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THE EFFECTS OF PENSIONS AND SOCIAL SECURITY ON THE DISTRIBUTION OF WEALTH IN THE U.S.

by

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This paper simulates a "lifetime" wealth distribution, which includes pension, social security, and human capital wealth, as well as traditional or disposable elements of household wealth. Calculations are made for the United States in 1969. Three concepts of household wealth are developed. The first is what I call "household disposable wealth", which includes the traditional components of the household portfolio. The second is "household reserve wealth", where it is assumed that the reserves of pension funds are included as part of the household portfolio along with traditional assets. Various assumptions are made to assign pension reserves to individual households. The third is lifetime wealth, which is defined as the present value of the discounted stream of expected net income flows. This measure includes the net value of pension and social security income (that is, future benefits less future contributions), as well as disposable wealth. Different simulations are run for various assumed growth rates for income and benefits to generate estimates of pension and social security wealth. Also, various assumptions are used in computing future social security benefits relative to contribution growth rates. Moreover, it is argued that, for consistency, this measure must also include the present value of lifetime earnings, or "human capital wealth". The sample is divided by age, sex, race, and education level to estimate lifetime earnings. A fourth measure is also developed for analytical purposes, called "household accumulations", defined as the sum of disposable wealth and the accumulated value of pension and social security contributions. This measure is used to compute household wealth distribution if retirement benefits were based directly on contributions into the retirement systems.

Three main conclusions emerge from this study. First, pension wealth is less equally distributed than disposable wealth, but its magnitude is very low compared to disposable wealth. Its addition to household disposable wealth has virtually no impact on wealth inequality. Second, social security wealth is more equally distributed than disposable wealth, and is close in magnitude to disposable wealth. Its inclusion in the houshold portfolio results in a significant reduction in measured wealth inequality. Third, human capital wealth is distributed more equally than disposable wealth but less equally than social security wealth and is strongly correlated with the latter. However, its magnitude is substantially greater than either. Its addition to household disposable wealth causes a significant reduction in measured inequality. The addition of social security wealth to the sum of disposable and human capital wealth causes a further but much more moderate decline. Finally, overall inequality in household lifetime wealth is dominated by two components: household disposable wealth, because of its high inequality, and human capital wealth, because of its size.

It might be helpful to contrast these results with those of a 1976 study by Martin Feldstein. He defined social security wealth (SSW) as the present value of expected social security benefits when retired.[1] Using the 1962 Survey of Financial Characteristics of Consumers, Feldstein imputed SSW to all families with a male head of household between the ages of 35 and 64. He found that the aggregate value of SSW for these households is $382 billion, compared to an aggregate value of fungible wealth of $711 billion. Thus, SSW amounts to 54 percent of fungible wealth for these families. As a result of its large magnitude and its more equitable distribution than fungible wealth, the inclusion of SSW in the household balance sheet greatly reduces the inequality of household wealth. In particular, the top one percent of wealth holders in the 35 to 64 age bracket owned 28.4 percent of fungible wealth in 1962 but only 18.9 percent of total wealth. The top 4.1 percent of families held 44.6 percent of fungible wealth but only 30.8 percent of total wealth. Moreover, the Gini coefficient for fungible wealth among families in the 35 to 64 age class is 0.72, while the Gini coefficient for total wealth is 0.51. The inclusion of social security wealth as a household asset thus results in about a 30 percent reduction in the measured concentration of household wealth.

I find a similar difference between the concentration of disposable wealth (Feldstein's fungible wealth) and that of lifetime wealth (Feldstein's total wealth). The Gini coefficient for disposable wealth is 0.73 and that for lifetime wealth is about 0.51. However, the similarity in result hides a major difference in the method used. Whereas Feldstein added only gross social security wealth to fungible wealth to derive total wealth, I include net pension and human capital wealth along with net social security wealth in my concept of lifetime wealth. As a result, most of the difference between the concentration of disposable and lifetime wealth is due to the incorporation of human capital in the latter measure, not social security wealth.

The paper is divided into six parts. The first discusses the various measures of household wealth. In the second part, results are presented on the distribution of household wealth, and, in part three, overall wealth inequality is decomposed by component. Part four analyzes social security by age and wealth class, and in part five, results are presented on wealth inequality by age class. Conclusions are drawn in the last section of the paper. Technical details on the imputation of pension, social security, and human capital wealth are included in the Appendix.

1. Measures of Household Wealth

Three concepts of household wealth are developed in this paper: (1) Household disposable wealth (HDW) is the traditional concept of household wealth, including assets (and liabilities) that have a current market value and that are directly or indirectly marketable (fungible). It represents the portion of wealth over which households have discretion. Household disposable wealth excludes non-tradeable or non-saleable accumulation rights such as social security wealth and most forms of pension wealth. These two forms of wealth are really entitlements controlled by an outside party and their disposition is not at the discretion of the individual household. However, this measure does include the cash surrender value of a pension plan, since this form of wealth is directly convertible into cash.

(2) Household reserve wealth (HRW). A slightly broader concept of household wealth is one that includes both marketable and fungible assets and asset reserves held by a third party for the benefit of individuals and households. In this measure, the full reserves of pension funds are included in household assets instead of their cash surrender value. The rationale for a reserves notion of wealth is that the assets accumulated in these funds are held for the benefit of households, since the stream of income from these reserves provides personal income to retired workers.[2] Pension funds are therefore similar to many kinds of trust funds whose capital value is not directly available to the beneficiaries but whose income is.

In a reserves concept of household wealth, only the actual accumulations of the pension funds are included in household wealth, rather than the fully funded pension liability. The difference, or the "unfunded" portion of pension liabilities, does enter the lifetime wealth measure.

(3) Lifetime Wealth(HLW). The third definition of household wealth is the neo-classical concept of the present value of the discounted stream of future net income flows. This is the concept of total wealth that Feldstein adopted in his 1976 study. In principle, all forms of future income should be included in computing HLW. These include property income, labor earnings, private pension income, and government transfers such as social security benefits, unemployment benefits, welfare payments, disability payments, medical payments, food stamps, and the like. The first four are by far the biggest and, for simplicity, I shall ignore the others.[3] The first component of HLW, the present value of the future stream of net income from household assets (less liabilities), is presumably already captured in HDW. That is to say, if all capital markets are perfect, then the current market value of household assets (liabilities) should equal the present value of their corresponding income (payment) flows.[4] HDW thus, in theory, capitilizes the future net income flows emanating from disposable assets and liabilities.

The second component of HLW is the capitalized value of future labor earnings, usually referred to as "human capital." Unlike disposable assets, there are no capital markets to assign a market value to human beings based on expectations of their future earnings. However, with some crude assumptions, one can estimate human capital for current workers.

The last two components are pension and social security wealth. The two are now on equal footing, because their value depends on expected future benefits and contributions, irrespective of the mode in which they are accumulated. Pension wealth is defined as the present value of discounted future pension benefits less the present value of discounted future pension contributions. In similar fashion, social security wealth is defined as the present value of the discounted stream of future social security benefits less the present value of future social security contributions. Future entitlements for both pensions and the social security program depend on many factors, such as the health (and survival) of a company, productivity growth and other macroeconomic factors, and future legislation.[5] Estimating the value of such forms of wealth, like human capital, depends on relatively crude assumptions about the future state of the economy.[6]

The concept used in computing pension and social security wealth is their net value. The gross value of each is defined as the capitalized value of future benefits. The net value is the difference between this and the capitalized value of future contributions. The reason for using the net value instead of the gross value is that the neo-classical notion of wealth requires the capitalized value of the net addition to the future income stream from the various sources of income. If benefits were exactly determined by contributions (as in a defined benefit pension plan), there would be no net addition to wealth, since the future benefits would already be captured in human capital. To include the future benefits in this case would be to double-count. Thus, an addition to this form of wealth from pensions or the social security system would occur only if a given group of retirees received a "bonus" over and above their accumulated contributions. For the social security system, this has been historically true, at least up to now, through legislative fiat. The underlying economic conditions that allowed this were labor force participation patterns, the age distribution, the start-up of the system in 1937, sustained productivity growth since World War II, and the pay-as-you-go nature of the social security system. Certain "defined benefit" pension plans also have this feature, where benefits are determined by a formula involving years of service and company earnings history, rather than by the worker's contributions into the pension fund. In this regard, the social security system is treated as a defined benefit plan.[7]

For analytical purposes, a fourth measure is developed, which I call "household accumulations" or HHA. In the reserves concept of wealth, pension funds represent the actual accumulations of savings made by employees and employers for the benefit of workers. Total household reserves thus represent the total savings accumulated for the benefit of the household sector held either directly by households or indirectly in the hands of a third party. Social security contributions are also made by employees and employers for the benefit of workers. The difference between pension and social security contributions is that the latter are not accumulated as reserves whereas the former are. This difference is due to the pay-as-you-go nature of the social security program.

One can construct a hypothetical measure of household wealth, which I call household accumulations, which equals the sum of household reserves and the accumulated contributions made by employees and employers to date into the social security system. This latter portion represents the savings-equivalent of these social security contributions if the contributions were put into a savings account or pension reserves. Like a savings plan or a pension fund, these contributions are accumulated over time with the going interest rate. This treatment of household wealth places social security contributions on an equal footing with private pension contributions. In particular, social security contributions are treated as if they are made into a "defined contribution" pension plan, the benefits from which are based directly on the contributions. Total household accumulations thus represent what the total wealth held by or for the benefit of the household sector would have been if social security contributions were placed in pension reserves.[8]

Definitions and Notations. In more formal terms, the accounting framework for each form of wealth can be stated, as follows. First, define

HDWX as the sum of (i) owner-occupied housing and other real estate; (ii) consumer durables; (iii) household inventories; (iv) bank deposits and other liquid assets; (v) bonds and other securities; (vi) corporate stock; (vii) equity in unincorporated businesses; (viii) trust fund equity; and (ix) the cash surrender value of life insurance policies; less the sum of (i) mortgage debt and (ii) other household debt.

Let us now define the various forms of pension and social security wealth as well as human capital wealth. (Technical details on the imputation procedures can be found in the Appendix).

PDW, or "pension disposable wealth", is the cash surrender value of pension plans.

PRW, or "pension reserve wealth", is the imputed value of the reserves held in the pension system to households.

PLW, or "pension lifetime wealth", is the present value of the projected stream of future (lifetime) pension benefits less contributions.

SSLW, or "social security lifetime wealth", is the present value of the projected stream of future (lifetime) social security benefits less contributions. Two scenarios are used to project social security benefits and contributions. Scenario A assumes that benefits grow at a constant rate and taxes are raised or lowered to pay for them. Scenario B assumes that social security tax rates are fixed and benefit growth rates vary to equate annual contributions with total annual benefits. Varied assumptions are also made in regard to future real earnings growth (k^*).

SSA, or "social security accumulations", is a hypothetical measure of the accumulated contributions made by employees and employers into the social security system on behalf of each individual.

HK, or "human capital wealth", is the present value of the stream of future expected labor earnings.

The three concepts of wealth can now be defined. Household disposable wealth (HDW) is given by:

(1) $$HDW = HDWX + PDW$$

Household reserve wealth (HRW) is defined as:[9]

(2) $$HRW = HDWX + PRW$$

and household lifetime wealth (HLW) becomes

(3) $$HLW = HDWX + PLW + SSLW + HK$$

Finally, the hypothetical measure household accumulations(HHA) is given by:

(4) $$HHA = HDWX + PRW + SSA$$

2. The Composition of Aggregate Wealth and Overall Wealth Inequality

Table 1 presents aggregate household balance sheets for the various measures of household wealth. Total household disposable wealth amounted to 2.9 trillion dollars in 1969. The cash surrender value of pension plans was 7 billion, a trivial proportion of HDW. Pension reserves in 1969 totaled 140 billion, or 5 percent of household reserve wealth. Pension wealth was thus relatively small compared to other components of household wealth.

In contrast, social security wealth was of approximately the same magnitude as household disposable wealth. In comparison, Feldstein found that

Table 1

Aggregate Household Wealth by Measure and Component [a]

Wealth Measure	Assumptions: Real Earnings Growth	Assumptions: Soc. Sec. Benefits Growth	Assumptions: Scenario[b] (A or B)	HDWX	Pension Wealth	Social Security Wealth	Human Capital	Total Household Wealth	Ratio SS WLT/ Total
1. HDW	-	-	-	$2,904.00	$7.00	-	-	$2,911.	
2. HRW	-	-	-	2,904.00	140.00	-	-	3,044.	
3. HLW	.01	.01	A	2,904.00	137.00	$2,083.00	$12,259.	17,383.	0.120
	.01	.02	A	2,904.00	137.00	3,364.00	12,259.	18,664.	0.180
	.01	.03	A	2,904.00	137.00	5,649.00	12,259.	20,949.	0.270
	.02	.01	A	2,904.00	137.00	2,083.00	14,344.	19,468.	0.107
	.02	.02	A	2,904.00	137.00	3,364.00	14,344.	20,729.	0.162
	.02	.03	A	2,904.00	137.00	5,649.00	14,344.	23,034.	0.245
	.01	-	B	2,904.00	137.00	1,194.00	12,259.	16,494.	0.072
	.02	-	B	2,904.00	137.00	2,001.00	14,344.	19,386.	0.103
4. HHA	-	-	-	2,904.00	140.00	288.00	-	3,332.	0.086
5. Feldstein(1976)[c]				711.00	-	382.00	-	1,093.	0.349

a. All values are in billions of (1969) dollars.

b. Scenario A assumes that social security benefits grow at a constant rate over time. Scenario B assumes that social security tax rates are fixed over time. See the Appendix for technical details.

c. Feldstein's results are based on the 1962 Survey of Financial Characteristics of Consumers. Only households with males between the ages of 35 and 64 are included in his calculations.

in 1962 social security wealth totaled about half the volume of fungible wealth. This suggests that social security wealth was increasing relative to traditional household wealth over the 1960's. Moreover, estimates of social security lifetime wealth show considerable variation, depending on the assumptions used to generate the imputations. In Scenario A, SSLW increases by 60 to 70 percent for each percentage point rise in the assumed annual growth rate of social security benefits. On the other hand, the aggregate value of SSLW is found to be independent of the assumed growth rate of real labor earnings, since total SSLW depends only on the assumed value of social security benefits and the implied value of social security contributions. The growth rate of real earnings determines only what the necessary tax rate must be to generate the needed social security contributions.

In Scenario B, the aggregate value of SSLW increases by about two-thirds each percentage point increase in the annual growth rate of labor earnings. There are two reasons for this. First, social security entitlements and, hence, gross social security lifetime wealth (GSSLW) varies directly with earnings growth, when the tax rate is fixed. Second, though social security contributions will also increase as benefits do, if the two are assumed equal on a year-by-year basis, only current covered workers are assigned this liability. Future workers, who are included in the projections and hence used to balance total contributions with total benefits in future years but who are not represented in the 1969 sample, can not be assigned this liability. Hence, even in a pay-as-you-go social security system, where total contributions balance with total benefits on an annual basis, total (net) SSLW will still be positive.

An interesting contrast is provided by the estimates of total social security accumulations (line 4). Estimated hypothetical social security "reserves" would have amounted to 288 billion in 1969. This is about twice the value of pension reserves in 1969 and about 10 percent of the aggregate value of household disposable wealth and of social security lifetime wealth.

The final component of household wealth is human capital. It is considerably larger in magnitude than household disposable wealth or social security wealth--on the order of four to five times as great. Moreover, its aggregate value also varies with the assumed growth in real labor earnings, increasing by about 15 percent for each percentage point increase in annual earnings growth.

The ratio of social security wealth to total household wealth also shows considerable variation, depending on the assumptions used. The proportion ranges from 7 to 27 percent. Of the eight calculations shown in Table 1, the median value is 0.14. Moreover, the ratio of social security accumulations to household accumulations is 9 percent. In contrast, Feldstein calculated a 0.35 ratio of (gross) social security wealth to total household wealth, a proportion considerably higher than mine, since human capital was not included in his measure of household wealth.

Measuresof overall wealth inequality are presented in Table 2. The Gini coefficient for household disposable wealth, the traditional measure of household wealth, is 0.73. The Gini coefficient for household reserve wealth is slightly lower, at 0.72. Gini coefficients for household lifetime wealth are considerably lower, ranging from 0.49 to 0.51 in the estimates shown. On the surface, these results are quite similar to those of Feldstein, who found that the addition of social security wealth to fungible wealth lowered the 1962 Gini coefficient from 0.72 to 0.51. However, it should be recalled that Feldstein's total wealth measure does not include human capital. Finally, the Gini coefficient

Table 2

Gini Coefficient Estimates of Wealth Inequality
by Component and Wealth Measure

Wealth Measure	Assumptions: Real Earnings Growth	Soc. Sec. Benefits Growth	Scenario[a] (A or B)	HDWX	Pension Wealth	Social Security Wealth	Human Capital	HDWX + PEN WLT	HDWX + SS WLT	HDWX + HUM CAP	Total Household Wealth
1. HDW	–	–	–	0.73	0.97	–	–	0.73	–	–	0.73
2. HRW	–	–	–	0.73	0.87	–	–	0.72	–	–	0.72
3. HLW	.01	.01	A	0.73	0.88	0.43	0.61	0.72	0.51	0.55	0.50
	.01	.02	A	0.73	0.88	0.48	0.61	0.72	0.49	0.55	0.50
	.01	.03	A	0.73	0.88	0.55	0.61	0.72	0.50	0.55	0.49
	.02	.01	A	0.73	0.88	0.43	0.62	0.72	0.51	0.56	0.52
	.02	.02	A	0.73	0.88	0.48	0.62	0.72	0.49	0.56	0.51
	.02	.03	A	0.73	0.88	0.55	0.62	0.72	0.50	0.56	0.50
	.01	–	B	0.73	0.88	0.53	0.61	0.72	0.60	0.55	0.51
	.02	–	B	0.73	0.88	0.47	0.62	0.72	0.54	0.56	0.51
4. HHA	–	–	–	0.73	0.87	0.37	–	0.72	0.67	–	0.66
5. Feldstein(1976)[b]				0.72	–	–	–	–	–	–	0.51

a. Scenario A assumes that social security benefits grow at a constant rate over time. Scenario B assumes that social security tax rates are fixed over time. See the Appendix for technical details.

b. Feldstein's results are based on the 1962 Survey of Financial Characteristics of Consumers. Only households with males between the ages of 35 and 64 are included in his calculations.

for household accumulations is 0.66, lower than that of HDW but higher than those for household lifetime wealth.

A breakdown of wealth inequality by component allows a further analysis of the sources of total wealth inequality. The Gini coefficient for HDWX is almost identical to that for HDW, since the two wealth measures differ by only 0.2 percent (from the exclusion of pension cash surrender value from the former). Inequality in the holdings of pension wealth is uniformally greater than that of HDWX. In the case of PDW, the cash surrender value of pension plans, the reason for the high inequality is the small percentage of households (only 5 percent) that hold this form of wealth. Among holders, the Gini coefficient is only 0.41. For both PRW, pension reserve wealth, and PLW, pension lifetime wealth, the high degree of inequality is due to two factors. The first is that half of all households do not hold this form of wealth. The second is that, among holders, the average value of PRW (and PLW) is about 20 times greater among pension beneficiaries than among individuals currently at work (in 1969). This is due, in large measure, to the assumptions used in the imputation procedure, whereby beneficiaries are assigned the full capitalized value of their annuity and the remaining reserves are divided among covered workers.[10] The Gini coefficient for PRW among pension beneficiaries separately is only 0.47 and that among covered workers is only 0.38.

Social security lifetime wealth is more equally distributied than HDWX. Gini coefficients for SSLW range from 0.43 to 0.55, in comparison to a value of 0.73 for HDWX. The degree of inequality in the distribution of SSLW, imputed under the assumptions of Scenario A, rises as the assumed rate of social security benefit growth (g*) increases from one to three percent per year. However, there is no apparent correlation between the two, since the Gini coefficient for SSLW is slightly higher for g* equal to zero than for g* equal to 0.01.[11] Inequality in the distribution of SSLW computed under Scenario B is greater for real earnings growth (k*) of one percent per year than two percent. Here, too, there is no apparent correlation between the two, since the Gini coefficient for SSLW is greater at k* equal to 0.03 than a value of k* of 0.02.[12] Finally, the distribution of social security accumulations (SSA) is more equal than that of SSLW (across all parameter values). This result may at first glance appear surprising, since social security benefit formulas in 1969 were such as to redistribute social security benefits relative to social security contributions in favor of the low wage earner. However, the equalizing effect implicit in the benefit formula is apparently more than offset by the disequalizing effect from differences in conditional life expectancies, particularly on the basis of age.

The distribution of human capital wealth is less equal than social security wealth but more equal than fungible wealth. The reason its distribution is more unequal than social security wealth is that, as defined, HK is the present value of <u>future</u> earnings, not total lifetime earnings. Therefore, HK is generally greater for younger age cohorts than older ones, even though older workers have greater annual earnings. As a result, the Gini coefficient for HK is greater than that for annual earnings--about 0.62 compared to 0.49.[13] The distribution of social security wealth, on the other hand, is largely determined by the distribution of annual earnings, because of the offsetting effects of the (equalizing) social security benefit formula and (disequalizing) differential life expectancies.[14]

The next two columns of Table 3 show the effects of adding pension wealth and social security wealth each separately to HDWX. The addition of pension wealth of all three forms (PDW, PRW, and PLW) to HDWX causes virtually no change in measured inequality, even though pension wealth is more unequally distributed than HDWX. There are two reasons for this. First, pension wealth is small relative to HDWX (the ratio of PRW to HDWX is 0.05). Second, pension wealth is almost uncorrelated with traditional household wealth (the correlation coefficient between HDWX and PRW is 0.01 as shown in Table 3).

In contrast, the inclusion of social security wealth with traditional wealth causes a marked reduction in measured wealth inequality from 0.73 to the range 0.49 to 0.60, depending on the assumptions made. These results are comparable to those of Feldstein, who found that the Gini coefficient fell from 0.72 to 0.51 from the inclusion of social security wealth. The large effect of social security wealth on measured inequality is due to three factors. First, it is more evenly distributed than traditional wealth. Second, its magnitude is very close to that of traditional household wealth. The exeception is Scenario B when earnings growth is one percent per year and aggregate SSLW is only 41 percent of HDWX. It is for this reason that the reduction in the Gini coefficient from the addition of SSLW to HDWX is the smallest of all the cases. Third, social security wealth is almost uncorrelated with traditional household wealth (see Table 3). This, in turn, is due to two offsetting tendencies. First, within age cohort, both traditional wealth and social security wealth are generally correlated with labor earnings and, as a result, positively correlated with each other. Second, the mean value of traditional wealth rises across age cohorts, whereas the mean value of social security wealth generally rises with age until middle-age and then declines (see section 4 for more de-

Table 3

Correlation Coefficients between Selected Components of Household Wealth

Wealth Component	Assumptions: Real Earnings Growth	Assumptions: Soc. Sec. Benefits Growth	Assumptions: Scenario[a] (A or B)	HDWX	Pension Wealth[b]	Human Capital k*=.01	Human Capital k*=.02
1. HDWX	-	-	-	-	-	-	-
2. PRW	-	-	-	0.01	-	-	-
3. PLW	-	-	-	0.01	-	-	-
4. SSLW	-	.01	A	-0.03	0.04	0.34	0.32
	-	.02	A	-0.03	0.03	0.43	0.42
	-	.03	A	-0.03	0.03	0.44	0.43
	.01	-	B	.00	0.06	-0.09	-
	.02	-	B	-0.02	0.05	-	0.14
5. SSA	-	-	-	-0.05	0.04	-	-
6. HK	.01	-	-	-0.03	-0.03	-	-
	.02	-	-	-0.03	-0.03	-	-

a. Scenario A assumes that social security benefits grow at a constant rate over time. Scenario B assumes that social security tax rates are fixed over time. See the Appendix for technical details.

b. Pension Lifetime Wealth (PLW) is used in all cases, except for line 5, where Pension Reserve Wealth (PRW) is used.

tails). As a result, HDWX and SSLW are generally negatively correlated across age cohort.[15] Finally, the inclusion of social security accumulations (SSA) with traditional household wealth causes the Gini coefficient to fall from 0.73 to 0.67. Though SSA is more evenly distributed than SSLW, it is uncorrelated with HDWX (the correlation coefficient is -0.05) and it is much smaller in magnitude than SSLW, accounting for its smaller impact.[16]

The addition of human capital wealth to traditional wealth results in a drop of the Gini coefficient from 0.73 to about 0.55, despite the fact that the Gini coefficient for human capital is about 0.62 (next to last column). There are two explanations for this. First, human capital is much larger in magnitude than HDWX (of the order of 4 to 5 times as large). Second, the two are essentially uncorrelated (the correlation coefficient is -0.03). This, in turn, is due to two factors. First, by construction, human capital tends to decline with age, since years left to work fall with age, whereas HDWX increases with age (see section 4 for more details), inducing a negative correlation between the two. Second, the two components are positively correlated with labor earnings within age cohort and, as a result, with each other.[17]

3. Decomposition of Overall Wealth Inequality

The contribution of each of the components of household wealth to overall wealth inequality can be analyzed more rigorously using a decomposition of the coefficient of variation measure. As noted in the discussion above, there are three factors which affect the contribution of a wealth component to total wealth inequality. The first is the magnitude of the component relative to total wealth. The greater the relative magnitude, the greater its effect on total wealth inequality. The second is the degree of inequality within the component itself. This also has a positive relation to overall wealth inequality. The third is the correlation of the component with the other components of wealth. The greater the correlation, the greater the effect on overall wealth inequality.

These relations can be formalized as follows: Suppose household wealth W is divided into two components, X_1 and X_2:

$$W = X_1 + X_2$$

The coefficient of variation of wealth, CV, is given by:

$$CV \equiv SD/\bar{W}$$

where SD is the standard deviation of wealth and $\bar{W}$ is mean wealth. From the standard formula,

$$V = V_1 + V_2 + 2C_{12}$$

where V is the variance of wealth, V_i is the variance of X_i, and C_{12} is the covariance between X_1 and X_2, and from

$$\bar{W} = \bar{X}_1 + \bar{X}_2$$

it follows that

$$CV^2 = p_1{}^2 \, CV_1{}^2 + p_2{}^2 \, CV_2{}^2 + 2p_1p_2 \, CC_{12}$$

where $p_1 = \bar{X}_i/\bar{W}$, CV_i is the coefficient of variation of X_i and CC_{12} is the "coefficient of covariation" between X_1 and X_2, defined as

$$CC_{12} \equiv C_{12}/(\bar{X}_1 \cdot \bar{X}_2)$$

The decomposition can be easily extended to the case of n wealth components.

Let:

$$W = X_1 + X_2 + \ldots + X_n$$

Then,

$$CV^2 = \sum_i p_i^{\,2} \, CV_i^{\,2} + \sum_{i \neq j}\sum p_i p_j \, CC_{ij}$$

The square of the coefficient of variation of wealth is thus decomposable into a weighted sum of the squares of the coefficient of variation of its components and the coefficients of covariation, where the weights depend on the proportion of each component in total wealth.

Decompositions are shown for four measures of household lifetime wealth and for household accumulations (see Table 4). The first line of each decomposition shows the value of each component; the second line shows its corresponding weight; and the third line shows the "contribution" of each component to overall wealth inequality, where the contribution is defined as the product of the value and the weight. The decompositions of HLW indicate quite clearly that there are only two components that contribute appreciably to overall wealth inequality. The first is the high degree of inequality in the distribution of HDWX, which, despite its very low weight, contributes to about half of overall inequality in HLW.[18] The second is the large magnitude of human capital wealth, which, despite its relatively low inequality, also contributes to about half of overall inequality. The distribution of social security wealth has very little effect on overall inequality because of its very small weight. Finally, the cross-terms also contribute very little to overall inequality, despite their high weights in several cases, because of the relatively low values of the coefficients of covariation.

Table 4

The Decomposition of the Coefficient of Variation of Wealth by Component and for Selected Measures of Wealth

	Coeff. of Variation Squared			Coeff. of Covaration			Total
Wealth Measure	CV^2 (HDWP)[c]	CV^2 (SSLW)	CV^2 (HK)	CC(HDWP & SSLW)	CC(HDWP & HK)	CC(SSLW & HK)	CV^2 (HLW)
1. HLW (k*=.01; g*=.01; Scen. A)[a]							
Value	29.34	0.84	1.54	−0.12	−0.21	0.39	–
Weight	0.03	0.01	0.50	0.04	0.25	0.17	1.00
Contrib.[b]	0.90	0.01	0.77	−0.01	−0.05	0.07	1.69
2. HLW (k*=.01; g*=.02; Scen. A)[a]							
Value	29.34	1.03	1.54	−0.17	−0.21	0.55	–
Weight	0.03	0.03	0.43	0.06	0.21	0.24	1.00
Contrib.[b]	0.78	0.03	0.66	−0.01	−0.05	0.13	1.55
3. HLW (k*=.01; Scen. B)[a]							
Value	29.34	1.45	1.54	.00	−0.21	−0.13	–
Weight	0.03	0.01	0.55	0.03	0.27	0.11	1.00
Contrib.[b]	1.00	0.01	0.85	.00	−0.06	−0.01	1.78
4. HLW (k*=.02; Scen. B)[a]							
Value	29.34	1.14	1.63	−0.10	−0.22	0.19	–
Weight	0.02	0.01	0.55	0.03	0.23	0.15	1.00
Contrib.[b]	0.72	0.01	0.89	.00	−0.05	0.03	1.60

Addendum:

Wealth Measure	CV^2 (HDWX)	CV^2 (PRW)	CV^2 (SSA)	CC(HDWX & PRW)	CC(HDWX & SSA)	CC(SSA & PRW)	CV^2 (HHA)
5. HHA							
Value	31.91	19.76	0.44	0.31	−0.20	0.13	–
Weight	0.76	.00	0.01	0.07	0.15	0.01	1.00
Contrib.[b]	24.24	0.03	.00	0.02	−0.03	.00	24.27

a. k* is the growth rate of real earnings; g* is the growth rate in social security benefits; and "Scen." refers to the Scenario.

b. The contribution (contrib.) is the product of the value term and the corresponding weight.

c. HDWP is defined as the sum of HDWX and PLW.

In comparison, overall inequality in household accumulations is almost totally dominated by the distribution of HDWX, which accounts for three quarters of the total weight. The only other component with a significant weight is the cross-term between HDWX and social security accumulations, but since their coefficient of covariation is relatively low, the contribution of this term is approximately zero.

4. Social Security Wealth by Age and Wealth Class

Further analysis reveals some of the reasons for the low correlations of traditional wealth with social security wealth and other components of expanded wealth. Table 5 shows mean wealth by age class for the various components of household wealth. The mean value of traditional household wealth, HDW, rises with age across all cohorts, though the increment among the last three age cohorts is relatively small. Mean pension lifetime wealth (and, by implication PRW, since the two differ by a constant proportion) has a hump-shaped distribution, peaking in the 45-54 age group. This age pattern is due to three factors. First, the percentage of families that hold pension wealth (that is, either expect pension benefits or currently receive pension benefits) rises sharply between the youngest age group and the 25-34 age group, peaks at 64 percent for 45-54 age group, falls off to 51 percent in the 55 to 64 age group, and then again to 16 percent in the oldest age group. Second, the mean value of <u>gross</u> pension wealth (the discounted value of future pension benefits) among pension wealth holders is relatively constant across age groups. Third, the mean value of pension liabilities declines with age group and for retirees is zero (since there are no more pension contributions to be made). The increase in mean pension wealth with age

Table 5

Mean Wealth by Component and Age Class

Wealth Component	Assumptions: Real Earnings Growth	Assumptions: Soc. Sec. Benefits Growth	Assumptions: Scenario (A or B)[a]	Mean Wealth by Age Class[b]: All	Under 25	25-34	35-44	45-54	55-64	Over 64
1. HDW	-	-	-	45,768	17,047	30,050	34,380	55,029	58,878	61,891
2. PRW	-	-	-	2,221	698	1,170	2,016	3,549	2,962	2,014
3. PLW	-	-	-	2,012	639	1,057	1,811	3,210	2,675	1,854
4. SSLW	-	.01	A	32,826	30,691	32,196	36,824	39,364	34,354	22,480
	-	.02	A	53,017	60,883	61,909	63,179	61,974	50,025	25,543
	.01	-	B	18,820	5,436	8,175	19,031	25,872	26,137	20,391
	.02	-	B	31,540	21,357	25,629	36,488	40,923	36,447	22,576
5. SSA	-	-	-	4,536	2,081	4,101	5,465	5,686	5,048	3,394
6. HK	.01	-	-	193,188	369,084	404,450	277,531	157,393	51,648	2,978
	.02	-	-	226,036	464,126	488,436	316,606	121,267	53,959	3,098
7. HDWX+PLW+SSLW		.02	A	100,686	78,569	93,016	99,369	120,212	111,578	88,716
	.01	-	B	66,489	23,122	39,281	55,222	84,110	87,690	83,563
	.02	-	B	79,209	39,043	56,736	72,678	99,162	98,000	85,749
8. HLW	.01	.02	A	293,874	447,652	497,465	376,900	277,605	163,226	91,694
	.02	.02	A	326,722	542,694	581,451	415,975	241,480	165,537	91,813
	.01	-	B	259,678	392,206	443,731	332,753	241,503	139,338	86,541
	.02	-	B	305,245	503,169	545,172	389,284	220,429	151,959	88,847
9. HHA	-	-	-	52,206	19,767	35,208	41,656	63,924	66,601	66,566
Memo: Ratio of Social Security Wealth to Total Wealth										
10. SSLW/HLW	.01	.02	A	0.180	0.136	0.124	0.168	0.223	0.306	0.279
	.02	.02	A	0.162	0.112	0.106	0.152	0.257	0.302	0.278
	.01	-	B	0.072	0.014	0.018	0.057	0.107	0.188	0.236
	.02	-	B	0.103	0.042	0.047	0.094	0.186	0.240	0.254
11. SSA/HHA		-	-	0.087	0.105	0.116	0.131	0.089	0.076	0.051

a. Scenario A assumes that social security benefits grow at a constant rate rate over time. Scenario B assumes that social security tax rates are fixed over time. See the Appendix for technical details.

b. The age class is based on the age of the head of household.

through the 45-54 age group is thus due to the increasing proportion of households with pension wealth and the decline in pension liabilities. The fall in mean pension wealth thereafter is due to the declining percentage of households with pension wealth.

Average social security wealth has a very similar hump-shaped pattern with age, with the peak occuring in either the 45-54 or the 55-64 age group. There are three factors involved. First, unlike pension wealth, the percent of households holding social security wealth is relatively constant across age groups, at about 90 percent. Second, average <u>gross</u> social security wealth tends to decline with age because future earnings growth is, in each of the cases shown here, greater than the (real) discount rate. Third, future social security liabilities will decline with age, since the number of working years left before retirement declines. Apparently the third factor dominates the second until middle-age, causing mean SSLW to advance with age. After that point, the second factor dominates the third, causing mean social security wealth to decline with age. Mean social security accumulations also has a hump-shaped pattern with respect to age. The reason is that, by definition, accumulations of social security contributions will generally rise with working life. The fall-off in the 55-64 year old cohort is likely due to their lower average earnings over their working life, and the decline in the last age cohort is from the dissipation of their social security "reserves" during retirement. Mean human capital wealth generally declines with age, since, by construction, its value is based on the number of years left to work.

Panel 7 shows the mean value of the sum of HDWX, PLW, and SSLW across age cohorts. It also follows a hump-shaped pattern across age groups, peaking at the 45-54 or 55-64 age group and following very close the pattern of SSLW across age groups. In contrast, the age pattern of mean HLW is dominated by that of human capital, rising slightly between the first two age groups and then falling off rapidly with age. Finally, mean household accumulations (HHA) rises with age until age group 55 to 64 and then levels off.

The importance of social security wealth in the household portfolio can now be analyzed by age cohort. Under the assumptions of Scenario A, SSLW as a proportion of total household wealth generally increases with age until the 55-64 age group and then declines moderately in the oldest age cohort. The major reason for this pattern is the sharp decline of human capital wealth with age. The moderate decline of SSLW in HLW in the oldest age group is due to the sharp decline in their social security wealth. If we exclude human capital wealth from total household wealth, then social security wealth declines in importance in the household portfolio with age, because of the increasing value of traditional household wealth.

In contrast, under the assumptions of Scenario B, SSLW rises as a proportion of HLW across all age cohorts, including the oldest; and more steeply than in Scenario A. This difference is due to the more rapid rate of increase of SSLW with age under Scenario B and the less pronounced fall off in average social security wealth in the oldest age cohort. The ratio of SSLW to the sum of HDWX, PLW, and SSLW is hump-shaped with respect to age, peaking in the 35 to 44 age group. Finally, the ratio of social security accumulations to HHA is also hump-shaped across age groups, also peaking in the 35-44 age cohort, because of the sharp increase in mean HDW between this cohort and the older ones.

Table 6 presents similar results by traditional wealth (HDW) class. The mean value of social security lifetime wealth and social security

Table 6

Mean Wealth by Component and Wealth Class

Wealth Component	Assumptions: Real Earnings Growth	Assumptions: Soc. Sec. Benefits Growth	Assumptions: Scenario[a] (A or B)	Mean Value by Wealth (HDW) Class[b]: All	0-25K	25-50K	50-100K	100-250K	250-500K	Over 500K
1. PRW	-	-	-	2,221	1,476	3,226	3,597	3,878	5,199	4,443
2. PLW	-	-	-	2,012	1,331	2,923	3,275	3,545	4,762	4,048
3. SSLW	-	.01	A	32,826	31,262	39,130	33,768	30,892	27,210	19,639
	-	.02	A	53,017	52,301	61,122	50,319	46,006	37,661	26,482
	.01	-	B	18,820	16,269	24,593	23,005	21,446	19,168	14,253
	.02	-	B	31,540	29,265	38,952	33,904	31,253	26,046	18,901
4. SSA	-	-	-	4,536	4,452	5,307	4,393	3,793	3,222	2,276
5. HK	.01	-	-	193,188	213,307	192,000	134,680	105,803	119,099	98,450
	.02	-	-	226,036	252,960	218,442	151,547	118,607	134,779	110,782
6. HDWX+PLW+SSLW		.02	A	100,686	63,471	98,636	122,996	199,149	378,632	1,886,518
	.01	-	B	66,489	27,438	62,106	95,683	174,589	360,139	1,874,289
	.02	-	B	79,209	40,435	76,465	106,582	184,396	367,017	1,878,937
7. HLW	.01	.02	A	293,874	276,778	290,635	257,676	304,952	497,731	1,984,968
	.02	.02	A	326,722	316,431	317,078	274,544	317,756	513,411	1,997,300
	.01	-	B	259,677	240,745	254,106	230,363	280,392	479,238	1,972,739
	.02	-	B	305,245	293,394	294,907	258,129	303,003	501,797	1,989,719
8. HHA	-	-	-	52,206	15,767	43,123	77,392	157,269	344,630	1,862,707
Memo: Ratio of Social Security Wealth to Total Wealth										
9. SSLW/HLW	.01	.02	A	0.180	0.189	0.210	0.195	0.151	0.076	0.013
	.02	.02	A	0.162	0.165	0.193	0.183	0.145	0.073	0.013
	.01	-	B	0.072	0.068	0.097	0.100	0.076	0.040	0.007
	.02	-	B	0.103	0.100	0.132	0.131	0.103	0.052	0.009
10. SSA/HHA		-	-	0.087	0.282	0.123	0.057	0.024	0.009	0.001

a. Scenario A assumes that social security benefits grow at a constant rate rate over time. Scenario B assumes that social security tax rates are fixed over time. See the Appendix for technical details.

b. Wealth Class is based on household disposable wealth (HDW). "K" refers to $1,000s.

accumulations rises between the lowest wealth (HDW) class and the second lowest wealth class and then declines as HDW increases. This pattern accounts for the low correlation between SSLW and HDW (see Table 3). On the other hand, human capital wealth tends to decline with HDW, due to its dependence on age. As a result, household lifetime wealth tends to remain relatively constant across the first four wealth classes and then rises with HDW across the last two classes, as traditional wealth begins to dominate human capital. Moreover, as a consequence, SSLW increases as a proportion of HLW across the first two wealth classes, falls off gradually across the next two, and then declines sharply as a percent of HLW across the upper two wealth classes. In contrast, social security accumulations as a proportion of household accumulations declines continuously with HDW. These results indicate that social security wealth is very unimportant in the household portfolio for the upper wealth classes.

5. Wealth Inequality by Age Cohort

The last issue to be addressed is whether social security and human capital wealth have the same effect on wealth inequality within age cohorts as across the whole population. Results on wealth inequality by component are shown in Table 7. Line 1 shows the Gini coefficients for the distribution of traditional household wealth within age cohort. Surprisingly, the distribution of HDW is almost as unequal within age cohort as within the full population. Traditional wealth inequality is at its lowest for the 35-44 age cohort, with a Gini coefficient of 0.60. The Gini coefficient falls by 0.10 between the first two age cohorts, increases across the next three age cohorts, reaching its maximum of 0.81, and then falls to 0.73 in the 65 and over age cohort.[19]

Table 7

Gini Coefficient Estimates of Wealth Inequality by Age Cohort

Wealth Component	Assumptions: Real Earnings Growth	Assumptions: Soc. Sec. Benefits Growth	Assumptions: Scenario[a] (A or B)	All	Under 35[b]	35-44	45-54	55-64	Over 64
1. HDW	-	-	-	0.73	0.70	0.60	0.67	0.81	0.73
2. PRW	-	-	-	0.87	0.87	0.78	0.81	0.84	0.94
3. PLW	-	-	-	0.88	0.87	0.79	0.82	0.85	0.94
4. SSLW	-	.02	A	0.48	0.41	0.44	0.46	0.52	0.45
	.02	-	B	0.47	0.51	0.42	0.43	0.48	0.42
5. SSA	-	-	-	0.37	0.36	0.29	0.32	0.37	0.35
6. HK	.02	-	-	0.62	0.36	0.41	0.47	0.62	0.92
7. HDWX+SSLW		.02	A	0.48	0.41	0.40	0.46	0.57	0.58
	.02	-	B	0.53	0.52	0.41	0.48	0.59	0.58
8. HDWX+HK	.02	-	-	0.56	0.35	0.38	0.44	0.61	0.72
9. HLW	.02	.02	A	0.51	0.33	0.36	0.41	0.52	0.56
	.02	-	B	0.51	0.33	0.36	0.41	0.53	0.57
10. HHA	-	-	-	0.66	0.63	0.52	0.60	0.73	0.68

a. Scenario A assumes that social security benefits grow at a constant rate rate over time. Scenario B assumes that social security tax rates are fixed over time. See the Appendix for technical details.

b. The age class is based on the age of the head of household.

Social security lifetime wealth also tends to be as unequally distributed within age cohort as within the whole population. Under Scenario A, the Gini coefficient for SSLW increases from 0.41 for the under 35 age cohort to 0.52 for the 55-64 age cohort and then declines to 0.45 for the 65 and over age group. The distribution of SSLW among preretirement families in Scenario A depends primarily on two factors: the distribution of labor earnings and the distribution of conditional life expectancies. Among age cohorts under 65, there is relatively little variation of conditional life expectancies. As a result, the increasing inequality in SSLW across age cohorts under 65 is almost entirely due to the increasing inequality in labor earnings (its Gini coefficient increases from 0.36 in the youngest age cohort to 0.50 in the 55-64 age cohort). The distribution of SSLW in the 65 and over age cohort is primarily due to the distribution of social security benefits and of conditional life expectancies. The distribution of social security benefits is more equal than that of labor earnings but the variation in life expectancies among the over 65 age group is considerably greater than that within younger age cohorts.

The age pattern for inequality in SSLW computed under Scenario B is very similar to that computed under Scenario A, exept for the youngest age cohort, which has the highest degree of inequality under Scenario B. Because of the assumed constant social security tax rate in Scenario B, young workers in the upper quartile or so of the earnings distribution will actually pay more into the social security system than they will receive in benefits and will therefore have negative SSLW. (This effect is more pronounced for $k^* = .01$ than for $k^* = .02$.) The resultant inequality in the distribution of SSLW is therefore substantially higher within the youngest cohort than the other cohorts.

The age pattern of inequality in the distribution of social security accumulations is very similar to that of SSLW computed under Scenario B, though the reasons are somewhat different. The distribution of SSA among the working population depends on two factors: the distribution of annual labor earnings and the distribution of number of years at work. The increasing inequality in SSA across the middle three age cohorts is due to the increasing degree of inequality in annual labor earnings. The high inequality in the youngest age cohort, on the other hand, is due to the large variance in (estimated) years at work, which is dominated by current age and age of entry into the labor force. The lower inequality of SSA than of SSLW among the retired population indicates that an annuity-based social security system leads to less inequality in retirement benefits than the current system.

Human capital wealth is distributed more equally within the younger three age cohorts than over the whole population. The reason for this is that human capital wealth, by construction, is age dependent and, in particular, depends on the number of years remaining in the work life. Except for the first age cohort, the inequality in human capital wealth increases with age, due to both the increasing inequality in annual labor earnings with age and the increasing relative variance in years left to work.

Inequality in the distribution of household lifetime wealth increases steadily across age cohort (line 9). The Gini coefficient for HLW is 0.33 for the youngest age cohort, considerably smaller than the 0.51 Gini coefficient for the full population, and reaches 0.56 or 0.57 for the elderly cohort. In contrast, the Gini coefficient for HDW declines between the first two age cohorts rises substantially between the second and fourth, and then falls between the fourth and fifth. The difference in age patterns is due primarily to the diffrential effect of human capital wealth on overall wealth inequality across age groups, since human capital wealth declines with age. For the youngest age cohort, the addition of human capital wealth to HDWX causes the Gini coefficient to fall from 0.70 to 0.35, or by 0.35 points (see line 8). For the 35-44 and 45-54 age groups, the resultant drop is 0.32 and 0.33 points, respectively. For the 55-64 age group, the Gini coefficient falls by 0.20 points; and for the elderly cohort there is virtually no effect (as expected).

The addition of social security wealth to HDWX also results in a reduction in wealth inequlaity within age cohort. However, the reduction in inequality is smaller for the three youngest age cohorts than that occassioned by the addition of human capital wealth and larger for the oldest two cohorts. Moreover, the degree of reduction in age cohort wealth inequality from the addition of SSLW to HDWX is generally related to the relative magnitude of SSLW in household lifetime wealth (see Table 5). The major exception is for the elderly, where the reduction in the Gini coefficient from the addition of social security wealth is the smallest, despite the fact that SSLW is a high proportion of total wealth for the elderly. The likely reason for this is a strong positive correlation between social security wealth and traditional wealth among the elderly.

The upward trend in inequality in household lifetime wealth across age cohorts can now be explained. The trend follows that of traditional household wealth except for the first and last age cohort. For the youngest cohort, the relative magnitude of human capital is the largest of any age cohort, which results in the largest reduction in the Gini coefficient from the addition of human capital to HDWX of any of the cohorts. For the oldest age cohort, the apparent positive correlation of SSLW with traditional wealth causes a much samller reduction in inequality form the addition of SSLW to HDWX than in the second oldest cohort. This, coupled with the absence of any human capital wealth among the elderly, results in the highest degree of total wealth inequality in this age cohort. In contrast, the age pattern in Gini coefficients for household accumulations (line 10) directly mirrors that of traditional wealth, and the inclusion of social security accumulations with HDWX causes a reduction in the Gini coefficient that is relatively small and unvarying across age cohorts.

6. Conclusion

The results of the analysis generally support those of Feldstein's 1976 study. Social security wealth is found to be more equally distributed than traditional household wealth. The Gini coefficient for the latter is 0.73, whereas Gini coefficients for social security lifetime wealth range from 0.43 to 0.55, depending on the assumptions used to generate social security wealth. Moreover, the addition of social security wealth to traditional household wealth causes a marked reduction in measured wealth inequality. However, the degree of reduction depends strongly on the assumptions used to generate estimates of household social security wealth. Whereas the Gini coefficient for household disposable wealth is 0.73, the Gini coefficient for household disposable wealth and social security lifetime wealth ranges from 0.49 to 0.61 in the limited set of simulation reported in this paper. In comparison, Feldstein calculated a reduction in the Gini coefficient from 0.72 to 0.51 from the additon of social security wealth.[20]

Pension lifetime wealth is found to be more unequally distributed than disposable wealth but much smaller in magnitude. Its inclusion in the household portfolio thus has a minimal effect on measured inequality.

The rationale for including social seurity wealth in the household portfolio also necessitates the inclusion of human capital wealth. Human capital wealth is found to dominate in magnitude all the other elements of household lifetime wealth. It is distributed more equally than traditional wealth but less equally than social security wealth. The addition of human capital wealth to disposable wealth causes a decline in the Gini coefficient from 0.73 to about 0.55. This reduction is found to be insensitive to the assumptions used to generate human capital wealth. The further addition of social security wealth causes the Gini coefficient to fall to about 0.50. It thus appears that it is the equalizing influence of human capital wealth, rather than social security wealth, that reduces the inequality of lifetime wealth over disposable wealth.

Further analysis using a decomposition of the coefficient of variation statistic seems to corroborate this. There are only two important elements that contribute to overall inequality in household lifetime wealth. The first is dispoable wealth because of its high degree of inequality and despite its relatively small magnitude. The other is human capital, because of its high magnitude and despite its relatively small degree of inequality. Social security wealth contributes little to both because its inequality is low and because its relative magnitude is low. Moreover, the coefficients of covariation between the various components are also uniformally low.

The effects of social security wealth and human capital wealth on total wealth inequality are different within age cohort than within the full sample. Inequality in the distribution of traditional wealth is found to be almost as great within age cohort as within the whole population. The Gini coefficient for traditional wealth is higher for families under 35 than for families between 35 and 44 year of age, then increases over the next two age cohorts, and then declines for elderly families. In contrast, inequlity in household lifetime wealth is considerably lower for families under 35 than for all families, increases uniformly age across age cohorts, and is somewhat higher for elderly families than for the full population.

The difference in age pattern is due to the diminishing importance of human capital wealth in the household portfolio as a cohort ages. The reduction in measured wealth inequality from the addition of human capital to disposable wealth is particularly pronounced for the youngest age cohort. As its effect wears off with age, so does the diminution in measured inequality. Social security wealth, on the other hand, increases in importance with age, and its effect on inequality is greater than that of human capital for the two oldest age cohorts. However, the reduction in measured inequality from the addition of social security wealth to disposable wealth is significantly lower for the elderly than for the 55-64 age cohort, apparently because of a strong position correlation between social security and disposable wealth among the elderly.

A similar set of calculations were also made for social security accumulations. Social security accumulations is a hypothetical concept of social security wealth which shows what social security entitlements would be if they were strictly based on actual social security contributions. Aggregate SSA is considerably smaller than aggregate SSLW and the consequent reduction in measured inequality from the addition of SSA to disposable wealth considerably smaller, with the Gini coefficient falling form 0.73 to 0.67. As a result, it appears that the large distributional effect of SSLW on measured inequality is due primarily to legislative fiat, and this effect will very likely diminish over time due to demographic changes.

Two other general inferences can also be made form the results of this study. First, according to Feldstein (1976), a major reason why the current fungible wealth distribution is so unequal is that middle and low income workers are saving less than they would otherwise, because they expect to receive future social security (and pension) benefits. Yet, my results indicate almost no (negative) correlation between social security wealth and fungible wealth, which suggests that the two are not substitutes. Second, Feldstein (1974) argued that, for similar reasons as above, social security wealth may have significantly depressed the aggregate savings of households. Yet, my results indicate that social security wealth is quite unimportant for the upper wealth groups, who likely account for the bulk of household savings.

Footnotes

* New York University. I would like to express my graditude to Lars Osberg, Marcia Marley, and others present at the conference for their helpful comments.

1. Technically, this is refered to as "gross social security wealth", since future contributions are not subtracted from expected benefits. His calculation of SSW uses the current social security benefit formula as the basis of the calculation. Each male earner is ranked in the distribution of labor earnings and his basic benefit is calculated based on his percentile ranking in the distribution of labor earnings. Thus, a man who was in the 39th percentile of the 1962 distribution of men's earnings is assigned the 39th percencile in the distribution of basic benefits as his base benefit B. This base benefit level is then adjusted by a factor $(1 + g)^T$, where g is the rate of growth of the social security benefit level for new retirees and T is the number of years to retirement (that is, to age 65). After age 65, the basic social security benefit is assumed to grow at a slower rate, g'. The family's SSW is then computed as the sum of the actuarial present values of (1) the man's basic retirement benefit, (2) his wife's retirement benefit while the husband is alive, and (3) his wife's survivor benefit after he is deceased. In the case of an unmarried man, SSW is given by

$$SSW = B \sum_{a=65}^{100} (1 + g)^T (1 + g')^{a-65} (1 + d)^{-(a-A_c)} m_{c,a}$$

where d is the discount rate, A_c is his current age, and $m_{c,a}$ is the probability of a man age A_c surviving to age a.

2. This should be qualified since many companies used their workers' pension funds as a source of capital, particularly before the passage of the ERISA act in 1974. The Erisa act eliminated most of these abuses.

3. Actually, the projected Medicare and Medicaid payments are so large that in future years they probably cannot be resonably ignored. The computation of the present value of income from such programs might be called "medi-wealth".

4. More correctly, the current market value reflects current expectations about future income flows. For my purposes here, I shall ignore this distinction.

5. The only exception is defined contribution pension plans. In these plans, benefits depend directly on contributions. The capital value of such a plan would equal the accumulated contributions to date, since increased benefits from future contributions would simply offset future contributions.

6. This is very different than for marketable forms of wealth. For these, the current market value reflects people's expectations about the future; for pension and social security wealth, their value depends on the actual future macroeconomic conditions.

7. It should be noted that I subtract both the employee and employer contributions into the systems in computing net pension and social security wealth. For this, I am making the standard assumption that the full incidence of social security taxes falls on the employee. The employer contribution, in other words, is part of worker compensation. A related issue is that one might argue that other forms of taxes, particularly income taxes, should also be netted from labor earnings in computing human capital. However, in a neo-classical world, one could counter by arguing that income and related taxes are paid by households in exchange for contemporaneous govern-

ment services, such as education or defense.

8. This assumes, of course, that other forms of household savings behavior would be unaffected by this new institutional treatment of social security contributions.

9. Technically, HRW should include life insurance reserve wealth (LIRW), instead of its cash surrender value (LIDW). The difference between the reserves and the cash surrender value represents the accumulation of equity by insurance companies from undistributed profits. These residual reserves could be viewed either as part of the net worth of insurance companies and therefore part of the assets of the enterprise sector or as assets held in trust (that is, as a mutual fund) for the benefit of policy holders (some insurance companies are, in fact, called "mutual life insurance companies). The dollar difference between LIDW and LIRW was quite small in 1969, with the former totaling $106.0 billion and the latter $117.8 billion. For convenience, I use only LIDW in the computation of household wealth.

10. This is likewise true for (net) PLW, since covered workers are assigned the liability for future pension contributions, as well as the (discounted) value of future benefits. However, average gross pension lifetime wealth (GPLW), which is defined as the (discounted) value of future benefits only, is about equal between pension beneficiaries and covered workers. As a result, the Gini coefficient for GPLW among holders only is 0.37, in comparison to a corresponding value of 0.75 among holders of (net) PLW.

11. On the other hand, the Gini coefficient for GSSLW does increase with g* over the range from zero to 0.03. In fact, under Scenario A assumptions, the Gini coefficients for GSSLW are almost identical with those for SSLW, for g* equal to 0.01, 0.02, and 0.03. The result may at first seem surprising since younger age cohorts must pay social security

contributions into the system for a longer period of time than older age cohorts and their total liability to the system (SSCW) will be correspondingly greater. However, as long as g* is greater then r*, which is the case in these three simulations, the present value of the expected annual social security benefit for a young worker in the nth percentile of the earnings distribution will be greater than that for an older worker in the nth percentile. As a result, GSSLW is greater for the younger worker than the older one.

12. Moreover, the Gini coefficient for GSSLW under Scenario B falls as k^* increase from zero to 0.01 and then rises as k^* increases from 0.01 to 0.03.

13. The Gini coefficients are computed on the basis of household labor earnings for all households, including those with no wage earners.

14. The Gini coefficient for HK is almost invarient across values of k^*. In the formula used to compute HK, annual earnings are essentially weighted by the number of years left in the working life multiplied by a factor involving the exponential term $(1 + k^* - r^*)$. The higher k* is, the greater becomes the estimated value of HK of younger age cohorts relative to older age cohorts. The apparent effect is that the increase is the standard deviation of HK is offset by the increase in its mean value.

15. Actually, SSLW computed under Scenario B and HDWX tend to be positively correlated across age cohort, because both increase at about the same rate with age until about age 55. However, SSLW and HDWX tend to be negatively correlated within age cohort. The explanation for this is as follows. First, <u>gross</u> SSLW is positively correlated with labor earnings and hence with HDWX within age cohort. Second, social security liabilities (SSCC) are greater for those with higher labor earnings than those with

lower earnings within age cohort. As a result, for certain assumed values of k*, (net) SSLW may actually be smaller for those with higher labor earnings than those with lower earnings, because future liabilities dominate future benefits. Indeed, net SSLW can be negative for the upper income families.

16. The low correlation of SSA and HDWX can be accounted for by the same two factors which explain the low correlation between SSLW and HDWX.

17. Human capital wealth and SSLW computed under Scenario A are positively correlated because both are strongly correlated with labor earnings. However, HK and SSLW computed under Scenario B are largely uncorrelated because (net) SSLW may be uncorrelated or even negatively correlated with labor earnings (see footnote 15 for more details).

18. Technically, I have used HDWP in the decompositions, where HDWP is defined as the sum of HDWX and pension lifetime wealth. Since PLW is only 4 percent of HDWX in total, the distribution of HDWP is almost completely dominated by that of HDWX.

19. Comparisons of Gini coefficients across age cohorts are not strictly legitimate, since the age span is greater for the first and last age cohort than for the middle four. It should be noted that the Gini coefficient for HDW is 0.72 among all families under 65 of age.

20. There are three other differences in methodology, which are found to make a minor difference in results. First, Feldstein used the 1962 Survey of Financial Characteristics of Consumers (SFCC). The SFCC omits pension rights, consumer durables (except automobiles), and household inventories as part of household assets (see Projector and Weiss (1966) for a description of the data). These exclusions are found to slightly bias upward the estimate of household wealth concentration and thereby slightly bias upward the measured reduction in inequality from the addition of social

security wealth.

Second, Feldstein included only those families with a man between the ages of 35 and 64 in his sampling frame. Using my sample, I find that the distribution of HDW is slightly less for the 35-64 age cohort than for the full population (the Gini coefficient is 0.70, compared to 0.73). The Gini coefficient for SSLW ranges from 7 to 22 percent less for the 35-64 age cohort than for the full sample, depending on the assumptions used. Moreover, the ratio of aggregate SSLW to disposable wealth is about 10 percent higher in the 35-64 age group than in the whole sample. As a result, the addition of SSLW to disposable wealth causes a slightly greater reduction (about 2 percent) in the Gini coefficient for the 35-64 age group than for the whole sample.

Third, Feldstein included gross social security wealth in the household portfolio rather than net social security wealth. The Gini coefficient for GSSLW is about 8 percent lower than SSLW for the whole sample. Moreover, its aggregate value is about 27 percent higher than the aggregate value of SSLW. As a result, the addition of GSSLW to HDW causes a 5 percent or so greater reduction in the Gini coefficient than the addition of SSLW.

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Appendix
The Estimation of Retirement and Human Capital Wealth

Estimates of pension,social security, and human capital wealth are carried out for each measure of household wealth where appropriate. All imputations are performed with the MESP database (see Wolff (1980) and Wolff (1983) for a description), and valuations are made as of December 31, 1969, from information provided in the 1970 Census Public Use sample, the 1969 Internal Revenue Service Tax model, and previous wealth imputations. In general, where alternative assumptions seem equally likely, I try to choose the one that lends to a more equal distribution of wealth.

1. Pension Wealth

For convenience, I will begin with the household reserve concept of pension wealth (PRW). Separate estimation procedures are used for pension beneficiaries and for current workers. From the Internal Revenue Service tax return data, information is provided on pension benefits. Though some pension plans, like those of the federal government, were indexed in 1969, most were not. As a result, it is assumed that pension benefits (PB) remain fixed in nominal terms. The appropriate discount rate to use is therefore the nominal interest rate rather than the real interest rate. The yield on a treasury bill is used for the discount rate, since it is the closest to a risk-free security. The average age of pension beneficiaries in 1969 was 70.2 and their average (conditional) life expectancy was 11.8 years.[1] The yield on a 10-year treasury bill in 1969, r_{TB}, is therefore used as the discount rate, and its rate was 6.67 percent. The value of pension reserve wealth for a pension beneficiary in 1969 is then estimated as the present value of the discounted stream of expected pension benefits:

$$PRW_b = \sum_{a=A_c}^{A_d} \frac{PB}{(1 + r_{TB})^{a-A_c}}$$

where A_c is the beneficiary's current age (as of 1969) and A_d is the expected age of death, based on the person's conditional life expectancy.

For current workers, the estimation procedure is more complicated since both pension coverage and pension accumulations have to be imputed. Moreover, for simplicity, it is assumed that all workers covered by pension plans are immediately vestal. Coverage is assigned as follows: (1) From Skolnik (1976), the total number of private workers covered by pension plans in 1969 is estimated to be 26.0 million. From Kotlikoff and Smith (1982, Table 3.1.1) the number of state and local government workers covered by a pension plan in 1969 is estimated at 7.1 million and the number of covered federal workers at 3.4 million. These figures are used as control totals for these three groups of workers. (2) From various publications of the Presidents Commission on Pension Policy[2], data are obtained on pension coverage rates by income class, industry of employment, and age and sex of worker in 1979. These coverage rates are each adjusted by a scalar so that total private and government worker coverage in 1969 aligns to their respective totals. Those adjusted coverage rates are used as the marginal totals of a four-way table of pension coverage[3]. Full-time workers are then randomly selected for membership in a pension plan[4].

In order to impute pension accumulations for workers who are assigned coverage, it is then necessary to estimate their accumulated earnings from start of working life up to and including 1969. The estimation of accumulated earnings requires five steps: (1) All full-time workers are divided into four groups: white males, white females, black and other males, and black and other females. (2) Within each of these groups, workers are then divided into four education classes: (i) 0-11 years, (ii) 12 years, (iii) 13-15 years, and (iv) 16 or more years. (3) Within each group, the following earnings function is estimated:

$$E_i = \beta_0 + \beta_1 A_{ci} + \beta_2 A_{ci}^2 + \varepsilon_i$$

where E_i is the individual's current earnings, A_{ci} is current age, and ε_i is a stochastic error term. The MESP sample is used for the estimation, so that the earnings fuctions are cross-sectional. (4) It is assumed that the age at first job, A_0, is given by

$$A_0 = A_c - S - 5$$

where S is years of schooling. It is also assumed that work experience is contiuous for all groups.[5] Let

$$\hat{E}_i = \hat{\beta}_0 + \hat{\beta}_1 A_{ci} + \hat{\beta}_2 A_{ci}^2$$

and

$$f(a) = \hat{\beta}_0 + \hat{\beta}_1 a + \hat{\beta}_2 a^2$$

(5) The present value (in 1969) of accumulated earnings EA from the start of working life up to current age is approximated by:

$$EA_i = \frac{E_i}{\hat{E}_i} \sum_{a=A_0}^{A_c} f(a) \frac{R_{(1969 + a - A_c)}}{K_{(1969 + a - A_c)}}$$

where $E/\hat{E}$ adjusts the individual earnings profile by a constant proportion over the lifetime depending on the 1969 ratio between individual earnings and the group mean (i.e., it is assumed that an individual's relative position to his group remains constant throughout his work life). The variables R and K are given by:

$$R_y = \prod_{x=y}^{1969} (1 + r_x) \quad \text{and} \quad K_y = \prod_{x=y}^{1969} (1 + k_y)$$

where r_x is the discount rate in calendar year x, k_x is the average annual rate of growth mean earnings in year x, and both r_x and k_x are in nominal terms.[6] For r_x the appropriate choice is the average yield on pension assets in year x, for which I use the average yield in year x on high-grade corporate bonds.[7]

Two additional assumptions are now required. First, it is assumed that workers currently covered by a pension plan were covered throughout their work life. Second, it is assumed that pension fund contributions remain a constant proportion α_p of earnings throughout the working life. Though the two assumptions are unrealistic, since both coverage rates and contribution rates have been increasing over time, this is probably the best one can do without additional data. Moreover, they will lead to an overstatement of pension wealth for lower income workers and an understatement for upper income workers and, hence, greater equality in pension wealth distribution.

For total pension reserves in 1969, a figure is available from national balance sheet data provided in Ruggles and Ruggles (1982), which is $140.3 billion. I assume that the pension reserve wealth of current pension beneficiaries is fully covered in the aggregate pension reserves.[8]

A value of α_p was chosen such that:

$$PRW_w = \alpha_p EA \quad \text{for covered workers}$$

$$= 0 \quad \text{for uncovered workers}$$

and

$$PRW = PRW_b + PRW_w = 140.3$$

The computed value of α_p is 0.126.

Pension Disposable Wealth. The appropriate valuation of pension wealth in the household disposable wealth measure is cash surrender value. This represents the portion of resources held in pension funds which can be directly converted into a money equivalent by the household. An aggregate control total for this portion of household wealth is provided in the national balance sheet data from Ruggles and Ruggles (1982). Its value in 1969 was $7.0 billion, a small fraction of the $140.3 billion reserves.

The imputation procedure is as follows: Though there are some pension funds like TIAA-CREF that allow the beneficiary to "cash in" their policy before retirement, these policies are extremely rare. Therefore, it is assumed in the imputation that the only pension policies that have a cash surrender option are for those individuals who are retired and are currently receiving benefits. In 1969, total pension benefits received by retired workers amounted to $8.5 billion, while the total cash surrender value of pension funds in estimated at $7.0 billion. The implication is that only a very small number of the pension plans have the option of being converted from an annuity (i.e., a stream of payments) into a lump-sum cash surrender payment. In the data available there is no way of knowing which plans have this provision. It is thus assumed that everyone receiving pension benefits has this option, and cash surrender pension wealth is imputed to each pension recipient. This will grossly overestimate the actual aggregate cash surrender value, and so the cash value for each recipient is deflated by a scalar β_p so that the total aligns with the $7.0 billion aggregate balance sheet value. This procedure is in accord with the basic methodology used here of understating the concentration of each asset in the balance sheet when relevant information is missing. Pension disposable wealth (PDW) is then given by:

$$PDW_b = \beta_p \cdot PRW_b$$

$$PDW_w = 0$$

Lifetime Pension Wealth. The imputation of pension wealth in the lifetime wealth measure also requires several arbitrary assumptions to be made. The major problem is to predict future pension entitlements for current workers. For current workers, there are questions involved in predicting both eligibility and future benefits at retirement. For pensions, eligibility or vesting may occur immediately or after five or ten years of continuous employment in a company, depending on the plan. Pension benefits may depend on the contributions made to a pension plan (a "defined contribution plan") but more often they depend on some complex formula of the number of years of employment and the person's salary in the last few years preceding retirement (a "defined benefit" plan). A worker's gross pension entitlement wealth, $GPEW_w$, is then defined as the present value of the discounted stream of expected pension benefits, where expectation is based on mortality rates, probability of coverage, and probability of vesting. (It is called "gross" wealth, because future contributions are not netted out.)

Following Feldstern (1976), I base the valuation of pension wealth on the current structure of pension benefits and a workers percentile ranking in the earnings distribution. For simplicity, I ignore the likelihood of vesting and mortality rates before retirement and assume that all workers currently imputed pension coverage will live to retirement and receive a pension at retirement. Current workers who are imputed coverage are assigned a percentile ranking based on the size distribution of wage and salary earnings among covered workers of the same age. Their imputed pension benefit,

PB_n, is that of the corresponding percentile rank n in the size distribution of pension benefits among retired workers aged 65. It is assumed that future pension benefits increase at the same (compounded) rate as average nominal mean earnings increased during the 1945-69 period, $\bar{k}$, and that the future discount rate is equal to $\bar{r}$, the average (compounded) value of r over the 1945-69 period.

It is also assumed that PB_n is fixed in nominal terms after retirement (which was true of most pension plans in 1969), and that workers retire at age 65. Then, the expected pension benefit at retirement for a covered worker in the n^{th} percentile and of age A_c is given by:

$$PBR_n = PB_n \cdot (1 + \bar{k})^{(65-A_c)} \quad .$$

With a discount rate $\bar{r}$, the present value of the stream of future pension benefits for a worker in the n^{th} percentile is given by:[9]

$$GPLW_{w,n} = \sum_{a=65}^{A_d} PBR_n/(1 + \bar{r})^{(a-A_c)} \quad \text{if worker covered}$$

$$= 0 \qquad \text{if worker not covered}$$

For current beneficiaries, their expected pension benefit is the same as their current benefit. Therefore,

$$GPLW_b = PRW_b$$

Pension lifetime wealth, PLW, is then the difference between GPLW and the present value of the stream of future contributions into the pension system.[10] PLW thus becomes identical to PRW, with one qualification regarding the current funding status of the pension plan. If the pension plan is currently underfunded (that is, the expected liabilities of the fund exceed the current reserves), then it is necessary to make an assumption about who bears the underfunding liability. In this regard, the underfunded portion can be thought of as the additional pension reserves that would be required to provide future pension beneficiaries with their expected benefits. It will be assumed that this shortfall in reserves is ultimately paid by current workers in the form of increased contributions. The only available information on this is from Kotlikoff and Smith (1982, Table 5.7.2) for the year 1980, when the median funding ratio γ_ρ among Fortune 1000 companies was 0.93.[11] Since the PUS data do not have company identification, this underfunding correction is distributed proportionately among the covered work force:

$$PLW_w = \gamma_\rho \cdot PRW_w$$

For retirees receiving pension benefits, it is assumed that their benefits are not affected by any current underfunding of the plan:

$$PLW_b = PRW_b$$

2. Social Security Wealth

The estimation of the various forms of social security wealth has many of the same difficulties as the imputation of pension wealth. In addition, there are no aggregate control totals for estimating social security wealth, since no reserves are held by the system.

For convenience, I will first discuss the imputation of social security "accumulations". These are essentially the sum of contributions made by employees and employers into the Old Age and Survivors' Insurance (OASI) program of the Social Security Administration.

Separate procedures are required for current workers and for current beneficiaries. For those currently in the labor force in 1969, a procedure similar to that for imputing PRW_w is used, as follows: (1) In the 1969 IRS tax data, the social security contribution is recorded separately for husband and wife, as well as the employment status of each (that is, as employee or as a self-employed worker). It is assumed that the coverage status remained the same throughout the worker's career, an assumption that will lead to an overstatement of the actual contributions made by workers, since the extent of social security coverage expanded considerably after 1937. (2) As in the calculation of pension wealth, it is assumed that anyone working in 1969 was continuously employed since age A_0. This assumption will also lead to an overstatement of the level of social security wealth. (3) Earnings functions are estimated in the same fashion as for pension wealth. (4) It is assumed, as in the computation of pension wealth, that earnings grew at the rate k_y in calendar year y and that social security contributions were accumulated over time at the rate r_y in year y. (5) Social security tax rates are compiled separately for employees and self-employed workers. Define δ_y to be either twice the employee social security tax rate in year y or the self-employed tax rate in year y, depending on the employment status of the worker, and $SSMAX_y$ to be the maximum taxable wage base in year y. The social security wage base, SSWAGE, in year y for a covered worker with earnings E_i and of age A_i in 1969 is then given by:

$$SSWAGE_{i,y} = MIN\left[\frac{E_i f(A_i - (1969 - y))}{\hat{E}_i K_y}, SSMAX_y\right]$$

where MIN indicates the minimum value of the two arguments. Then social security accumulations for workers is given by

$$SSA_w = \sum_{y=1969+A_0-A_c}^{1969} \delta_y \cdot SSWAGE_y \cdot R_y \quad \text{if covered}$$

$$= 0 \quad \text{if not covered}$$

Computations are made separately for husbands and wives in those families where each made a contribution.

For social security beneficiaries, the imputation is even more problematic. The reason is that though the social security benefit received in 1969 is positively correlated with the accumulated value of the individual's social security contributions while at work, the actual benefit received in 1969 is considerably in excess of that which would be based on the person's accumulated contributions. It is, in fact, the present value of benefits that would be strictly calculated as an annuity on the person's accumulated contributions that is the appropriate measure of social security accumulations. This measure is equivalent to the reserves that would be held for this beneficiary if social security were on an equal footing with the private pension system.

Unfortunately, information on past accumulation into the social security system for social security beneficiaries in 1969 is not available. However, information is available about the actual benefits received.[12] Because of this, the imputation of social security accumulations to beneficiaries, SSA_b, is based on a percentile ranking of social security benefits actually received in 1969. The procedure is as follows: (1) It is assumed that the <u>rank</u> order of social security benefits by age of beneficiary is the same as the rank order of accumulated social security contributions during the work life. (2) It is assumed that beneficiaries aged 65 or over retired at 65 and those under 65 retired in 1969. (3) The size distribution of $SSAW_w$ is computed among current workers at each age between 62 and 65. (4) A social security beneficiary whose age during his last working year is ℓ and whose benefits rank in the n^{th} percentile of social security beneficiaries of his age is assigned an initial accumulation of $SSA_{w,\ell,n}$--that is the n^{th} percentile of social security accumulations of workers aged ℓ. This amount is then divided by the factor $K_{(1969-(A_c-\ell))}$ in order to adjust for the general increase in earnings of the labor force since the year of retirement. The total accumulation of social security contributions for a beneficiary in the n^{th} percentile and whose age in the last working year is ℓ is estimated to be

$$SSR_{\ell,n} = SSA_{w,\ell,n}/K_{(1969-(A_c-\ell))}$$

(5) It is assumed that the pension-equivalent social security benefit is determined as an annuity with an initial wealth accumulation of SSR. In other words, a pension-equivalent benefit level SSB* is determined such that the initial accumulation is exhausted (like a mortgage) at the expected time of death. For this annuity calculation, the term in years is given by $A_{d,\ell} - \ell$, where $A_{d,\ell}$ is the expected age of death, conditional on age and year of retirement. (The population average is used for selecting $A_{d,\ell}$ since social security benefit levels are determined independently of sex.) Moreover, the interest rate is fixed at r_{y*}, where y* is year of retirement, and it is assumed that the annuity is paid out in monthly installments. (6) As in the calculation of PRW_b, it is assumed that SSB* is fixed in nominal terms and the appropriate discount rate is r_{TB}. Then,[13]

$$SSA_b = \sum_{a=A_c}^{A_d} \frac{SSB^*}{(1 + r_{TB})^{a-A_c}}$$

It should be noted that this procedure will lead to an overstatement of SSA_b, since social security tax rates were increasing from 1933 to 1969 and thus $SSR_{\ell,n}$ is overestimated.

Social Security Lifetime Wealth. The estimation of social security lifetime wealth is also complicated, since both expected eligibility and benefit levels must be considered and these depend on mortality rates, earnings history in covered employment in the years prior to retirement, and marital status. Feldstein (1976) does try to control for the last factor in his calculation, but because of the high divorce rates in the last decade or so, it is very hard to predict an individual's marital status thirty years in the future based on current marital status. I will therefore ignore this factor, and simply assume that, for current workers, entitlements are based on the earnings history of each spouse as if each were unmarried. This will lead to an overstatement of social security entitlements, since by current law the wife's benefits are lower if her husband receives social security benefits. It is also assumed that social security coverage is based on a person's 1969 employment status (that is, whether the worker paid social security taxes in 1969 and whether he was self-employed), that this coverage status remains unchanged until retirement, that workers survive until retirement, and that retirement occurs at age 65. For retirees, social security benefits are known from the Census data, and they are assumed to be the base amount until death. Life expectancy for current beneficiaries is based on the greater of that of the husband or wife in the case of a married couple.[14]

Following Feldstein (1974), I define gross social security lifetime wealth, GSSLW, as the present value of the stream of expected social security benefits. For the families currently receiving social security benefits, SSB, it is given by:

$$GGSLW_b = \sum_{a=A_c}^{A_d} SSB(1 + g' - r)^{(a-A_c)}$$

where g' is the expected rate of growth of average nominal social security benefits for those already receiving benefits and r is the nominal discount rate. For a worker in the n^{th} percentile of the size distribution of labor earnings of workers of his age, the expected social security benefit at retirement (at 65) in nominal terms, SSBR, is given by:

$$SSBR_n = SSB_n(1 + g)^{(65-A_c)}$$

where SSB_n is the n^{th} percentile in the size distribution of social security benefits received by beneficiaries of age 65 and g is the rate of growth of the average social security benefit level for new retirees. Then

$$GSSLW_w = \sum_{a=65}^{A_d} SSBR \frac{(1 + g)^{(a-65)}}{(1+r)^{(a-A_c)}} \quad \text{if covered}$$

$$= 0 \quad \text{if not covered}$$

The difficulty in imputing GSSLW is to predict g, g', and r. For this one must make alternative assumptions. My scenarios are as follows:

(A) The first is to pre-assign values to g and g' and assume that they are constant over time. In fact, it is more sensible to assign values to g* and (g')*, the rate of growth in real social security benefits (and to use the real rate of interest, r*, in the calculation). Moreover, since it is hard to project g* and (g')* independantly, I assume that the two values are equal.

From 1960 to 1969, average real social security benefits grew at an average annual rate of 3.3 percent, and from 1960 to 1980, the average level grew at 2.8 percent. Future rates will probably be lower because of the slowdown in productivity growth and resulting slowdown in real earnings growth and because of the increasing ratio of social security beneficiaries to workers. As a result, I simulate three different values for g* in this range: (i) 0.01, (ii) 0.02, (iii) 0.03.

(B) A second approach is to assume that the social security tax rate is maintained at some pre-assigned level. In particular, I use 1969 level. In order to compute g and g', it is necessary to make an additional assumption about the relation of social security benefits to social security contributions. In this regard, I assume that the rate of growth of real social security benefits is such that total social security benefits equal total social security contributions at every point in time--that is,

$$\Sigma SSB_y = \Sigma SSC_y$$

where SSC_y is social security contributions in year y. Total SSC is given approximately by:

$$\Sigma SSC_y = \delta_y (N_{wc})_y \cdot \bar{E}_y$$

where δ is the average social security tax rate (employee plus employer), N_{wc} is the number of covered workers, and $\bar{E}$ is average labor earnings.[15] Moreover,

$$\Sigma SSB_y = (N_b)_y \cdot \overline{SSB}_y$$

where N_b is the number of social security beneficiaries and $\overline{SSB}_y$ is the average social security benefit in year y. Then,

$$\overline{SSB}_y = \delta_y \cdot \frac{(N_{wc})_y}{(N_b)_y} \cdot \bar{E}_y$$

In this scenario, future social security benefits depend on the ratio of covered workers to beneficiaries and on real earnings growth. Data on the number of covered workers from 1969 to 1977 and the number of beneficiaries from 1969 to 1980 were obtained from the 1980 statistical supplement of the Social Security Bulletin (Tables 30 and 49). Projections through the year 2050 were obtained from Long-Range Cost Estimates for OASDI (HEW Publication No. 78-11524, June 1978, Tables 3a, 3b, 9a, and 9b).

For projecting real earnings growth, I rely on the post-war performance of the U.S. economy. From 1947 to 1980, average real earnings grew at an annual rate of 1.02 percent. However, from 1947 to 1969, they grew at an annual rate of 1.94 percent and from 1960 to 1980 they grew at 0.23 percent. It is probably safe to predict that real earnings will grow somewhere between 1 and 2 percent over the next three to four decades. Therefore, two different values for k*, the real earnings growth rate, are simulated: (i) 0.01 and (ii) 0.02.

In this scenario, the formula for computing $GSSLW_w$ must be altered slightly, since the rates g and g' are variable from year to year. Let g_y and g'_y be the benefit growth rate for calendar year y. Then:

$$SSBR^*_n = SSB_n \prod_{a=A_c}^{65} (1 + g_y)$$

where $y = 1969 + (a - A_c)$. Then

$$GSSLW^*_w = \sum_{a=65}^{A_d} SSBR^*[\prod_{b=65}^{a} (1 + g'_{y'})]/(1 + r)^{(a-A_c)}$$

where $y' = 1969 + (b - A_c)$.

For the parameter r, the ten-year treasury bill rate in 1969, r_{TB}, is used. (Actually, the corresponding real rate r^*_{TB} is used, dfined as r_{TB} less the average change in the CPI in 1960-70.).

Social security lifetime wealth, SSLW, is defined as GSSLW less the present value of future social security contributions, SSCW. For retirees, there are no future contributions into the system, so that[16].

$$SSLW_b = GSSLW_b$$

For current workers, SSCW is given by:

$$SSCW_w = \frac{E}{\hat{E}} \sum_{a=A_c}^{65} \delta_y f(a) \frac{(1+k^*)^{(a-A_c)}}{(1+r^*_{TB})^{(a-A_c)}}$$

where k* is the rate of growth of real earnings.[17] As above, k* is simulated at two values: 1 and 2 percent per annum. SSCW is determined by assuming that total SSB equal total SSC for each year y. Then, from above.

$$\delta_y = \frac{\overline{SSB}_y}{\bar{E}_y} \cdot \frac{(N_b)_y}{(N_{wc})_y}$$

It then follows that

$$SSLW_w = GSSLW_w - SSCW_w$$

<u>Human capital</u>. A calculation of human capital follows directly from this. However, to be consistent with the formulation of PLW and SSLW, let us define E* as total employee compensation, including the <u>employer's</u> contribution to the social security system, and the <u>employer's</u> contribution to the pension plan. Let f*(a) be the corresponding

compensation function. Then human capital HK is the present value of the discounted future stream of employee compensation:

$$HK = \frac{E^*}{\hat{E}^*} \sum_{a=A_c}^{65} f(a) \frac{(1 + k^*)^{(a-A_c)}}{(1 + r^*_{TB})^{(a-A_c)}}$$

Footnotes to Appendix

1. Data on median conditional life expectancies by age, sex, and race are from: U.S. Bureau of the Census, Statistical Abstract of the United States, 1972, 93rd edition, Government Printing Office, Washington, 1972.

2. The sources are: President's Commission on Pension Policy, "Pension Coverage in the United States," mimeo; and "Preliminary Findings of a Nationwide Survey on Retirement Income Issues," mimeo, May 1980.

3. The four-way table is constructed by first computing the joint distribution of workers in 1969 by income, industry, age, and sex from the MESP database. Then, a modified version of the so-called R.A.S. method is used. This is a procedure which is employed to balance input-output tables when the row and column totals of the matrix are known but only partial information is available on the matrix elements themselves. The procedure is to distribute the marginal totals over the original matrix, which in this case is the joint distribution of workers by income, industry, age, and sex, in successive iterations until convergence is reached.

4. Pension coverage for part-time workers is much lower than for full-time workers and can be safely ignored in this imputation.

5. These last two assumptions will tend to understate the concentration of pension wealth, since the method equalizes the distribution of lifetime earnings between those with contimuous employment and those without.

6. Technically, earnings are recorded as of the beginning of the calander year. A better method for estimating EA would be to compute the value of k_a separately for each sex, race, and education group, but the needed information is not available.

7. For this, I use Moody's corporate bond rate on Aaa bonds.

8. That is to say, it is assumed that the liabilities of current pension beneficiaries are fully funded.

9. There is no apparent bias in this imputation technique. On the one hand, since labor productivity has fallen since 1969, the growth in future real earnings is probably overstated. On the other hand, insofar as the real discount rate tends to equal the growth in real earnings, the real interest rate is also overstated. In fact, $\bar{r} - \bar{k}$ equals -0.47 percent per annum.

10. This is true even if the worker's company makes the actual contributions into the pension plan, since such contributions will still represent a subtraction from total labor compensation.

11. The data source in the NBER Fortune 1000 Annual Reports File (1980). The concept used is the fraction of the total accrued pension liability for all plan participants which is funded. It should be noted that this fraction depends heavily on the interest rate assumption used in the calculation by the pension plan accountant.

12. The information of social security benefits received by households comes from the Census PUS income category "income from social security or railroad retirement." (Since these benefits are not taxed, they are not recorded in the IRS tax data.) This category also includes social security disability benefits.Since it is necessary to exclude disability benefits, I assume that households receiving income in this category, where the head of the household is under 62, received disability payments. Moreover, since there is no way of separating railroad retirement benefits from social security benefits, I assume all benefits in this category are social security benefits. This assumption will likely lead to an overestimate of the level of social security wealth.

13. The treatment of SSA_b is thus equivalent to that of PAW_b. In both cases, it is assumed that the total contributions into the respective plans can be converted into a lump sum accumulation (SSR for the former). However, in both cases, the beneficiary elects to take an annuity equivalent of the lump sum amount. At time of retirement, the expected value of the stream of annuity payments is equal to the lump sum accumulation. However, as a retiree ages, the expected number of years he has to live declines, and, as a result, the expected value of the annuity stream also declines. On the other hand, those who live longer receive more years of benefits (the benefits do not terminate at $A_{d,\ell}$) and thus the actual (ex post) value of their stream of annuities will exceed that of those who die younger. For those who live past $A_{d,\ell}$, the value of their annuity stream will exceed SSR. Ex post, death will redistribute $SSAW_b$ and PAW_b in favor of those with longevity.

14. In most cases, it will be that of the wife since women outlive men. However, in the case of a couple where the husband is considerably younger than the wife, the conditional life expectancy might be greater for the husband.

15. The relationship is approximate, since there is a maximum on social security contributions, $\bar{E}$ is the average earnings of all workers, and there are different rates for salaried and self-employed workers.

16. The difference between $SSLW_b$ and $SSAW_b$ might most helpfully be thought of as a pure government transfer. This difference is not necessarily positive and, in fact, is very likely to be negative for younger age cohorts today (particularly their upper income members).

17. In this calculation, the future ceiling on social security contributions is ignored and social security coverage is assumed to remain as it was in 1969.