$$H \geq 10{,}000/CPI(\tau^*) \quad \text{For persons dying after April 1973.} \qquad (5.12)$$

τ^* is the date of death. Let g(CPI [t]) represent the right-hand side of 5.12. Then it is clear that

$$\Pr\text{ (Probate record)} = \Pr(H - g[(CPI[t^*])] > 0) \qquad (5.13)$$

Assuming that the expression in 5.13 can be modelled by a normal distribution, we can estimate a multiple variable probit equation using the explanatory variables appearing in 5.10 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 $_2$ is bivariate normally distributed with $_1$, then adding the variable

$$\lambda = \frac{f(s)}{1-F(s)} \qquad (5.14)$$

to 5.10 gives unbiased estimates of the parameters $\{A_j\}$.[38] –s is the standardized value of the error term estimated for each observation from the probit 5.13; f(s) and F(s) are the standard normal density and the normal distributions respectively.

6. RESULTS

The Distribution of Bequests

Table 3 shows the percentiles of the distribution of B^*, the value of the estate including gifts and insurance.[39] The percentiles are probably lower bounds since persons with no report are unlikely to have died with zero net assets. The comprehensive character of the data available is indicated by the fact that more than seventy percent of the population of decedents is covered by some report of their assets and liabilities at death.

Estimates of the Bequest Equation

Table 4 presents estimates of the model presented in section 5. The most robust finding is that marginal propensities to bequeath out of the top quintile in the earnings distribution are significantly positive, and the function in this range is elastic. The model provides a reasonable fit for all but the oldest cohort, for whom income earned reflects experiences after age 56 (the age of the youngest member of the cohort in 1945), and for whom the measure E_i may be quite unrepresentive of earlier earnings.

Demographic influences on bequests do not appear significant. Neither the report of a surviving spouse, nor the absence of indications of marriage affect the level of bequest significantly.

Table 3

Net Estate Deciles, B*
(in 1967 dollars)

Decile	Birth Year Cohort					
	1924 or later	1910-1924	1900-1909	1890-1899	1880-1889	Prior to 1880
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	307	2125	1291	229	1734
4	3605	3949	6535	5452	3792	5999
5, median	7321	8142	9270	8786	7389	9141
6	11820	12570	14620	12480	10520	12960
7	20560	19070	20390	17170	16750	21670
8	32210	27740	28430	24970	23490	31570
9	48200	40090	43480	42630	43210	81350
Mean	16904	17057	20651	19324	18913	30845
σ	22629	31800	44704	38146	67442	80108
N	96	238	464	699	528	153

Table 4

Regression Model of the Level of Bequests
(Wisconsin Males; all monetary values in 1967 dollars)

	Birth Year Cohort			
Variable[a]	1910-1924	1900-1909	1890-1899	1880-1889
E_1	2.185 (2.12)	2.826 (1.22)	1.992 (1.03)	-2.396 (-.37)
E_2	-.5567 (-.144)	1.008 (.28)	2.534 (.97)	11.26 (1.34)
E_3	10.67 (7.45)	9.686 (8.40)	9.489 (15.7)	19.28 (4.86)
D_N	6,012 (.25)	-11,990 (-.65)	-21,510 (-.61)	-18,830 (-.73)
D_M	6,052 (.25)	-2,489 (.10)	1,096 (.11)	25,190 (.88)
D_S	7,329 (1.28)	5,902 (.89)	-1,499 (.37)	7,859 (.58)
Z	8,110 (.96)	10,210 (1.24)	17,780 (3.57)	19,710 (1.43)
A*	545.9 (1.74)	743.2 (1.87)	516.3 (2.40)	1,722[b] (2.52)
λ	1,623 (.08)	3,753 (.16)	-733.9 (.06)	34,500 (.96)
constant	-30,750 (1.08)	-39,640 (.97)	-30,030 (1.43)	-152,100 (2.10)
$\bar{R}^2$	.316	.213	.408	.088
$\sigma_{\varepsilon 2}$	29,140	44,320	32,560	74,940
N	171	344	517	378

Note: t-ratios in parentheses.

[a]See text for definition of variables.

[b]Seven persons whose date of birth was known to be prior to 1900 were included in this cohort. The value of A* = 0 for these persons and a dummy variable was set. The coefficient is 152,897 and t = 2.47.

Bequests appear to increase with age at death. The effect is significant for the two older cohorts. This finding has been reported by others (Darby) and is damaging to the life cycle theory of accumulation. As indicated in section 5, this result could be generated by a taste for bequests among the longer-lived members of society and from greater net pension wealth among older persons. It is hard to attribute the pension wealth effect to the youngest cohort as few of that group would have been eligible for pensions; the eldest reaches age 62 in 1972 (and decedents were identified as of late 1977).

Lambda does not have a significant coefficient, suggesting that the availability of probate data does not have a significant correlation to the error term in the bequest model (the estimated probit equations are not presented). It also gives some additional confidence in the value of the model to represent the experience of the whole population of decedents.

We now turn to a detailed discussion of the coefficients for earned income and self-employment.

<u>The spline on earned income</u>. Inspection of the coefficients of E_1, E_2, and E_3 indicates a monotone increase in the coefficients for the two oldest cohorts. As indicated above, the coefficient of E_3 is highly significant, so it appears reasonable to ask whether persons in the range median to 80th percentile behave in a fashion more like the top earnings quintile or more like the below median group. That is, can the spline be reduced to a single discontinuity in the slope? The answer is provided in Table 5. Only the eldest cohort indicates behavior

Table 5

Tests of Joint Significance for the Regression Model

Coefficient sum for	Birth Year Cohort 1910–1924	1900–1909	1890–1899	1880–1889
D_S plus Z[a]	15,439 (1.74)	16,115 (1.82)	16,281 (3.01)	27,570 (1.77)
E_3 less E_2	11.23 (2.39)	8.68 (2.10)	6.96 (2.39)	8.02 (.75)
E_2 less E_1	---	---	---	13.65 (1.86)

Note: t-ratios in parentheses.

[a]All coefficients significantly positive using a one-tailed test and critical region of .05.

in which the propensity to bequeath out of the earned income above the 80th percentile level is not significantly larger than the propensity to bequeath out the median to 80th percentile level. Thus, it is fair to characterize the earnings-bequest relationship as a single kink occurring at the top quintile point, except for the eldest group where that point may occur somewhat lower in the earned income distribution. For earnings below the kink, a zero propensity to bequeath can not be rejected, although the OLS coefficients are predominantly positive.

An alternative interpretation of these results would be to take the coefficient estimates at face value and compute the marginal propensities to bequeath out of lifetime earnings. Assume workers had 40-year working lives. Since the estimated coefficients of E_1 and E_2 are around two, we can say that the marginal propensity to bequeath out of discounted lifetime earnings is .05, or 2/40, for those below the top quintile of earnings. The corresponding lifetime marginal propensity to consume would of course be .95. For those in the top quintile the coefficient of earnings is around ten, hence, their lifetime marginal propensity to bequeath would be .25, or 10/40.

The model permits the bequest of self-employed persons to differ from the levels of non-self-employed by a constant plus an amount that depends on the importance of self-employment income to the total of earned income. Thus, both the coefficients of D_S and Z should be considered in assessing the difference between bequests of the self-employed and the non-self-employed. The sum of those two coefficients and its t-ratio is also shown in Table 5. Underreporting of earnings due to tax accounting leads us to a strong prior that this sum will be positive, and for that reason a one-tailed test is applied. In each cohort the sum is statistically significant using a critical region of .05. This result is consistent with two interpretations: (1) self-employed report less income and pay less taxes but bequeath in the same fashion as non-self-employed; (2) for a specific endowment of earnings, self-employed have a greater capital accumulation than the non-self-employed.

Table 6 displays the implications of the regression model for the level of bequest of persons at the 25th, 65th, and 90th percentiles of the distribution of earnings. The expected bequest has been evaluated for persons who survive their spouse, who report no self-employment income, and who die at the mean age of decedents in their cohort (standard case).

For each of the cohorts, except the eldest, the expected bequest is positive for individuals at the 25th percentile of the earnings distribution. This implies that the average propensity to bequeath must be U-shaped as earned income increases. The significance of the declining portion of that curve is unclear. Eligibility for income maintenance characterizes an increasing proportion of individuals as earned resources decline substantially below the median level of earned resources. Thus, the average propensity to bequeath out of lifetime resources is presumably overstated for the below median group in Table 6.

Table 6

Expected Bequest, Alternative Assumptions

Percentile	Statistic	Birth Year Cohort 1910-1924	1900-1909	1890-1899	1880-1889
		A. Standard Assumptions			
≤ 50	E_{25}	3,661	3,338	2,340	1,451
	B*	5,771	16,120	11,200	-9,959
	B^*/E_{25}	1.58	4.83	4.78	-6.86
51-79	E_{65}	6,571	6,081	4,446	3,178
	B*	9,841	22,010	15,880	-3,689
	B^*/E_{65}	1.50	3.62	3.57	-1.16
80+	E_{90}	8,922	8,135	6,663	4,802
	B*	24,270	32,930	30,660	28,290
	B^*/E_{65}	2.72	4.05	4.60	5.89
		B. Death Assumed at Age 72			
80+	B*	35,300	39,430	31,110	19,480
	B^*/E_{90}	3.96	4.85	4.67	4.06
		C. Death at Age 72 and Self-employment Assumed			
80+	B*	50,740	55,550	47,390	47,050
	B^*/E_{90}	5.69	6.83	7.11	9.80

Notes:

A. Individual is assumed to report earnings at the indicated percentile; $D_N=D_M=D_S=Z=0$; $A^* = \bar{A}^*$; $\lambda = \bar{\lambda}$.

B. Standard assumptions are modified so that $A^* = 72$.

C. Standard assumptions are modified so that $A^* = 72$ and $D_S=Z=1$.

An alternative calculation of expected bequest can be made by assuming a constant life expectancy over all birth cohorts.[40] This was done in calculating the expected bequests shown in the rows following the heading Age 72. The effect of the procedure is to extrapolate differences observed between persons dying earlier and later within each cohort to the year when the individual would reach age 72. The calculation does not adjust the level of earned income by applying an expected lifetime profile to the percentile position observed for the individual.

The last set of calculations in Table 6 shows expected bequest for persons whose sole source of income is self-employment, again adjusting the expectation to a uniform age of death of 72 years.

Table 7 translates the results of the model to elasticities evaluated at the 25th, 65th and 90th percentiles. The elasticities for the top quintile are all substantially in excess of unity, while those for lower quintiles are not significantly different from zero. The high values of the elasticities are somewhat attentuated under the uniform age at death assumption, and further reduced for the fully self-employed. However, even for the latter group the elasticity exceeds unity (see Table 6).

Sensitivity of the Estimates to Underlying Assumptions

A number of variants on the basic regression model were run to test its sensitivity to assumptions. Each variant was characterized by increasing values for the slopes of the spline on earned income, by

Table 7

Marginal Propensities to Bequeath, Average Propensities to Bequeath, and Elasticities

($\frac{\partial B^*}{\partial E}$ for the initial property income variant in parentheses)

Percentile	Statistic	Birth Year Cohort 1910-1924	1900-1909	1890-1899	1880-1889
		A. Standard Assumptions			
≤ 50	$\frac{\partial B^*}{\partial E}$	2.180 (3.679)**	2.826 (2.536)	1.992 (.936)	-2.396 (2.617)
	B*/E	1.58	4.83	4.78	-6.86
	η	.29	.59	.42	.35
50-79	$\frac{\partial B^*}{\partial E}$	-.557 -2.625	1.008 (2.037)	2.534 (.147)	11.256 (1.246)
	B*/E	1.50	3.62	3.57	-1.16
	η	.37	.28	.71	-9.70
80+	$\frac{\partial B^*}{\partial E}$	10.6686*** (10.598)	9.686*** (9.506)	9.489*** (9.316)	19.275*** (20.161)
	B*/E	2.72	4.05	4.60	5.89
	η	3.92	2.39	2.06	3.27
		B. Death Assumed at Age 72			
80+	η	2.70	2.0	2.03	4.75
		C. Death at Age 72 and Self-employment Assumed			
80+	η	1.88	1.42	1.33	1.97

**Significantly different than zero, two-tailed test, critical region = .02.

***Significantly different than zero, two-tailed test, critical region = .001.

positive self-employment effects, by positive age effects, and by few significant marital status effects. The variants indicate that the model in 5.10 is robust and that further refinements are unlikely to alter the basic character of the findings.

Initial property income. No provision was made to measure and include I_0 in the earned income variable. As a consequence, coefficients on earned income are subject to bias. If we assume that inheritances were received prior to the period in which earned income is observed, the consequences of that inheritance should be reflected in income from wealth (to the extent that the inheritance augments lifetime saving). Thus, a measure of income from wealth can be included as a regressor augmenting the model of 5.10. The specific measure chosen was the real value of rent, interest, dividends, and miscellaneous income (in 1967 dollars) cumulated at the real rate of interest over the first three years of tax records reported and averaged. The marginal propensities to bequeath estimated from the augmented model are shown in parentheses in Table 7. Only one of the twelve slope coefficients is altered in a way that conflicts with earlier interpretations. The youngest cohort now shows a significant propensity to bequeath from earned income below the median level. The kink in the propensity to bequeath at the 80th percentile remains significant. (The effect of the property income variable is significantly positive in all four cohorts and adds slightly to R^2.)

Real interest r = .03. Recomputation of the earned income measure (and spline) with a higher rate of real interest gives virtually identical values for the regressors--the correlations between the values of E_1, E_2, and E_3 under the two rates of interest are .995, .955, and.929 respectively. As a result, the model fitted to the 1890-1899 cohort appears essentially identical to that in Table 4. This assumption was not pursued for other cohorts.

Log-Log Variant. A peculiarity of the linear spline chosen is that the right and left derivatives at the median and the 80th percentile are different, producing a discontinuity in the elasticity. Furthermore the changing B*/E implies variable elasticities. These problems are probably best addressed by quadratic splines. However, the familiarity of economists with constant elasticity formulations lead us to reestimate (5.10) with a piecewise constant elasticity spline rather than the linear spline. The difficulty with this functional form is that it is undefined for negative bequests. All cases with nonpositive bequests were excluded. The value of the functional form is that extreme values of the dependent variable are given less weight in the computation of coefficients. We summarize the elasticities significantly different from zero, with a critical region of .01:

Coefficient	Birth Year Cohort			
	1910-1924	1900-1909	1890-1899	1880-1889
Log E_1	.67	*	*	*
Log E_2	*	*	1.22	*
Log E_3	2.13	2.10	1.59	2.18
$\overline{R}^2$	.305	.175	.330	.114

The elasticities from the constant elasticity spline are somewhat smaller than the values from the linear spline evaluated at the 90th percentile. (This reflects the fact that the ratio B*/E increases throughout the top quintile in the linear model and the value of the elasticity will fall as E_i rises.) Results from the constant elasticity model do not appear sufficiently different from the linear model to warrant further discussion. The inappropriateness of excluding negative and zero bequest values seems sufficient reason to discard the logarithmic approach.

Total income variant. It can be argued that substantial information is lost by not considering the differential rate of return to savings by different individuals. Inclusion of total income, in which the savings decisions of individuals are endogenous, may therefore provide different insights into the bequest function. The model of 5.10 was estimated run using total disposable income as the argument of the spline. This procedure produces only one difference to our earlier conclusion: age at death becomes significant for all four cohorts at the .05 level. R^2 rises dramatically for the two older cohorts to .607 and .702. However, the spline for the eldest cohort becomes unstable with significant coefficients of 12.8, -29.5, and 44.4. We view that result as a reflection on the relatively weak earned income data available for the cohort rather than finding that the inclusion of property income in the spline should overturn our earlier conclusions.

The variations of the basic model that have been explored confirm the robustness of the coefficients of the linear spline. We speculate that more refined work on family status and the manner of inclusion of self-employment income may yield additional insights but will not detract from the main conclusions, which we interpret in the concluding section.

7. CONCLUSIONS

Our econometric analysis reveals no significant relationship between bequests and earnings within the first two income groups and a sharply increasing and highly elastic relationship in the top group--the highest quintile. This finding is consistent with the following scenario (though other stories are possible). The nonrich do not have a strong material bequest motive. The wealth held at death, attributable to precautionary and other motives, constitutes an unplanned bequest. On the other hand, the rich (top quintile) do plan (after having exhausted the opportunities for making productive human bequests) and succeed in making a financial bequest.

We will now discuss what we feel are the most significant findings of this paper.

Validation of the Relative Income Hypothesis of Bequest Saving

When individuals are classified into earnings groups based on their position in the earnings distribution of that cohort, we find remarkably similar coefficient estimates for all but the oldest cohort (see Table 4). With one exception, the coefficients on the low and medium earnings levels are not significantly different from zero. At the same time, the coefficients of earnings in the top quintile are positive, highly significant, precisely estimated, and (with the exception of the oldest cohort) remarkably similar to each other.

Real productivity growth implies that absolute earnings of many in the top quintile of the 1890-1899 cohort would place them in the second quintile (60-80%) of the 1910-1924 cohort (see Table 2). If an absolute earnings hypothesis were appropriate, we would expect similar marginal propensities to bequeath for those two groups. The fact that this does not occur and the similarity of coefficients found for the highest relative groups is persuasive evidence that a relative earnings hypothesis is appropriate. Note that a relative earnings hypothesis for bequest saving enables us to understand why aggregate saving rates do not change over time when cross-section studies indicate higher saving rates for the rich than for the poor.

Some Inferences About the Appropriate Theoretical Model of Bequests

Recall that theories 2.1 and 2.4 were too general to generate strong hypotheses about the shape of the bequest function. However, the Marshallian theory (2.2) and the interdependent welfare model (2.3) generate predictions that appear to be confirmed by the data. They predict a relatively flat bequest-earnings function (at a low level of bequests) up to some critical earnings level, and sharply rising function thereafter.[41] Although both theories predict the observed outcome, the interdependent welfare theory predicts an outcome that has been found not to occur in other studies, e.g., zero bequests to the most able child, and all to the least able child. Since equal bequests to children is the rule, the altruist model is of dubious validity. The Marshallian nonhuman bequest model predicts a bequest function of similar shapes. Note that the distinction between the two theories is important since, if the second is the correct model, the lifetime consumption tax distorts the consumption-bequest decision and creates an ensuing welfare loss. Being skeptics, however, we intend to subject the theories to additional empirical tests before declaring a winner.

The Burden of the Lifetime Consumption Tax

Comparison of average propensities to bequeath by earnings classes (Table 6) allow us to make some inferences about the relative burdens of a lifetime consumption tax.[42] The comparison between the burdens a proportional tax would place on the rich (the highest group) seems clear enough. Since the rich have a higher average propensity to bequeath than the middle class, the tax would be a smaller proportion of their earnings. However, consideration of the tax burden on the lower earnings group produces the finding that they face the lightest proportionate burden of all. As mentioned above, the high average propensity to bequeath observed for the poor may be a creature of incorrect measurement of receipts. Alternatively, we might observe that a man at the 25th percentile (which puts one on the threshold of the Poverty Line) is probably living a hand-to-mouth existence. Though a lifetime model and accounting period may be appropriate for the nonpoor, it is doubtful that credit markets will allow a poor man to be in Fisherian equilibrium. If so, the burden of an annual, not lifetime, consumption tax is the appropriate measuring rod, and it is likely that the annual propensity to consume is highest for the poor man.

Tax Effects on Saving and Income Distribution

It is clear that taxes on the lifetime rich retard lifetime saving more than taxes on the lifetime nonrich. Hence, a dollar of tax on property income should reduce saving more than a dollar of tax levied on labor earnings, since property income is weighted toward the rich.

It also appears that the trade offs between encouraging saving and distributional equalities--reduced static equality, dynamic equality, and mobility--also exist. If policies that encourage saving also redistribute income to the rich in the present period, the distribution of wealth and rentier income will become more disparate as the high earners age. Furthermore, if wealthy parents have children that earn more than non-wealthy parents, the fact that they will receive a bequest larger in magnitude than other children reinforces dynamic inequality and reduces intergenerational mobility. It is our view that such trade offs must be explicitly considered in light of the results developed here.

The Effect of Income Distribution and Redistribution on Saving

Since the marginal propensity to bequeath is highest among the rich, redistribution from the rich to others will reduce material saving. Interestingly, redistribution from the middle earners to the poor should <u>not</u> reduce saving since both of their <u>MPB</u>'s are indistinguishable from zero. An egalitarian state with most people at the median would likely save less than a less egalitarian state with many people at the tails of the earnings distribution. However, lest we forget the lessons of the past (and present), we conclude with a passage from Marshall (who else?):

> The power to save depends on an excess of income over necessary expenditure; and this is greatest among the wealthy... But even in Modern England rent and the earnings of professional men and hired workers are an important source of accumulation; and they have been the chief source of it in all the earlier stages of civilization. Moreover the middle and especially the professional classes have always denied themselves much in order to invest capital in the education of their children; while a great part of the wages of the working classes is invested in the physical health and strength of their children. The older economists took too little account of the fact that human faculties are as important a means of production as any other kind of capital; and we may conclude, in opposition to them, that any change in the distribution of wealth which gives more to the wage receivers and less to the capitalists is likely, other things being equal to hasten the increase of material production, and that it will not perceptibly retard the storing-up of material wealth. [Marshall, 1949, pp. 229-230]

NOTES

[1]Bequests include, in present value units, inter vivos transfers made to others. Blinder assumes that the taste for immediate consumption, the subjective rate of time preference in consumption, is constant across the income distribution and that capital markets are perfect. Consequently, all consumers have a consumption time path of similar shape.

[2]Assuming full employment can generally be attained. There are, of course, many tools to affect accumulation, e.g., public saving.

[3]For evidence that this factor substitution in fact occurs, see Berndt and White (1979).

[4]Boskin (1978) finds bequests to explain only 20% of the capital stock.

[5]Consequently, economists should be more cautious about making pronouncements about the burden of sales taxes (see, e.g., Browning, 1978).

[6]For a lively discussion about the importance of price effects on saving, see Howry and Hymans (1978), Boskin's reply, and the general discussion.

[7]Smith (1974) shows that the richest one percent own 27% of all privately held wealth. David and Menchik (1979) show that the distribution of permanent property income is over six times more unequal (measured by the coefficient of variation) than the distribution of permanent adjusted gross income.

[8]Variance of the log is a commonly used measure of dispersion in the human capital literature.

[9]Earnings (or human) inheritance has been studied and found to be important by Taubman (1978) and others.

[10]See Yaari (1965). It has been argued that the annuity and life insurance market must be imperfect due to adverse selection.

[11]Including no changes in tastes, taxes, or relative prices.

[12]Nigel Tomes is currently studying this problem.

[13]See Barro (1974). We had originally planned to include net Social Security wealth as a determinant of bequests, but we could not develop this variable in time for inclusion here.

[14]Examples of such policies would include expenditures on health and education, as well as general redistributive policies that strengthen the family and provide work incentives and opportunities.

[15]Alfred Marshall, Principals of Economics, 8th ed. (New York: MacMillan, 1949), pp. 227-228.

[16]This adverse effect seems to have been ignored by advocates of the consumption tax.

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

[18]See, e.g., Blinder (1976) for a discussion of this portfolio choice model.

[19]See Bevan and Stiglitz (1978) for a recent discussion of this altruist model. This model may not represent reality since it appears that parents make equal bequests to children (Menchik, 1980) as opposed to altruistic compensatory bequests.

[20]This result of course requires regression to the mean in earnings. If children and parents were alike, there would be no planned bequests.

[21]J. M. Keynes, The General Theory of Interest Employment and Money (London: Macmillan, 1964), p. 374.

[22]Whether or not the estate includes life insurance proceeds was not specified by the authors.

[23]See Ferber (1965) and Ferber et al. (1969).

[24]See Projector and Weiss (1966), Ferber (1965), and Ferber et al. (1969).

[25]In fact, the interstate network for reporting deaths implies that Wisconsin is informed of outstate deaths of Wisconsin residents. Only nonresidents must be searched in other states.

[26]It may be that some records were missed owing to discrepancies between the place of death and the county of residence at the time of death. Great efforts were made to search all counties for probate information when the last known address disagreed with the information present on the death certificate.

[27]An additional 48 cases were excluded from the analysis as the probate data search revealed failures to match the time series of income information for 48 individuals.

[28]Further checks on marital status and interspousal transfers will serve to identify many of these individuals.

[29]This starting point compares to that used by Blinder (1974) and is unrealistic to the extent that the individual is precluded from freely borrowing and lending at the common interest rate of the model, r.

[30]The model can also be used to address the question of what marginal rate of substitution characterizes the trade off between consumption and bequests. (We have not yet calculated the price variables needed for such

an analysis.) Our maintained hypothesis is that price elasticities of bequest behavior are small, both because of uncertainties of the date of death, and also because many substitute channels exist for the transfer of wealth at lower cost. See Cooper (1979).

[31]It may be instructive to aggregate over marital units and model the transfers outside the marital unit. In that case net accumulation for marital units could be studied, and an alternative, more clearly intergenerational, interpretation could be given to the transfers at death.

[32]To the extent that P_A and T are predetermined, they may be placed on the right hand side of (5.6), and the model can be posed as choice of transfer channels and lifetime consumption out of the amount of net lifetime earnings, net pension wealth, and inheritances.

[33]This is an arbitrary choice. Age 18 could also have been chosen. The difference between the two is determined by interest rates in the years intervening between the receipt of income and the reference age chosen.

[34]The sensitivity of results to the assumed rate of interest was tested by recalculating the estimates using a 3% real rate of interest. Differences were of no consequence.

[35]Clearly, the latter includes a joint return on invested capital and labor. We were unable to distinguish those elements. Measurement of self-employment income is also obscured because of tax provisions for depreciation and amortization which have tended historically to produce an underestimate of the return to enterprise. Exact deriviations of both

earned income and property income are given in Appendix E of David et al. (1974).

[36]E_i was adjusted to reflect disposable earned income. Actual taxes paid to the state of Wisconsin were reported on the return and subtracted from gross earned income; federal taxes were estimated as a ratio to the amount of Wisconsin taxes paid, and that estimate was also subtracted from earned income. As a result, earned income for persons living primarily on *rentier* incomes may be negative. The procedure used provides a lower bound estimate for tax liability for the indiviual.

The ratio of mean U.S. tax liability to mean Wisconsin tax liability was computed on the 1974 sample of Wisconsin tax returns collected by the State of Wisconsin. Married couples in which the second earner accounted for more than five percent of Wisconsin Adjusted Gross Income were excluded, so that the ratio reflects the multiplier for persons who are able to take advantage of income splitting on the federal return to the maximum extent. The ratio was estimated for each of ten individual Wisconsin Adjusted Gross income ranges as follows:

Individual WAGI (000's)	Ratio of WI to U.S. tax liability
0-2	.295
2-5	.190
5-10	.240
10-15	.323
15-20	.400
20-30	.432
30-50	.393
50-100	.320
100-300	.271
300+	.290

[37] In future work on the data, we will be able to measure Social Security pension wealth and its impacts on bequests, but that work is not yet complete.

[38] This theory for estimating 5.10 is slightly oversimplified. Insurance in excess of $10,000 must be included in the computation of the gross estate H, so that technically two types of truncation are logically possible. In fact, none of the observed probated estates were required to be probated solely on the bases of an excess of insurance, so this legal complexity can be ignored for all practical purposes.

[39] The reporting of the latter two items is truncated as up to $10,000 of insurance may be excluded from the estate, and only gifts three years prior to death are required to be reported. However, persons who reported insurance were likely to report the gross amount on the probate form, and so the amounts reported are complete although some are missing altogether. For gifts, both underreporting and overreporting relative to the requirement occur. Some persons detail gifts for long periods (presumably to comply with federal estate and gift tax reporting requirements); others have undoubtedly made gifts that are completely unreported in order to evade transfer taxes.

[40] Comparisons across cohorts are subject to a caveat. If mortality is inversely related to income (Rosen and Taubman, 1979), then the survivors in older cohorts occupied higher percentile positions when they were younger. This is one reason why we would expect to see a rise in the ratio B^*/E as birth year declines. A second reason is that the older cohorts have had a chance to realize a larger fraction of their human wealth than

younger cohorts. Therefore, older cohorts are less constrained by imperfections in the capital market in achieving their desired bequest level.

[41]Note that our estimation procedure allows the function to be linear over the entire range but doesn't constrain it to be linear.

[42]Note that exempt items complicate the picture in potentially opposite ways, e.g. exemptions for charitable contributions would favor the rich while exemptions for food favor the poor.

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