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MANDATORY RETIREMENT SAVING AND CAPITAL FORMATION

Introduction: the Contesting Views.

Recent debate on the macroeconomic effects of mandatory retirement saving has run the gamut from B to F.[1/] The B position is that pension institutions, public and private, make no difference. National saving and capital formation are the same with them or without them. The F position is that these institutions, because they have incompletely funded their future obligations, increase consumption at the expense of capital formation.

Suppose that more generous pensions are announced for present and future annuitants and that sufficient new taxes or payroll deductions are levied on currently employed workers to pay the increases to contemporaneous beneficiaries. The F position is that the workers will not reduce their consumption; they will pay the new levies from the voluntary saving that would otherwise have bought them the consumption in old age now assured them by their pensions. At the same time, the current beneficiaries will consume their gains. The result is an increase in consumption, at the expense of investment.

The B position is that neither active workers nor their retired contemporaries will alter consumption. These beneficiaries will, directly

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1/. Barro, Robert J. (1974, 1976, 1978)
Feldstein, Martin (1974, 1976, 1977)

or indirectly, transfer their gains to the generations that will have to pay more taxes or wage deductions. They will take less support from their children, or plan to bequeath more to their descendants.

These two views have sharply different policy implications, and they are based on quite different models of individual consumption and saving. The F view relies on the life cycle model, according to which individuals consume their lifetime resources within their lifetimes. They do not internalize, i.e., adapt their consumption, to the expectation that their descendants will have to pay higher premiums for retirement benefits. Therefore, inauguration or liberalization of pensions financed from contemporaneous mandatory savings does result in a once-for-all-time increase in the national propensity to consume. This would not happen if the pensions, or pension improvements, were deferred so that each cohort of beneficiaries received no more than its prior contributions had earned.

The B model attributes to consumer-savers a dynastic cross-generational view; horizons are essentially infinite. So long as the dynasty's intertemporal budget constraint, involving the present values of taxes, pensions, and other endowments, is the same, the consumption of each generation will be the same.

The evidence of household budget surveys does not support the implication of the strict life cycle model that retired consumers are dissavers, living off their pensions and previously accumulated assets. In 1972-73, for example, families (including single individuals) with head aged 65 or more (average age 73) were net savers, on average 9.2% of disposable income. They owned financial assets worth 2.3 times annual income and a home valued 2.1 times income. Half their income came from social insurance and other pensions and annuities. These aged families are making gifts and contributions totalling about 10% of their income. These observations suggest that at least part of the mandatory retirement saving done by these households is being channeled into bequests and gifts.[1/] There is surely some truth in the Barro effect, especially for the more affluent.

The two approaches have in common the view that the institutions -- mandatory social and private retirement plans -- matter very little. They are to a good first approximation a transparent veil through which the basic intertemporal preferences of individuals may be seen to prevail. In the B model, this is true however and whenever the pensions are financed. In the F model it is true if the pensions are funded.

There are other, old-fashioned, approaches. One we could call the L (for liquidity) view. This would attribute to households much shorter horizons than either the life cycle or the dynastic model. If workers had no voluntary saving to reduce and no liquid assets to consume, their con-

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1/. U. S. Department of Labor, Bureau of Labor Statistics (1978).

sumption would have to fall by the full amount of their mandatory saving. Likewise if pensioners were liquidity-constrained they would consume all their annuities. In aggregate the L model agrees with the B model: nothing happens. But the L model differs by predicting a shift of consumption from the younger to the older generation. A more realistic and pragmatic version would expect less than 100% adjustments by both generations, and entertain the empirical possibility that the marginal propensity to consume of the old, who might be saving for bequests, would be smaller than that of the young. In this case the assumed transfer would reduce aggregate consumption.

In earlier post-war years, when the U. S. social insurance system was younger and its coverage of the population less complete, George Katona (1965) reported surveys indicating that covered workers actually saved more from their disposable incomes (after social security and other taxes) than similar uncovered workers. Even though they could look forward to social insurance benefits, they were doing more voluntary saving for old age than their uninsured brethren. This finding can be rationalized by the hypothesis that social insurance enabled workers to cross a critical threshold previously beyond their reach, namely to make economic independence in old age a feasible aspiration. Now that the great social transition from dependence on children, usually including residence with them, has been so generally made, the Katona effect is probably no longer relevant. But it does suggest that institutions are not as vacuous as economic analysts frequently assume.

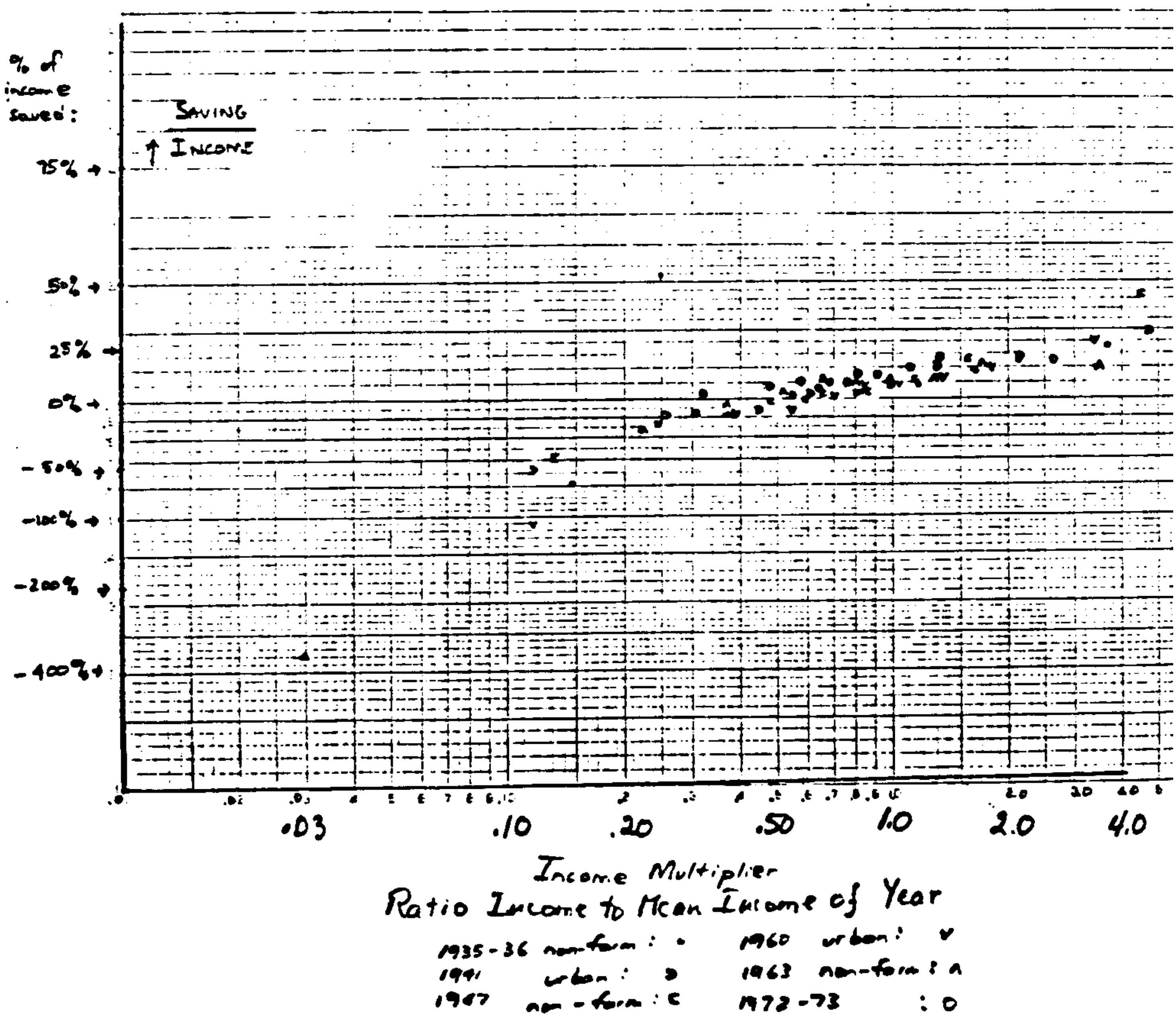
Philip Cagan (1965) came to conclusions similar to Katona's in studying private pension plans.

Has Anything Really Happened?

In Figure 1 we have plotted, for several household budget surveys from 1935-36 to 1972-73, the ratio of saving to income against the ratio of income to mean income in the survey.[1/] (Income is disposable income, after payroll and other direct taxes, and after receipt of pensions, social security benefits, and other transfers. Saving does not include payroll taxes for social insurance but does include employees' contributions to private pension funds as well as other life insurance and annuity premiums. In each survey the basic data are from income brackets, but the average income in each bracket has been adjusted for family size to a standard size of 3.5.) As Dorothy Brady and Rose Friedman pointed out long ago, (1947) this simple transformation of budget data makes the points of different surveys, widely separated in time, fall into a common track. The result is consistent with either or both permanent income and relative income models of saving. The point of Figure 1 is that the Brady-Friedman conclusions encompass post-war surveys increasingly vulnerable to the impacts of social security wealth and in some degree of private pension wealth. One might have expected those impacts to show up in a downward drift of the scatters for the more recent surveys.

1/. For the earlier five surveys, the data are tabulated in Projector (1968), Table 4, p. 9. The 1972-73 data were calculated by the authors from U. S. Department of Labor, BLS (1978), Table 1.

Figure 1



% of income saved:
Saving / Income
75%
50%
25%
0%
-50%
-100%
-200%
-400%
.03
.10
.20
.50
1.0
2.0
4.0
Income Multiplier
Ratio Income to Mean Income of Year
1935-36 non-farm: •
1960 urban: v
1941 urban: b
1963 non-farm: A
1947 non-farm: C
1972-73: O

Figure 1 underscores the point that Feldstein, as he recognizes, is suggesting that total saving ratios, individual and aggregate, would have risen sharply in the post-war period had they not been compressed by social security. This is, of course, a difficult proposition to evaluate. According to the life cycle model, there is no permanent absolute-income effect on saving ratios. Aggregate saving might rise as a share of income from changes in age distribution, interest rates, wage income profiles, rates of growth of productivity, normal retirement spans, etc. Assessing the direction and magnitude of these effects would require simulation models of the sort we present below. But aggregation effects would not necessarily show up in cross-section scatters like those in Figure 1, whereas the social security effect should. A possible source of an absolute-income effect is that the propensity to bequeath rises with lifetime income, but we do not have evidence on this point.

The foregoing discussion ignores the Keynesian question, and the body of our paper will likewise assume it away. But it is certainly relevant to any operational policy discussions -- for example, the capital formation lost because retirement obligations were not funded, or the increases in investment and future production that would result if they were funded. On the F view, unfunded increases in contributions and benefits increase the national propensity to consume. The assumption that capital formation is correspondingly crowded out assumes that the path of real GNP is constrained by resources or by macro policy judgments of the authorities, in the United States the President, Congress, and Federal Reserve

System. This has not been continuously the case in the 1970s and previous post-war decades. When it was not, the additional consumption need not, given accommodative monetary policies, have crowded out private investment. The other side of the coin is that funding will not automatically be translated into higher investment. It would require actively stimulative monetary policies to induce the investment corresponding to the funding.[1/]

Even without Keynesian problems, it may not be accurate to treat social insurance funding in isolation from other government finance. Under the unified federal budget accounting practices in force in the U. S. since 1967 social insurance receipts and outlays are included in the budget totals and affect the deficits or surpluses that are the foci of fiscal politics. It is not safe to assume that a surplus or deficit in the social security accounts translates dollar for dollar into surplus or deficit for the federal government as a whole. The vanishing of the social insurance trust fund may have been offset at least partially by an increase in other taxes or a reduction in other outlays in order to keep the overall deficit down. Likewise funding might be offset by greater deficit spending in the rest of the budget. Thus the impact of the social security system on the saving available for capital formation depends intermediately on its impact on other fiscal behavior.

1/. This has been eloquently argued in Eisner (1979). See also Tobin (1976).

Relevant Differences between Mandatory Saving and Voluntary Saving.

We turn now to some features of public and private pension plans in the United States which render the mandatory and contractual saving for these pensions less than perfect substitutes for voluntary individual saving. The argument is that voluntary saving will be reduced significantly less than a dollar for every dollar of mandated saving. Thus the rise in the national propensity to consume is smaller than the F model says, and indeed would be negative for fully funded plans.

The underlying motivation for mandatory retirement saving, under public and private plans, has been the popular aspiration for higher standards of living, leisure time, and economic independence in old age. Longer expectancies of life and health have made these objectives more salient. General economic progress has brought them within reach. But why are they not pursued solely by individual voluntary saving? Why do they involve collective saving programs, in which individuals are required to participate as a condition of their employment? These collective vehicles for mandatory retirement saving have arisen and multiplied in number and size at the instance of the participants. They have not been imposed from above without consent. The presumption is that they are not trivial but bring about behavior different from what would happen if they did not exist.

National retirement and survivors' insurance has been adopted and expanded because people really do want to shift consumption to old age.

Workers, through collective bargaining and less formal competitive pressures, have chosen to defer compensation for their work for the same reason. The government has fostered this process by deferring taxes on part or all of the deferred compensation, enabling the individual to gain not only the interest on the taxes but the benefit of a lower marginal tax rate.

Retirement saving plans have a significant insurance dimension. Compulsory membership is efficient in avoiding adverse selection, or the costs of controlling for adverse selection. Risk-averse participants might otherwise save for improbably long survival and for improbably high medical costs. Private insurance against these risks must incur the costs of adverse selection or of controlling for it, as well as the administrative costs of smaller and more variable pools. In this respect the compulsory plans could reduce the total saving of these participants, while increasing their lifetime expected consumption and welfare -- an example that warns us against the facile identification of capital formation effects as welfare effects. On the other hand, risk-loving or uninformed individuals may not on their own provide even actuarially for these contingencies of old age. A civilized society will not let anyone go without subsistence or medical care, even if the inability to pay for them is the result of personal improvidence. This fact, which may in some cases contribute to such improvidence, is a justification for compulsory participation, which increases the total saving of those individuals.

Mandatory retirement saving is in a sense a collective manifestation of the "Christmas Club" syndrome. The phenomenon is that individuals deliberately discipline themselves to save for a future goal, whether Christmas shopping or retirement, by making it costly or impossible to stop doing so. Other examples are the use of mortgage or installment credit to make purchases which some consumers could finance in whole or part by drawing on liquid assets. The rationale is that they fear they will not in fact restore their assets, while the debt repayment contract forces them to do the equivalent saving. In these cases the household seeks to protect its true long-run utility maximization against less valid short-run temptations, self-disciplinary behavior that is no less real for being ruled out of standard economic models.

The assets acquired by mandatory retirement saving are illiquid pension rights, death or disability benefits, and claims to medical care in case of need. They cannot be cashed in advance, or pledged as loan collateral. Their full value is often realizable only by continued participation and contribution. These features impose the intended self-discipline, and they make the mandatory savings considerably less than perfect substitutes for other savings.

Substitution is possible only for households who would otherwise own or acquire more liquid, intertemporally fungible, assets than the pension rights they are forced to accumulate. Many households are in this position, but many are not. The major accumulation of a typical household, other than pensions and retirement annuities, is equity in a residence. This too has limited liquidity. For many households the discipline that illiquidity imposes is that economic reverses, losses of income or extraordinary consumption needs, will be met by squeezing normal consumption outlays rather than by dissaving.

Survey data leave little doubt that liquidity constraints are important determinants of consumption. Otherwise it is difficult to understand why there is not more lifetime spreading of consumption. In 1972-73 families under 25 had on average less than $900 in financial assets. Their discretionary dissaving was only $400, and they were paying a similar amount in insurance and retirement premiums. In an arbitrary commonsense attempt to classify households as liquidity-constrained or simply wealth-constrained, Kowalewski and Smith (1979) found that 65% of the households in the 1963 Survey of Changes in Family Finances (Federal Reserve Board), owning 14% of net household wealth, failed to meet any of the following four tests: (a) ratio of liquid assets to annual consumption plus contractual saving at least 1/4, (b) ratio of noncontractual saving to consumption plus contractual saving at least 1/12, (c) positive net purchases of financial securities, (d) net wealth excluding family home at least 2 times consumption plus contractual saving. They then estimated a classification function involving only demographic, stock, and state variables. Households classified by this function not only in the 1963 Survey but in other cross-sections showed substantial and significant differences in consumption behavior.

Another reason that mandatory and contractual saving for old age is an imperfect substitute for other saving is that the plans are redistributive. For an individual participant, the connection between contributions and the actuarial value of the benefits to be received is quite loose. In federal old age and survivors' insurance, the relationship of an individual's annuities and other benefits to payroll taxes paid on his or her behalf is a complicated nonlinear formula. For example, in 1979 the gross return on the taxes paid on the first $2160 of annual earnings was six times as high as on the taxes paid on taxed earnings above $13,020. The progressivity of this schedule means that those workers who are most likely to have long horizons and liquidity receive a relatively bad deal and have both motivation and capacity for voluntary saving. Those who receive a relatively good deal lack the liquidity to maintain their consumption while paying the payroll taxes. There are similar redistributive effects in many private plans. However, the tendency to reward employees of long tenure at the expense of those of short tenure -- who may receive nothing, or anyway much less than the value of the contributions incident to their employment -- tends to bias the outcome in the other direction.

Social Security and Induced Retirement.

One effect of social retirement insurance seems quite clear. It has led to earlier retirements and longer retirement spans. Although the labor force participation of men aged 65 and over has trended downward in the United States since 1890, the decline accelerated after the introduction of social security. The rate was 54.0% in 1930, 41.8% in 1940, 41.4% in 1950, and fell to 19.3% in 1977. Probably the effect is due less to the pensions per se than to the heavy tax on earnings implicit in the calculation of retirement benefits for persons between the ages of 62 and 72.[1/]

Martin Feldstein (1974) points out that the early retirement effect mitigates the displacement of saving by unfunded social insurance.[2/]

1/. However, as Blinder and Gordon (1979) have pointed out, the U. S. system does include incentives for deferring retirement.

2/. The nature of this effect can be illustrated in the simple Modigliani-Brumberg model. Let the life span be 1, of which the final fraction r is spent in retirement, while income is earned at rate y during the previous interval $(0, 1-r)$. The even rate of consumption is $(1-r)y$. Assume a stationary population, evenly distributed over all ages. Wealth per capita is $\frac{r}{2}y(1-r)$. That is, the wealth/income ratio is half the retirement span. Now suppose an unfunded social insurance system collects taxes of ty from workers to pay benefits of $\frac{1-r}{r}ty$ to the retired. This system does not change the lifetime consumption opportunity of any participant; hence consumption will still be $(1-r)y$ throughout life. It does, however, change per capita wealth excluding "social security wealth," i.e., productive capital. This becomes $\frac{(r-t)}{2}y(1-r)$. Its derivative with respect to t is $\frac{y}{2}\left[(1+t-2r)\frac{\partial r}{\partial t} - 1 + r\right]$, where $\frac{\partial r}{\partial t}$, presumably positive, is the early retirement effect. Assuming $t < r < \frac{1}{2}$, this derivative is negative if $\frac{\partial r}{\partial t} = 1$ and becomes positive only if $\frac{\partial r}{\partial t}$ exceeds $\frac{1}{1 + \frac{t-r}{1-r}}$. Further repercussions arise from the effects of reducing capital and labor inputs.

Working fewer years, the family must save more to support a longer retirement. The result is lower lifetime consumption of goods, but greater consumption of leisure. Alternatively and more realistically, in view of the concomitant upward trend in labor force participation of women younger than 65, the net result is substitution of male retired leisure for female housework.

Effects of the Low Return to Unfunded Retirement Insurance.

The return yielded by a pay-as-you-go retirement plan in a steady state is the natural rate of growth of the economy. This rate of return is generally less than the after-tax real return to private saving in the capital markets. If it is so perceived, participants will wish to save voluntarily to make up the loss.

In Feldstein's seminal article (1974) calling attention to the displacement of capital formation by "social security wealth" (SSW), he estimated a time series of such wealth and found that it carries a significant positive coefficient in regressions explaining personal consumption.[1/] He calculated SSW both gross, GSSW, an estimate of the present value of future benefits, and net, NSSW, which subtracted from GSSW the present value of future payroll taxes. These are aggregate figures at each date, for all taxpayers and beneficiaries.

The regressions also included current and lagged disposable income,

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1/. Since the conference at which we presented this paper in preliminary form, it has turned out that there were computational errors in Feldstein's 1974 calculations; the empirical findings did not survive their correction. See Leimer and Lesnoy (1980). Our following remarks may nonetheless be a relevant comment on the concepts and methods of the study.

from which payroll taxes had already been subtracted. Feldstein suggested that this subtraction roughly justified the use of GSSW in several of the regressions, including the one from which he concluded that social security had halved personal saving. It is, however, surprising that the coefficient of disposable income was the same in the NSSW regressions as in the GSSW regressions. In principle one would have expected the negative effects of payroll taxes to show up in higher coefficients of disposable income when payroll taxes were not removed from social security wealth. Instead the substitution of NSSW for GSSW merely increased the SSW coefficient; the two series share an upward trend, along with many other time series. These results cast doubt on whether the SSW series really represent the conceptually intended variables.

There is a more serious problem. The computations of SSW did not impose the "pay-as-you-go" constraint on the system. It was precisely this feature of the system that Feldstein was, with considerable justice, complaining about. For it is this feature, compared to funding, that results in the alleged crowding-out of capital formation. In Feldstein's calculations, however, consumers expect certain benefits without expecting the taxes to pay for them year by year. He froze benefit expectations at the historical average of the ratio of single-retiree annual annuity to disposable income per capita. (His figure was .41, approximately the level of 1965-70, although the actual figure was .46 in 1960 and has been .48 in recent years.) At the same time, he froze the ratio of payroll taxes to disposable income at the 1971 level. The two freezes are not consistent. As everybody knows, payroll tax rates have been steadily rising and are scheduled to rise further. Otherwise the system cannot stay out of deficit with the present menu of benefits. Feldstein attributed to participants an exaggerated view of their social security wealth.

The unfunded social insurance system cannot sustain a rate of return on contributions in excess of the rate of growth of the system. In its youth the system was growing very fast, as it was expanded to cover more and more of the labor force. Consequently the early beneficiaries were able to enjoy very high rates of return. Now that the system is mature, its real return is limited to the growth of real payrolls, essentially labor force and productivity. Mistaken extrapolation of the past ratios of benefits to contributions could lead participants to under-save, and this is what Feldstein's regressions predict.

Feldstein assumes, quite properly, that the real interest rate available to individuals on market saving, and presumably also on funded private pension contributions, exceeds the real growth rate of the economy.[1/] If the market rate is used to discount future taxes and benefits, then in a steady state the net social security wealth of a young worker beginning his career is negative. The present value of his lifetime consumption will be reduced by this amount. Capital formation will reflect this reduction as well as the substitution of future social security benefits for other saving. The wealth effect can be substantial. Suppose the real interest rate is .04 and the growth rate of the population

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1/. This is not the assumption he always makes. He asserts the opposite in assessing the benefit/cost balance of measures to reduce anticipated inflation. See Feldstein (1979).

is .01. Assume that all active workers at any time receive the same wage, which is growing over time at a rate of .02, and that workers retire for 10 years after working 45 years. Then an unfunded retirement insurance scheme, which each year collects 10% of wages and disburses them in benefits, diminishes the initial human capital of a worker by 2.6%. If workers spread discounted consumption evenly over their lifetimes, aggregate consumption will be diminished by the same percentage. Aggregating this behavior over workers of all ages in a steady state results in a reduction in capital stock from 50% of human wealth to 35% of human wealth. The aggregate "social security wealth" of the population in percentage of its human wealth is 22% gross- and 12% net.

The point of the example is that in principle social security wealth is negatively, not positively, related to consumption and at the same time negatively related to the capital stock. Direct regression of the capital stock on SSW would be a more relevant test of the extended life cycle hypothesis than regressions of consumption.

The Purpose of Simulations.

Regressions of aggregate time series do not seem a fruitful way to investigate the complex stock-flow relationships involved in lifetime saving behavior. If the economy were in a steady state in which households are simply realizing their plans, aggregate wealth and income would be perfectly correlated. It would not be possible, or even conceptually meaningful, to distinguish income effects from wealth effects. Actual observations do not come from steady states, but they certainly contain pervasive trend growth effects. Deviations of measured wealth and income from collinear tracks reflect a mélange of cyclical fluctuations, disequilibrium adjustments, adaptations to new demographic, economic, and policy parameters, errors of observation, and miscellaneous noise. It is hard to imagine how to interpret the resulting coefficients, and especially hard to see how they can be used for thought experiments that try to make comparisons across steady states differing in parameters.

The Ando-Modigliani[1/] equation used by Feldstein (1974) does not distinguish planned wealth from unplanned wealth. The life cycle model does not suggest that consumption behavior will be changed simply because planned saving increases wealth over time by the expected amount, but the coefficient of wealth probably includes some of the common trend of consumption, income, and wealth. To the unknown extent that the coefficient tells the impact of unplanned accretions of wealth, it does not convey information about planned saving behavior -- which is the principal matter at issue in discussions of social security, for example. Finally, aggregate time series say nothing about the important differential impacts of parameter and policy changes on households of different circumstances (even ages!) and tastes.

For these reasons, we think it is fruitful to investigate the issues by simulations, in particular by simulations that allow comparisons of steady states. These also make it possible to consider households differing not only in age but in other relevant characteristics: liquidity, bequest motivation, income level. Such simu-

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1/. Ando and Modigliani (1963).

lations, however "realistic" we try to make their assumptions, cannot tell us about the real world. Their advantage is that they enable us to trace consistently and fully the effects of various changes of parameters and policies. Here we have considered only steady states. The technique could be applied also to disequilibrium adjustments and cyclical fluctuations. The ultimate test would be the congruence of the outcomes of the analog economy of the simulations with both time series and cross-section data.

The Research Strategy.

We have on previous occasions employed simulation analysis similar in spirit to that presented here. Tobin (1967), Dolde and Tobin (1971), Dolde (1973). Simulation analysis, like the more frequently encountered theoretical and statistical research methods, has both advantages and disadvantages.

The principal advantage of simulation analysis over pure theory is that it permits investigation of behavior far too rich to be tractable for theoretical analysis. Pure theory further suffers the difficulty that even when feasible, it may yield indeterminate results. The signs of important relationships may depend on quantitative restrictions on parameters rather than just qualitative assumptions. Simulations may at least give guidance on whether interesting relationships are "large and positive," "near zero", "large and negative", or somewhere in between. Finally, we would observe that pure theory gains its simplicity by assuming a large number of zero restrictions on parameters relating to variables which might be included in the analysis but must be excluded to obtain the simplicity. Thus it is not obvious that theoretical models are uniformly "more general" than simulation models.

The proof of the pudding is in the eating, and statistical investigation thus has an obvious attraction. In too many cases, however, we find it difficult or impossible to discern statistically the behavior of interest. The data often have disappointingly little information content, even in large samples. Likelihood functions often appear to be long, wide, and gently rolling in parameter space rather than sharply peaked. Even where parameter estimate appear to possess statistical significance, extreme caution is called for in their interpretation, especially in inferring causality. In time series, for example, timing of changes in social security taxes and benefits often is influenced by other macroeconomic events which affect spending and saving as well. Thus part of the correlation of consumer behavior with social security changes may not be causal, but rather reflect the dependence of both on other events. In cross-section data, saving, spending, and wealthholding are all correlated with age, as is the immediate impact of changes in the social security system. Finally there is the difficult problem of households' expectations about the social security system. A very large part of the growth of benefits and taxes has ocurred within the last decade or so. Could this sort of growth of benefits have been reasonably anticipated during their working life by the currently retired? To the extent that the current generosity of the system is a "surprise", it should not provide an explanation of saving and wealthholding of the aged.

In contrast with statistical work, of course, simulation analysis makes no formal test of the conformity of a model with some set of data. As with pure theory, the importance of simulation results depends on the plausibility of the assumptions of the model.

A clear advantage of simulation over statistical analysis is the ability to investigate counterfactual events whose effects are not reflected in any data base. This ability is shared with pure theory, but again simulation analysis possesses much greater facility for experiments involving changes in policy variatles and key parameters.

The simulations reported here are for a dynamic steady state economy in which all households possess perfect foresight. There is no uncertainty. Naturally we regard the analysis of steady states as a first rather than a final step in determining the effects of mandatory retirement saving on capital formation. In future research we plan to relax the steady state assumptions and investigate the implications of mandatory retirement saving for the actual U.S. population and economy over the next several decades. In the meantime the current results can give some guidance to the equilibrium to which we might converge if alternative scenarios persist.

Overview of the Model

Households, firms, and the national government comprise the units whose behavior is modeled. Much of the behavior of households and firms is represented as explicit maximizing behavior. The design of private pension plans, however, is simply treated parametrically. Similarly all aspects of government behavior are taken as exogenous, with effects to be inferred as policy instruments are set at different levels.

Households differ in two respects: by age and by "economic group". The three economic groups in the current model differ in labor productivity and in propensity to grant bequests. Since this is a steady state model, those with higher bequest propensities inherit greater bequests from their ancestors. Labor productivity and inheritances/bequests are correlated across economic groups: those with the greatest inherited wealth also have the highest labor productivity. Ability and willingness to invest in human capital could well account for this, although such a process is not made explicit in the model. There is no mobility among economic groups.

Households begin their economic life at age 18. We ignore any age difference between male and female adults. All households exhibit identical fertility and mortality behavior. Because the utility function described below has as its arguments variables expressed "per equivalent adult", the behavior of a cohort of households of a given age and economic group is the same whether viewed as the outcome of a single decision made by the entire cohort or as the aggregation of individual decisions.

The arguments of the lifetime utility function are housing and non-housing consumption for each period. Bequests should appear as arguments of the utility function as well. Computational difficulties, however, necessitated a parametric treatment of bequests and inheritances. Households maximize lifetime utility subject to an exogenous non-property income stream and an interest rate earnable or payable on net worth at each point in time. The non-property income stream consists of labor earnings -- labor is supplied inelastically and there is no unemployment-- social security benefits, private pension benefits, and other government transfer payments. All of these are net of any taxes, as is the interest rate. Non-property income also is augmented by gifts inter vivos and inheritances and later reduced by committed bequests. A second set of constraints limits the set of feasible life cycles in housing and other consumption. Unsecured borrowing cannot exceed some fraction of a year's non-property income.

Because of the dynamic steady state assumptions, only the life cycle plan of the household currently at the formation stage need by analyzed. Consumption, earnings, and wealth holding of other age groups will differ by a factor reflecting only the growth rates of population and labor productivity. Similarly national aggregates can be derived readily from the base household's life cycle.

Firms produce all output except that of owner-occupied housing. There are no costs to adjusting factor inputs, so static profit maximization suffices to describe firm behavior. Firms decide on how much labor and capital to employ and how much output to produce. Full wage and capital rental flexibility guarantee full employment. In a perfectly anticipated steady state, of course, the wage-per-effective-worker/rental ratio is constant.

There is only one production process. Its output can be used as the non-housing consumption good, as government purchases, or as investment in plant and equipment or in housing. The composite good is the numeraire.

Firms pay out the entirety of their sales proceeds. In addition to factor payments for labor and capital rental, they pay taxes and make contributions to private pension plans. There is no depreciation. Firms behave as if none of these taxes or transfers is lump sum. Rather they view them all as being proportional to gross factor payments. Thus there is a payroll tax on employers for social security which is proportionate to the wage bill. The corporate profits tax is included here as a proportional tax on capital rental.

Private pension plans are non-contributory defined benefit plans proportional to earnings in the period from age 55 to 64. Current contributions to pension reserves are viewed as proportional to wage and/or capital rental payments.

The government purchases output, makes general transfer payments and social security benefit payments, and collects taxes. Households pay proportional taxes, not necessarily all at the same rate, on property income, private pension benefits, on inheritances, and on labor income. The latter bears both a personal income tax and a payroll tax for social security. Firms pay proportional taxes on capital rental payments and a payroll tax for social security.

Non-uniform tax rates drive wedges between before- and after-tax rates of return on the various assets in which the public can hold its wealth. Wealth can be held as capital "rented out" to corporations, as owner-occupied housing, and as government debt. Both the social security and private pension systems have cumulative surpluses, which they hold either as government or corporate debt. In this model with uncertainty and transaction costs, all debt and corporate capital are perfect substitutes as stores of wealth and must therefore have equal yields to wealth holders.

Only corporate capital is subject to a tax before its return is distributed. Thus the social return to capital, its marginal productivity, will exceed the social return on other forms of wealth holding in equilibrium. Households pay the same proportionate tax rate on all forms of property income save one. The exception is the use value of owner-occupied housing, which is completely untaxed. Households' desires to arbitrage this tax subsidy to homeowning are less than infinite, however, since housing yields no return other than its consumption value.

Numerical Results

In this section we summarize solutions for the model for eight cases. Appendix A presents the equations and variables of the model. Appendix B indicates the parameter values and exogenous variables for the base case and the changes which generated the other seven cases. Complete solutions for the base case and for the case of fully funded retirement systems appear in Appendix C.

Table 1 provides a key to the eight cases we examined.

TABLE 1.

Definition of Cases Examined

Case 1	Base Case
Case 2	Retirement Systems Fully Funded - both social security and private retirement systems fully funded
Case 3	Social Security Benefits Increased - social security benefits are doubled as a percentage of labor earnings
Case 4	Private Retirement Benefits Increased - private retirement benefits are doubled as a percentage of labor earnings
Case 5	Bequest Motive Increased - inheritances and bequests are increased by 10% as a proportion of labor earnings
Case 6	Unsecured Borrowing Prohibited
Case 7	Borrowing Limits Increased - maximum permitted unsecured borrowing increased by 10% as a proportion of labor earnings
Case 8	Capital Taxes Reduced - rates of taxation on corporate capital, personal property income, private pension benefits, and inheritances all reduced by 10% relative to the rate of taxation of labor earnings

Table 2 - Results of Steady State Simulations

Case	Non-Housing Consumption C	Housing Stock H	Capital Stock K	Household Net Worth W	Net National Product Y	Non-Housing Output YNH	Utility Comparison*
1 Base	596	822	1465	2582	913	852	--
2 Retirement Systems Fully Funded	678	1085	3386	3529	1049	1008	-20%
3 Social Security Benefits Increased	546	709	962	1939	843	773	36%
4 Private Retirement Benefits Increased	582	789	1299	2384	892	829	2%
5 Bequest Motive Increased	629	892	1828	3032	960	904	-7%
6 Unsecured Borrowing Prohibited	606	844	1612	2756	926	868	0%
7 Borrowing Limits Increased	595	820	1450	2564	911	850	-0%
8 Capital Taxes Reduced	591	798	1417	2506	906	844	4%

*Measure of consumption change required to equate utility to base case. Thus a negative entry is an improvement over the base case. See text for explanation.

Both population and labor input remain unchanged across all eight cases. Thus a comparison of absolute levels of variables across cases also indicates proportionate changes in per capita and per-worker experience.

Table 2 indicates the levels of six aggregate variables for the eight cases. The final column of Table 2 presents an approximate utility-based comparison of the base case with each of the other cases. The entries in this column indicate for each case the amount by which non-housing consumption of middle level (group 2) households would have to be changed during ages 18-24 to leave them indifferent between the case in question and the base case. A minus sign (-) indicates a preferred case in which consumption could be reduced during the first seven years. The units are percentages of non-housing consumption levels during those seven years. Thus, for example, households in group 2 prefer the base case to case 3, but would be indifferent between the two if non-housing consumption during ages 18-24 were augmented in case 3 by 36% of its level in the base case.

From Table 2 we observe a high correlation between the ranking of cases on the utility measure and on aggregate consumption. The quantitative differences between aggregate consumption and the utility measures across cases is more complex, most importantly because of aggregation.

Case 2, with fully funded retirement systems, exhibits the greatest difference from the base case. Household net worth is 40% higher than in the base case, but the capital stock is higher by 130%. The difference is the increase in the social security trust fund from 18 to 1195 (Appendix C) and in private pension reserves from 146 to 280 (Appendix C). Cash flow profiles are uniformly higher, as are non-housing consumption profiles for groups 1 and 2. Group 3 rotates its non-housing consumption profile, consuming more before age 35 and less thereafter. Housing profiles are also higher for all economic groups, with group 3 rotating its profile to augment initial housing by a greater proportion. Wealth profiles are also higher for each group for each age. The profile for group 3 is changed greatly, with much more accumulation between ages 35 and 55.

Clearly a society given the choice between cases 1 and 2 -- including as initial endowments the smaller capital stock of case 1 or the larger capital stock of case 2 -- would elect case 2, including the obligation to maintain full funding of retirement benefits. Our current model does not permit assessments of the feasibility or desirability of the transitions between alternative steady states.

Case 3, in which the ratio of social security benefits to labor earnings is doubled, also reflects major differences from the base case. Here, all of the aggregate and individual measures of economic acitivity are lower. The basic change to which households respond is a rotation of the cash flow profile -- higher after age 65 but lower before. Cash flow during the working years is lower because the doubling of social security benefits requires a doubling of social security contribution rates with the trust fund a fixed proportion of net national product. Thus the increase in social security benefits is essentially unfunded. Further, the counterclockwise rotation of the cash flow portfolio both reduces the desire and ability of households to accumulate wealth.

By comparison to cases 2 and 3, the differences of the remaining cases from the base case are more moderate. Because they are smaller to begin with, doubling private retirement benefits relative to labor earnings (case 4) causes smaller changes than a relative doubling of social security benefits (case 3). In the base case, aggregate social security benefits are four times as large as aggregate private retirement benefits (Q = 42.2, P = 9.9 in Appendix C).

Increasing bequests and inheritances relative to labor earnings by 10 percent (case 5) raises all of the aggregate economic indicators. Cohorts receiving larger inheritances can both grant larger bequests and enjoy higher consumption along the way. Again our steady state model is an inadequate vehicle for addressing issues concerning transitions between steady states.

Elimination of unsecured borrowing (case 6) and a modest increase in unsecured borrowing (case 7) cause appropriately scaled changes in the economic aggregates. Clearly the borrowing constraints are binding, or no differences would be observed. Preventing or permitting households to raise early consumption at the expense of later consumption or accumulation of down payment for a house raises or lowers aggregate wealth and capital. In terms of utility comparisons, the disutility associated with tighter borrowing constraints apparently completely offsets the increased utility from higher average consumption.

Reducing capital tax rates by 10 percent relative to other tax rates (case 8) yields surprising results indeed. Wealth and capital stock are both lower, as are the other economic aggregates. Since government outlays are fixed as a proportion of net national product, other tax rates must rise to offset the decrease in capital tax rates. The resulting lower labor earnings profile reduces corresponding economic activity, including wealth accumulation, and more than offsets the increase in real returns from cutting capital taxes.

Appendix A: Specification of the Model

Equations of the Model

Households

Maximize $\sum_i \frac{\alpha_{ij}}{\rho} c_{ij}^{\rho} + \sum_i \frac{\zeta_{ij} h_{ij}^{\rho}}{\rho}$	utility function
subject to $\dot{w}_{ij} + c_{ij} \leq r(w_{ij} - h_{ij}) + e_{ij}$	instantaneous budget constraint
$w_{ij} - h_{ij}(1-m) \geq \tilde{w}_{ij}$	limit on unsecured debt
$e_{ij} = (1-t_v-t_s)\beta_{ij} v_n n_{ij} + q_{ij} + (1-t_b)p_{ij} + z_{ij} - b_{ij}$	non-property earnings = labor + social security + private pensions + other government transfers - net bequests granted
$r = u_h(1-t_u)$	yield on household wealth except housing
α_{ij}, ζ_{ij}	reflect survival probabilities fertility equivalent adult weights time preference, housing, bequest utilities

Production

$Y_{NH} = \theta K^{\phi}(JL)^{1-\phi}$	production, except housing services
$v = (1-\phi)Y_{NH}/L$	marginal product of labor
$u = \phi\, Y_{NH}/K$	marginal product of capital
$L = \sum_i \sum_j \beta_{ij} n_{ij}$	natural labor force, in terms of fully employed males 25 and over
$\dot{J} = \gamma J$	Harrod-neutral technical progress

Identities and Equilibrium

$$K = W - D_s - D_g - D_p - H$$

capital is wealth not absorbed as debt for social security, other government, private pensions or housing (D_s, D_p currently negative in actual US)

$$W = \sum_i \sum_j w_{ij}$$

aggregate wealth

$$C = \sum_i \sum_j c_{ij}$$

aggregate consumption

$$H = \sum_i \sum_j h_{ij}$$

aggregate housing

$$Y_{NH} = C + \dot{K} + \dot{H} + G$$

output, except housing services

$$Y_{NI} = Y_{NH} + u_h H$$

national income

$$\dot{D}_g = G + Z_g - T_g + u_h D_g$$

general government deficit

$$D_g = \dot{D}_j / (\gamma + n)$$

general government debt outstanding

$$T_g = t_v v_h L + t_u u_h (W-H) + t_c uK + t_b P$$

general government taxes

$$\dot{D}_s = Q - T_s + u_h D_s$$

social security deficit

$$D_s = \dot{D}_s / (\gamma + n)$$

social security debt outstanding (possibly negative)

$$Q = \sum_i \sum_j q_{ij}$$

aggregate social security benefits

$$T_s = t_s v_h L + t_p v_h L$$

social security revenues

$$\dot{D}_p = P - X + u_h D_p$$

private pension deficit

$$D_p = \dot{D}_p / (\gamma + n)$$

private pension debt outstanding (possibly negative)

$P = \sum_i \sum_j p_{ij}$	private pension benefits
$X = x_v vL$	provide pension revenues
$v_h = v(1-x_v)(1-t_p)$	household wage
$u_h = u(1-t_c-x_u)$	household return
$0 = \sum_i b_{ij}$	current inheritances = current bequests

A2. Variables of the Model

b_{ij}	net bequests granted by economic group j of age i (negative for net inheritance)
C	aggregate consumption
c_{ij}	consumption of economic group j of age i
D_g	cumulative deficit, general government
D_s	cumulative deficit, social security system
D_p	cumulative deficit, private pension system
e_{ij}	non-property earnings of economic group j of age i
G	government purchases of goods and services
H	aggregate housing stock
h_{ij}	housing stock of economic group j of age i
i	age group
j	economic group
J	state of Harrod-neutral technical progress
K	physical capital stock
L	natural labor force

n_{ij}	labor force of economic group j of age i
Q	aggregate social security benefits
q_{ij}	social security benefits of economic group j of age i
P	aggregage private pension benefits
P_{ij}	private pension benefits of economic group j of age i
r	after tax real return realized by households on lending/borrowing
T_g	general government taxes
T_s	social security taxes
t_b	tax rate on private pension benefits
t_c	tax rate on corporate capital
t_i	tax rate on intergenerational transfers
t_p	tax rate on corporate payroll, on corporations, for social security
t_s	tax rate on corporate payroll, on households, for social security
t_u	personal income tax rate on property income
t_v	personal income tax rate on labor income
u	rental rate on capital gross of all taxes and pension contributions
u_h	rental rate on capital realized by households gross of personal income taxes
v	wage cost, gross of all taxes and pension contributions
v_h	wage rate, gross of personal income and personal social security tax
W	aggregate wealth
w_{ij}	wealth of economic group j of age i

$\bar{w}_{ij}$	lower limit on wealth (possibly negative) of economic group j of age i
X	aggregate private pension contributions
x_v	private pension contribution rate for defined benefit plans, from labor earnings
Y_{NH}	output except housing services
Y_{NI}	national income
Z_g	general government transfers
z_{ij}	general government transfers to economic group j of age i

Appendix B: Parameter Values for Cases

Table B.1 indicates parameter values for the base case. Table B.2 presents those parameters which were changed in each case. Unless indicated in Table B.2, other parameters maintain the same value as in the base case.

Table B1 - Parameter Values for Base Case

NPDS	NINCS	ITER	ITERW	NYVAR	NYAVAR	NYBVAR	ITPRNT	ITWPRT
6	3	910	499	39	60	60	100	0

EPS	EPSW	ADJ	ADJW
0.0010	0.0001	0.5000	0.5000

AGE VECTOR

18.0000	25.0000	35.0000	45.0000	55.0000	65.0000
85.0000					

THETAP	PHI	H	GAMMA	GPOP	DGRAT
11.3000	0.2000	1.0000	0.0200	0.0003	0.0100

GRAT	TVR	TUR	TCR	DSRAT	TSR
0.2300	0.2500	0.5000	0.4000	-0.0004	0.0700

TPR	DPRAT	XVR	XCR	XUR	RHO
0.0700	-0.0032	1.0000	0.0000	0.0000	-4.0000

DNPMT1	DNPMT2	DNPMT3	TBR	TIR
0.2000	0.2000	0.2000	0.1400	0.1000

HEIGHT1	HEIGHT2	HEIGHT3
0.0250	0.1250	5.0000

NB

0.1000	0.2400	0.2800	0.2600	0.2100	0.0600
2.3400	5.7000	6.5800	6.0500	4.8500	1.2900
0.4400	1.0800	1.2500	1.1600	0.9200	0.2400

Table B1 (continued)

BORRAT

-0.2000	-0.2000	-0.2000	-0.2000	-0.2000	0.0000
-0.2000	-0.2000	-0.2000	-0.2000	-0.2000	0.0000
-0.2000	-0.2000	-0.2000	-0.2000	-0.2000	0.0000

ALPHA

5.5800	19.8000	21.0000	4.4900	0.9630	0.6310
16.4000	58.0000	61.8000	13.2000	2.8300	1.8600
1.6600	5.8900	6.2700	1.3400	0.2870	0.1890

KSI

2.1700	7.7200	8.1900	1.7500	0.3670	0.2460
6.4000	22.6000	24.1000	5.1500	1.1000	0.7250
0.6470	2.3000	2.4500	0.5230	0.1120	0.0737

ZRAT

0.0010	0.0017	0.0018	0.0014	0.0011	0.0019
0.0051	0.0036	0.0090	0.0071	0.0057	0.0095
0.0003	0.0005	0.0006	0.0004	0.0004	0.0006

QRAT

0.0000	0.0000	0.0000	0.0000	0.0420	0.4640
0.0000	0.0000	0.0000	0.0000	0.0420	0.4640
0.0000	0.0000	0.0000	0.0000	0.0140	0.1550

PRAT

0.0000	0.0000	0.0000	0.0000	0.0083	0.0976
0.0000	0.0000	0.0000	0.0000	0.0083	0.0976
0.0000	0.0000	0.0000	0.0000	0.0083	0.0976

SHAPE

0.4700	0.4700	0.5300	0.7100	1.0000
0.4700	0.4700	0.5300	0.7100	1.0000
0.1400	0.1400	0.4300	0.5700	1.0000

Table B2	Changed Parameter Values for Other Cases
Case 2	Retirement Systems Fully Funded - DSRAT and DPRAT, respectively the ratios of the negative of the social security and private retirement reserves to Y, become endogenous, taking on whatever values are necessary so that both retirement systems are fully funded.
Case 3	Social Security Benefits Increased - QRAT, the ratio of social security benefits to final average labor earnings, is doubled for each age and income group.
Case 4	Private Retirement Benefits Increased - PRAT, the ratio of private retirement benefits to final average labor earnings, is doubled for each age and income group.
Case 5	Bequest Motive Increased - HEIGHT, the ratio of inheritances to labor earnings during ages 45-54, is increased by 10 percent for each economic group.
Case 6	Unsecured Borrowing Prohibited - BORRAT, the ratio of permitted unsecured borrowing to labor earnings, is set to zero.

Table B2 (continued)

Case 7	Borrowing Limits Increased - BORRAT raised by 10 percent.
Case 8	Capital Taxes Reduced - TUR, TCR, TBR, TIR, tax relatives for TU, TC, TB, TI, are reduced by 10 percent relative to other tax rates.

Appendix C. Solutions for Cases 1 and 2

Table C1 presents the solution for the base case. Aggregate variables appear first, followed by those for age-economic groups.

The first row under each heading indicates the profile expected or planned by a household of economic group 1 currently aged 18. The six columns correspond to the intervals 18-24, 25-34, 35-44, 45-54, 55-64, and 65-84.

The second and third rows correspond similarly to profiles for groups 2 and 3. (Units here are not commensurate with the aggregates, but might represent, say, thousands of dollars per household.) For example, group 3 households currently aged 8 expect to have non-housing of 131.2 an average during ages 45-54.

Rows 4 through 6 show current values aggregated for all households in an age-income cell. Economy-wide aggregates are the sum of these 18 numbers. For example, aggregate non-housing consumption of group 2 households aged 25 to 34 is 80.1.

Table C1 - Solution for Base Case

C	DG	DS	DP	G	K
596.4686	456.3534	-18.2541	-146.0331	209.9299	1464.7970
L	Q	P	R	TG	TS
33.0500	42.1827	9.8830	0.0401	286.5138	41.1979
TB	TC	TP	TS	TU	TV
0.1279	0.3655	0.0335	0.0335	0.4568	0.2284
U	UH	V	VH	W	X
0.1163	0.0738	19.2962	18.5894	2581.8764	2.0198
XC	XU	XV	Y	ZG	KDOT
0.0000	0.0000	0.0032	912.7680	52.0261	29.2901
DGDOT	DSDOT	DPDOT	WDOT/W	H	HDOT
9.1274	-0.3651	-2.9208	0.0200	822.2757	16.4444
YNH	B	TI			
852.1001	255.1343	0.0914			

CONSUMPTION PROFILES, FOR BASE COHORT, THEN BY AGE

1.8979	3.3954	4.6928	5.0909	4.3139	3.8479
6.5083	12.8716	18.1580	19.3070	15.0331	12.6031
31.1222	63.9005	172.6691	131.2058	104.4563	73.1197

1.9835	4.2806	4.8438	4.3022	2.9843	3.9644
33.5850	80.1219	92.5397	80.5596	51.3562	64.1360
10.1646	25.1743	55.6953	34.6496	22.5851	23.5413

CASH FLOW PROFILES

2.0338	3.5531	4.9003	5.3273	5.5343	3.2269
7.1075	13.4395	18.9611	21.6109	23.2319	5.2209
34.4390	67.5701	190.0169	266.9299	414.3115	-485.5955

2.3339	4.9423	5.5806	4.9671	4.2248	4.0337
39.3044	92.3018	106.6182	99.4904	87.5657	32.2230
12.0536	29.3713	67.6242	77.7765	98.8369	-189.6871

SOCIAL SECURITY BENEFITS PROFILES

0.0000	0.0000	0.0000	0.0000	0.2177	1.1863
0.0000	0.0000	0.0000	0.0000	1.0260	5.5492
0.0000	0.0000	0.0000	0.0000	1.0361	5.5558

0.0000	0.0000	0.0000	0.0000	0.1662	1.4829
0.0000	0.0000	0.0000	0.0000	3.8672	34.2490
0.0000	0.0000	0.0000	0.0000	0.2472	2.1702

PRIVATE PENSION BENEFITS PROFILES

0.0000	0.0000	0.0000	0.0000	0.0456	0.2495
0.0000	0.0000	0.0000	0.0000	0.2150	1.1672
0.0000	0.0000	0.0000	0.0000	0.6512	3.4983

0.0000	0.0000	0.0000	0.0000	0.0348	0.3119
0.0000	0.0000	0.0000	0.0000	0.8103	7.2041
0.0000	0.0000	0.0000	0.0000	0.1554	1.3666

WEALTH PROFILES

0.5337	0.4788	0.1538	0.0043	11.8862	0.0000
1.5176	1.0461	-0.4340	15.6581	112.5661	0.0000
10.9094	21.2634	164.8885	1813.9324	6439.5942	0.0000

0.2594	0.6417	0.3432	0.0731	3.7031	7.3334
3.6416	8.1258	1.9364	28.4098	202.4935	342.9101
1.6568	6.1339	27.7095	239.5500	842.3428	864.6121

BORROWING LIMITS

-0.3818	-0.7835	-1.1164	-1.2662	-1.2491	0.0000
-1.8095	-3.7686	-5.3137	-5.9674	-5.8429	0.0000
-5.3760	-11.2821	-15.9491	-18.0777	-17.5118	0.0000

-0.3718	-0.8923	-1.0410	-0.9666	-0.7807	0.0000
-8.6995	-21.1910	-24.4626	-22.4922	-18.0309	0.0000
-1.6358	-4.0151	-4.6472	-4.3126	-3.4203	0.0000

OTHER TRANSFER PROFILES

0.8394	1.1483	1.4667	1.4096	1.3750	1.4020
0.8401	1.1469	1.4658	1.4136	1.3755	1.4005
0.8345	1.1549	1.4619	1.4096	1.3774	1.4020

0.9401	1.5973	1.6703	1.3143	1.0496	1.7525
4.6458	7.8769	8.2420	6.5078	5.1844	8.6436
0.2921	0.5020	0.5203	0.4107	0.3286	0.5476

HOUSING PROFILES

2.9895	4.5776	6.3113	6.3513	6.3525	6.0642
10.2588	16.6358	24.0739	24.3985	23.6775	19.8683
49.0448	81.4272	162.7276	206.8215	164.6500	115.2550

3.1244	5.7710	6.5144	5.3673	4.3952	6.2476
52.9392	103.5535	122.6894	101.8040	80.8871	101.0705
16.0182	32.0798	52.4886	54.6186	35.5998	37.1070

LABOR INCOME PROFILES

1.6597	3.2073	4.5703	5.1835	5.1136	0.8922
7.8657	15.4275	21.7523	24.4283	23.9188	3.3852
23.3685	46.1851	65.2900	74.0038	71.6874	11.4208

1.8589	4.4613	5.2048	4.8330	3.9036	1.1153
43.4973	105.9550	122.3130	112.4611	90.1547	23.9793
8.1790	20.0757	23.2358	21.5623	17.1015	4.4613

INHERITANCE/BEQUEST PROFILES

0.0195	0.0377	0.0606	0.0920	0.1278	-0.2613
0.4621	0.9063	1.4410	2.1679	2.9397	-6.1783
16.3573	32.3282	140.3675	210.9015	358.4211	-554.7152

0.0218	0.0524	0.0690	0.0858	0.0976	-0.3266
2.5554	6.2246	8.1029	9.9805	11.2689	-38.1322
5.7250	14.0524	49.9547	61.4512	85.5039	-216.6872

Table C2 - Solution for Case 2

C	DC	DS	DP	G	K
677.9218	524.4157	-1195.1433	-280.0370	241.2955	3386.4757
L	**Q**	**P**	**R**	**TG**	**TS**
33.0500	50.2844	11.7812	0.0207	310.3952	28.8394
TB	**TC**	**TP**	**TS**	**TU**	**TV**
0.1270	0.3630	0.0197	0.0197	0.4537	0.2269
U	**UH**	**V**	**VH**	**W**	**X**
0.0595	0.0379	22.3153	22.1622	3529.0917	6.7563
XC	**XU**	**XV**	**Y**	**ZG**	**KDOT**
0.0000	0.0000	0.0090	1049.3566	59.7993	67.6845
DCDOT	**DSDOT**	**DPDOT**	**WDOT/W**	**H**	**HDOT**
10.4911	-23.8976	-5.5995	0.0199	1085.3979	21.7025
YNH	**B**	**TI**			
1008.4096	304.0471	0.0907			

2.2836	4.1290	5.7300	6.2285	5.2767	4.4519
7.9398	15.8384	22.4391	23.4472	17.7364	13.9898
37.7997	78.2882	160.3792	120.3543	92.1699	64.5189

2.3867	5.2054	5.9143	5.2635	3.6509	4.5866
40.9722	98.5896	114.3578	97.8348	60.5909	71.1645
12.3455	30.8432	51.7311	31.7839	19.9285	20.7722

CASH FLOW PROFILES

2.4785	4.2452	5.8626	6.3852	6.6323	3.8028
8.5810	16.2550	22.9396	26.1496	28.0741	6.2314
41.4446	81.3421	227.6271	319.4634	495.0872	-579.0459

2.7759	5.9050	6.6765	5.9535	5.0630	4.7536
47.4532	111.6383	128.9891	120.3853	105.8169	38.4596
14.5056	35.3577	81.0091	93.0834	118.1065	-226.1914

SOCIAL SECURITY BENEFITS PROFILES

0.0000	0.0000	0.0000	0.0000	0.2595	1.4142
0.0000	0.0000	0.0000	0.0000	1.2230	6.6149
0.0000	0.0000	0.0000	0.0000	1.2350	6.6228

0.0000	0.0000	0.0000	0.0000	0.1981	1.7678
0.0000	0.0000	0.0000	0.0000	4.6099	40.8269
0.0000	0.0000	0.0000	0.0000	0.2946	2.5871

PRIVATE PENSION BENEFITS PROFILES

0.0000	0.0000	0.0000	0.0000	0.0544	0.2975
0.0000	0.0000	0.0000	0.0000	0.2563	1.3914
0.0000	0.0000	0.0000	0.0000	0.7763	4.1702

0.0000	0.0000	0.0000	0.0000	0.0415	0.3718
0.0000	0.0000	0.0000	0.0000	0.9659	8.5377
0.0000	0.0000	0.0000	0.0000	0.1852	1.6290

WEALTH PROFILES

0.8272	0.8322	0.4626	0.2449	13.3438	0.0000
2.6001	2.3486	0.5712	22.7777	135.5567	0.0000
16.8425	27.8741	733.9648	3065.7251	8211.1379	0.0000

0.4117	1.0458	0.6811	0.3052	4.3937	7.8020
6.3902	15.4554	7.7474	45.5716	257.3913	391.3376
2.6198	8.6612	115.1473	480.8484	1181.4033	1001.8788

BORROWING LIMITS

-0.4552	-0.9340	-1.3309	-1.5094	-1.4891	0.0000
-2.1571	-4.4925	-6.3342	-7.1135	-6.9651	0.0000
-6.4086	-13.4490	-19.0123	-21.5497	-20.8752	0.0000

-0.4432	-1.0636	-1.2409	-1.1523	-0.9307	0.0000
-10.3703	-25.2610	-29.1610	-26.8121	-21.4940	0.0000
-1.9500	-4.7863	-5.5397	-5.1408	-4.0772	0.0000

OTHER TRANSFER PROFILES

0.9648	1.3199	1.6858	1.6203	1.5804	1.6114
0.9656	1.3183	1.6848	1.6248	1.5810	1.6097
0.9592	1.3274	1.6803	1.6203	1.5832	1.6114

1.0806	1.8359	1.9199	1.5107	1.2065	2.0143
5.3400	9.0538	9.4735	7.4802	5.9589	9.9351
0.3357	0.5770	0.5980	0.4721	0.3777	0.6295

HOUSING PROFILES

4.1045	6.4113	8.8307	8.9672	8.7716	8.0056
14.2805	23.7861	34.2054	34.5274	31.8750	25.1559
67.9695	116.2554	206.6152	216.4753	165.7670	116.0369

4.2897	8.0834	9.1148	7.5780	6.0690	8.2478
73.6926	148.0620	174.3233	144.0675	108.8915	127.9652
22.1991	45.8011	66.6448	57.1681	35.8413	37.3587

LABOR INCOME PROFILES

1.9785	3.8233	5.4481	6.1790	6.0957	1.0636
9.3764	18.3906	25.9301	29.1201	28.5127	4.6314
27.8568	55.0555	77.8298	88.2171	85.4558	13.6143

2.2159	5.3181	6.2045	5.7613	4.6533	1.3295
51.8516	126.3051	145.3048	134.0607	107.4701	28.5848
9.7499	23.9315	27.6985	25.7042	20.3861	5.3181

INHERITANCE/BEQUEST PROFILES

0.0232	0.0449	0.0722	0.1097	0.1524	-0.3114
0.5508	1.0803	1.7176	2.5840	3.5635	-7.3640
19.4963	38.5320	167.3044	251.3741	427.2032	-661.1667

0.0260	0.0625	0.0822	0.1022	0.1163	-0.3893
3.0457	7.4191	9.6579	11.8958	13.4314	-45.4498
6.8237	16.7491	59.5411	73.2439	101.9123	-258.2701

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