Volume Title: Financial Aspects of the United States Pension System

Volume Author/Editor: Zvi Bodie and John B. Shoven, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-06281-3

Volume URL: http://www.nber.org/books/bodi83-1

Publication Date: 1983

Chapter Title: Observations on the Indexation of Old Age Pensions

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Chapter URL: http://www.nber.org/chapters/c6034

Chapter pages in book: (p. 231 - 258)

9 Observations on the Indexation of Old Age Pensions

Lawrence H. Summers

A major issue in the design of both public and private pension plans involves the indexation of benefits to price-level changes. A major purported virtue of current public pensions in the United States is that they provide an asset with a fixed real return. This is regarded as important because of the absence of an indexed bond market. It is frequently alleged that the failure to provide indexed benefits is a major weakness of standard private pension arrangements. These views have influenced the recommendations of groups such as the President's Commission on Pension Policy (1980) and the Advisory Council on Social Security (1979). Both these groups, without detailed argument, strongly endorsed the indexation of social security benefits.

Serious consideration of issues regarding indexation requires the careful specification of an alternative to indexing. It is clearly naive to suppose that social security benefit levels would never be adjusted in the absence of indexation or that real benefits would never be adjusted in the presence of indexing. It also requires recognition of three fundamental principles of modern finance. First, as the Modigliani-Miller theorem demonstrates, repackaging risk does not make it go away. Provisions which insure pension recipients against some risks impose these same risks on the bearers of pension liabilities. Second, risk associated with an asset cannot be measured in isolation but depends on the covariance of its return with other economic events. Third, the consumers' objective is to reduce total risk, not to insulate themselves completely from any one source of uncertainty. While these principles are widely recognized, they have not informed many previous analyses of pension policy.

This chapter examines some positive and normative aspects of the inflation indexation of public and private pensions. A major conclusion of

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the analysis is that alternative indexing arrangements may have far less impact on actual patterns of risk bearing than is usually thought to be the case. Insofar as inflation indexing has real effects, there is no presumption that they are beneficial. In particular, the precommitment aspects of public indexing may be quite undesirable. There are sound reasons to believe that voluntarily agreed on, nonindexed private pensions may be efficient. Nonindexed pensions may result in an efficient allocation of risks given the other assets and liabilities of pension issuers and beneficiaries. In this case, indexation would impede the efficient allocation of risks.

Discussions of indexation in most contexts invariably focus only on inflation indexation. The reasons for this narrow focus are not clear. Consumers' objective is to minimize uncertainty about their well-being, not just to be free from inflation risk. It is certainly possible to imagine indexing public or private benefit levels to variables other than price indices. In this chapter I develop an intertemporal cost-of-living index (ICOLI) which is superior to conventional price indices as a way of evaluating the changes in real well-being, associated with changes in wealth. The use of this measure has significant implications for the indexation of pensions and for the question of what assets should be held in pension portfolios.

The plan of the chapter is as follows. The first section analyzes the inflation indexation of public old age pensions. Under standard assumptions of either complete legislative discretion or perfect capital markets, there will be no real effects arising from the indexation of social security benefits. If enough imperfections are introduced for indexation to have real effects, there is no presumption that they will be desirable. I argue that, in the context of public pensions, indexation should be thought of primarily as a kind of "no real benefit cut" precommitment. Such a precommitment can have the perverse effect of holding down the size of the program.

The second section examines issues connected with the indexation of private pensions. Because of the noncoercive nature of private pensions, there are important differences from public pensions. Again, however, it is demonstrated that if capital markets are perfect, indexation of benefits will have no real effects. Once imperfections of a kind which permit indexing to have real effects are introduced, it is exceedingly unlikely that full indexing will be optimal. Indeed, some crude empirical calculations suggest that fixing nominal benefit levels may result in efficient risk sharing.

The third section of the chapter extends the analysis by considering the possibility of indexing pensions benefits to variables other than the rate of inflation. There appear to be other sources of aggregate uncertainty which are more important than inflation. A major source of uncertainty comes from fluctuations in the real rate of return which change the price of future consumption and so raise the sustainable standard of living. The merits of indexing benefits to a price index which includes the price of future consumption are assessed. The practicality of this proposal is examined briefly.

The fourth and final section of the chapter summarizes the results and examines their policy implications. A brief discussion of Robert Merton's proposal that social security benefits be indexed to aggregate consumption concludes the chapter.

9.1 Indexing Public Pensions

This section considers the effects of indexing the benefits in public pensions to the price level. Consideration of the possibility of indexing to an alternative aggregate magnitude is deferred to the third section. The analysis here focuses on the effects of changing the size of the program in response to changes in the price level. The issue of indexing in the design of benefit formulas is not considered.[1]

Since 1972, the social security program has in some sense been indexed to the price level.[2] The indexation scheme first enacted was conceptually flawed and led benefits to rise much more rapidly than prices. The error was repaired in new legislation in 1977, which has been gradually phased in. At present, benefits for current recipients are indexed on an annual basis. In July of each year, benefits are increased by the annual rate of CPI inflation over the preceding 12 months. Several advisory groups, including most recently the President's Commission on Pension Policy (1981), have recommended that the frequency of benefit adjustments be increased.

Arguments in favor of indexing the level of public pension benefits do not appear to be very well developed. The argument seems to be that indexing benefit levels provides insurance for beneficiaries against the effects of inflation. Little attention is given to the possibility that this insurance can be provided through private financial transactions. Frequently the consequences of alternative indexing arrangements for the risk characteristics of tax liabilities are not considered. Without considering these facets of the problem, it is impossible to evaluate the merits of indexing public pension benefits.

For clarity it is useful to consider the necessary conditions for indexing benefits to have any real effects at all. This is most easily done recognizing the following pair of "Indexing Irrelevance Propositions" for public pensions.

Proposition 1: If benefits can be adjusted continuously to desired real levels, indexing arrangements will have no real effects on any economic variables.

Proposition 2: If capital markets are perfect, and if private indexed bonds and nominal bonds exist, indexing arrangements will have no real effects, even if benefits can be adjusted only periodically.

The first proposition is obvious once stated. Regardless of indexing arrangements, real benefits will be set at their desired level at each instant. The form of indexing arrangement will affect whether benefit *changes* are or are not necessary, and their magnitudes, but will have no impact on real benefit levels. A similar argument suggests that in a competitive spot labor market, indexing in wage contracts will have no real consequences. This proposition establishes that for indexation to have real effects, benefits can only be adjusted periodically or that some types of legislated benefit adjustments (i.e., real benefit cuts) are not permitted. These possibilities are considered below.

The second proposition is equivalent to the Modigliani-Miller theorems for indexed bonds proved by Liviatan and Levhari (1977). It can be demonstrated as follows. Assume that a consumer has wealth W_0 which he allocates to consumption and various portfolio assets in order to maximize

$$EU(C,\ W_T) \text{ s.t. } W_T = \Sigma(1 + r_i)A_i + B, \tag{1}$$

where C is consumption, W_T is terminal wealth, r_i is the real return on asset i, A_i is investment in asset i, and B represents real social security benefits, which may be uncertain. Suppose, for concreteness, that asset 1 is the riskless indexed bond and asset 2 is an otherwise riskless nominal bond. Then, when benefits are indexed, in order for them to have the same real value, the condition $B_{\text{nom}} = B_{\text{real}}(1 + r_2)/(1 + r_1)$ must hold.[3] Now, supposing that this condition does hold, consider any feasible allocation (C,A) when social security is not indexed. The same terminal wealth distribution can be obtained if social security is indexed by taking $\overset{*}{A}_1 = \hat{A}_1 - B_{\text{real}}/(1 + r)$, $\overset{*}{A}_2 = \hat{A}_2 + B_{\text{real}}/(1 + r)$ and making no other portfolio changes. A similar argument can be used to show that switching from indexed to nonindexed benefits does not change the feasible set. It follows that indexing has no real effects under the stated conditions. The argument could be extended to consider taxpayers' behavior and show that indexing has no general equilibrium effects.

This proposition is clearly not literally applicable to the real world since indexed bonds do not exist. However, it is an open question whether or not portfolios of assets with near constant real returns can be formed. If so the irrelevance proposition here will continue to hold. Even in the absence of indexed bonds, or the capacity to manufacture them from existing assets, individuals can undo the effects of nonindexation by borrowing to purchase real durable assets. Thus it seems likely that, at least to the extent that individuals have access to the capital markets, they can negate many of the effects of indexing arrangements.

The preceding discussion demonstrates that capital market imperfections in conjunction with rigidities in adjusting benefit levels are a necessary condition for indexation to have real effects. We now consider the case where individuals have no access to indexed bonds or any close substitute and where benefits are subject to infrequent adjustment.

9.1.1 Indexation as Insurance

If a program can be legislatively modified only infrequently, indexation of benefits will provide insurance against unexpected developments between legislative adjustments. The importance of this insurance depends on the amount of unexpected variation in the price level which takes place between legislative adjustments. Table 9.1 reproduces a chronology of legislative changes in social security benefit formulas. It is clear from the table that benefit adjustments are very common, occurring on average every 4 years. It is useful to get an idea of how far out of line benefits can be over intervals of this length. The likely error in forecasts of the average price level over various horizons can easily be estimated. Forecasts based on estimates of expected inflation were generated by applying an ARMA (1,1) process to annual rates of CPI inflation for 1947–75. The root mean square forecast error rises from 1.1% with a 1-year horizon to 4.2% with a 5-year horizon. These numbers do not suggest that indexation mitigates an otherwise important source of uncertainty and may seem surprisingly small. Suppose, however, that one misestimated the annual inflation rate over a 5-year period by 3%. The average error in estimates of the price level would only be 7.5%.

For two reasons, even these figures overstate the importance of any real uncertainties generated by the nonindexation of benefits. First, the timing of benefit readjustments is endogenous. When the price-level innovation is large, adjustment of benefits can be accelerated. This means that large undesired changes in real benefit levels are unlikely. Second, and more important, benefit adjustments can take account of losses or gains suffered during the preceding period. For simplicity, assume that the target level of real benefits is a constant $\bar{b}$. Now assume that benefits are adjusted each period. Then suppose that in each period benefits are set to satisfy the expression

$$E(B_t) = \bar{B} + (1+r)[B_{t-1} - E(B_{t-1})]. \tag{2}$$

It follows that

$$\sum_1^T \frac{B_t}{(1+r)^t} = \sum_1^T \frac{\bar{B}}{(1+r)^t} \frac{(B_T - \bar{B})}{(1+r)^T}. \tag{3}$$

That is, the uncertainty in the present value of benefits received by an individual (the second term in [3]) is much smaller than the uncertainty associated with benefits in any given year.

Assuming that individuals have a capacity to borrow and lend at the

Table 9.1

Act

1977 Modified to distribute total creditable wages in years 1937–50 over 1–14 years, with 4–14 increment years assumed. Table in the Act (as deemed effective for December 1978) relating PIB's to PIA's frozen for workers who attain age 62, become disabled, or die after 1978. Cost-of-living adjustments applicable in year worker attained age 62 and after, or if earlier, year worker became disabled or died applied to December 1978 PIA's. *Effective for June 1979*, increase of 9.9% in *current* benefit levels. *Effective for June 1980*, increase of 14.3% in *current* benefit levels. *Effective for June 1981*, increase of 11.2% in *current* benefit levels.

[Formula applies to AMW computed for period after 1950]

1950 50% of first $100 plus 15% of next $200. *Effective for April 1952.*

1952 55% of first $100 plus 15% of next $200. *Effective for September 1952*, increase of 12½%, but not less that $5 in *current* benefit levels.

1954 55% of first $110 plus 20% of next $240. *Effective for September 1954*, increase of at least $5 (*current* benefit levels increased by approximately 13%).

[Underlying formula appearing (or deemed to appear) in table in the Act]

1958 58.85% of first $110 plus 21.40% of next $290. *Effective for January 1959*, increase of the greater of 7% or $3 in benefit level.

1965 62.97% of first $110 plus 22.90% of next $290 plus 21.40% of next $150. *Effective for January 1965*, increase of the greater of 7% or $4 in benefit level.

1967 71.16% of first $110 plus 25.88% of next $290 plus 24.18% of next $150 plus 28.43% of next $100. *Effective for February 1968*, increase of at least 13% in benefit level.

1969 81.83% of first $110 plus 29.76% of next $290 plus 27.81% of next $150 plus 32.69% of next $100. *Effective for January 1970*, increase of at least 15% in benefit level.

1971 90.01% of first $110 plus 32.74% of next $290 plus 30.59% of next $150 plus 35.96% of next $100 plus 20% of next $100. *Effective for January 1971*, increase of 10% in benefit level.

1972a 108.01% of first $110 plus 39.29% of next $290 plus 36.71% of next $150 plus 43.15% of next $100 plus 24% of next $100 plus 20% of next $250. *Effective for September 1972*, increase of 20% in benefit level. (Provision for future automatic "cost-of-living" increases.)

1973a 114.38% of first $110 plus 41.61% of next $290 plus 38.88% of next $150 plus 45.70% of next $100 plus 25.42% of next $100 plus 21.18% of next $250 plus 20% of next 50. *Effective for June 1974 through December 1974 but never applicable.* Increase of 5.9% in benefit level eliminated by 1973b legislation.

1973b 119.89% of first $110 plus 43.61% of next $290 plus 40.75% of next $150 plus 47.90% of next $100 plus 26.64% of next $100 plus 22.20% of next $250 plus 20% of next $100. Increase of 11% in 1972a benefit levels, *effective in 2 steps: 7%, for March–May 1974; 4% additional, for June 1974.* (Beginning June 1975, subject to automatic "cost-of-living" increase, under modification of 1972 provision.) Plus 20% of next $75, *effective for January 1975.*

129.48% of first $110 plus 47.10% of next $290 plus 44.01% of next $150 plus 51.73% of next $100 plus 28.77% of next $100 plus 23.98% of next $250 plus 21.60% of next $175. *Effective for June 1975*, increase of 8% in benefit level. Plus 20% of next $100, *effective for January 1976.*

Act

137.77% of first $110 plus 50.10% of next $290 plus 46.82% of next $150 plus 55.05% of next $100 plus 30.61% of next $100 plus 25.51% of next $250 plus 22.98% of next $175 plus 21.28% of next $100. *Effective for June 1976*, increase of 6.4% in benefit level. Plus 20% of next $100, *effective for January 1977.*

145.90% of first $110 plus 53.06% of next $290 plus 49.58% of next $150 plus 58.30% of next $100 plus 32.42% of next $100 plus 27.02% of next $250 plus 24.34% of next $175 plus 22.54% of next $100 plus 21.18% of next $100. *Effective for June 1977*, increase of 5.9% in benefit level. Plus 20% of next $100, *effective for January 1978.*

155.38% of first $110 plus 56.51% of next $290 plus 52.81% of next $150 plus 62.09% of next $100 plus 34.53% of next $100 plus 28.78% of next $250 plus 25.92% of next $175 plus 24.01% of next $100 plus 22.56% of next $100 plus 21.30% of next $100. *Effective for June 1978*, increase of 6.5% in benefit level.

1977 For workers who attain age 62, become disabled, or die before 1979: formula same as preceding formula plus 20% of next $435, *effective for January 1979.*

170.76% of first $110 plus 62.01% of next $290 plus 58.04% of next $150 plus 68.24% of next $100 plus 37.95% of next $100 plus 31.63% of next $250 plus 28.49% of next $175 plus 26.39% of next $100 plus 24.79% of next $100 plus 23.41% of next $100 plus 21.98% of next $435. *Effective for June 1979*, increase of 9.9% in benefit level. Plus 20% of next $250, *effective for January 1980.*

195.18% of first $110 plus 70.98% of next $290 plus 66.34% of next $150 plus 78.00% of next $100 plus 43.38% of next $100 plus 36.15% of next $250 plus 32.56% of next $175 plus 30.16% of next $100 plus 28.33% of next $100 plus 26.76% of next $100 plus 25.12% of next $435 plus 22.86% of next $250. *Effective for June 1980*, increase of 14.3% in benefit level. Plus 20% of next $315, *effective for January 1981.*

217.04% of first $110 plus 78.93% of next $290 plus 73.77% of next $150 plus 86.74% of next $100 plus 48.24% of next $100 plus 40.20% of next $250 plus 36.21% of next $175 plus 33.54% of next $100 plus 31.50% of next $100 plus 29.76 of next $100 plus 27.93% of next $435 plus 25.42% of next $250 plus 22.24% of next $315. *Effective for June 1981*, increase of 11.2% in benefit level.

[Formula applies to AIME]

1977 For workers who attain age 62, become disabled, or die in 1979: 90% of first $180 plus 32% of next $905 plus 15% of excess over $1,085. *Effective for January 1979.* (Provision for future automatic increases in bend points, $180 and $1,085, and for future automatic "cost-of-living" increases after eligibility for benefits.) *Effective for June 1979*, increase of 9.9% in benefit level. *Effective for June 1980*, increase of 14.3% in benefit level. *Effective for June 1981*, increase of 11.2% in benefit level.

For workers attaining age 62 in 1979–83 and applying for old-age retirement benefits of dying in or after

Source: Social Security Bulletin, Annual Statistical Suppement, 1980.

interest rate r, in equation (2), the reduction in lifetime risk due to indexing is clearly negligible. Some data on the financial position of the elderly are presented below. They show that most possess at least a small amount of liquid assets. That is all that would be necessary to buffer any fluctuations in real income due to unexpected changes in the price level. Even for individuals with no access to the capital market, there is some margin for intertemporal substitution in the timing of the purchases of durable goods. It thus seems unlikely that the length of the adjustment period constitutes any significant argument for indexation. The data in table 9.2 certainly suggest that there has been no reduction in the variance in real benefit levels in the post-1972 period when social security was indexed. Admittedly this evidence is difficult to interpret, because there has been an upward drift in benefit levels.

9.1.2 Indexation as Precommitment

None of the preceding discussion suggests any large effect of a policy of indexed benefits. Yet the issue seems to be viewed passionately by many interest groups. One plausible explanation of how indexation can have important effects comes from viewing it as a form of precommitment. The government is committed because of political constraints to maintain the level of benefits, however they are denominated. If benefits are indexed, they cannot be cut in real terms. If not indexed, they cannot be cut in nominal terms. This distinction is frequently cited in discussions of tax bracket indexing as well as social security indexing. It may be the result of any political process in which it is difficult to enact legislation because more than a majority is required, or because it is hard to build a consensus among diverse constituencies. In this situation, it is possible to reduce real benefit levels through inflation erosion and inaction but not through actual legislation. Thus the main effect of indexation may be precommitment to a minimum fixed real benefit level.

At first it may seem as if such a policy should be favored by advocates of a larger social security system. Indexation does prevent reductions in real benefit levels through inflation. On reflection, however, the situation is more complex. The optimum level of real benefits legislated will in general be lower if a constraint is imposed precluding future benefit reductions. The nature of the ambiguity can be highlighted in the context of a highly stylized model.

Suppose that optimum level of benefits in period t is given by X_s where X_s is distributed uniformly on the unit interval and is serially uncorrelated. Assume also that the regret associated with setting a benefit level B_s in period t is given by

$$(4)\qquad \begin{aligned} R(\mathbf{B},X) &= X - B \quad \text{if } B \leq X \\ &= a(B - X) \text{ if } b \geq X. \end{aligned}$$

Table 9.2 **Ratios of Primary Benefit for Man Retiring at Age 65 at Beginning of Various Years to Earnings in Year before Retirement (%)**

Year	Low-Earnings Individual	Average-Earnings Individual	Maximum-Earnings Individual
1953	53.5	30.7	28.3
1954	51.9	29.3	28.3
1955	54.8	34.3	32.8
1956	53.8	33.5	29.6
1957	52.3	32.5	31.0
1958	50.8	31.9	31.0
1959	52.7	33.5	33.1
1960	51.8	32.8	29.8
1961	49.6	31.7	30.0
1962	48.8	31.3	30.2
1963	46.8	30.3	30.5
1964	46.4	29.8	30.8
1965	48.9	31.5	32.9
1966	48.1	31.3	33.2
1967	52.1	34.2	27.9
1968	49.7	32.4	28.4
1969	47.1	30.8	24.7
1970	52.2	34.3	29.2
1971	51.5	34.3	29.2
1972	52.3	34.9	33.2
1973	58.4	39.4	35.5
1974	56.3	38.3	30.5
1975	59.7	40.7	28.8
1976	60.6	42.4	31.0
1977	61.8	43.6	32.4
1978	62.1	44.4	33.4
1979	62.1	45.3	34.1
1980	64.2	47.1	29.9

Source: Robert J. Myers, "Summary of the Provisions of the Old-Age, Survivors, and Disability Insurance System, the Hospital Insurance System, and the Supplemental Medical Insurance System" (unpublished manuscript, Temple University, June 1980).

Note: Earnings record for average-earnings individual is the annualized average wage for *all* workers in the first quarter of the particular years. Earnings record for low-earnings individual is $3,200 for 1974; for other years, it is the same ratio to the earnings of the average-earnings individual as prevailed in 1974 (namely, 39.8%). Ratios for the average-earnings individual are lower than for the maximum-earnings one in 1963–66 result because the maximum taxable earnings base remained unchanged in 1959–65. Thus the average earner had almost the same "final" earnings as the maximum earner but had significantly lower "career" earnings.

Let policymakers design the social security scheme to minimize the present value of future regrets. That is, they choose a sequence of values B_s in each period to minimize

(5) $$L = E\sum_{t}^{\infty} R(B_s - X)\beta^{(s-t)}.$$

In the case where there is no precommitment problem, the optimal strategy is clearly to set $B_s = X_s$ in each period and have zero regret. Note that when this strategy is followed, the mean level of benefits is $\bar{X} = 0.5$.

Now consider the optimal strategy when benefits can never be cut. It is immediately obvious that it will never be desirable to set $B_s > X_s$. However, it may be desirable to set $B_s < X_s$. This may be seen as follows. Let $L(\mathbf{B})$ be the expected regret if the optimal strategy is pursued, given that benefits are constrained to be greater than $\mathbf{B}$ in all remaining periods. It follows immediately that if $X_s \leq \mathbf{B}_s$, then the optimal strategy is to set $B_s = X_s$ or to satisfy the first-order condition,

(6) $$1 - \beta\left(\frac{dL}{d\mathbf{B}}\right)_{\mathbf{B} = B_s} = 0,$$

if the value of B_s satisfying this first-order condition is less than X_s. The first-order condition (6) states that the marginal gain from increasing benefits in the current period must equal the marginal cost from imposing tighter constraints in future periods. The first-order condition (6) does not provide a basis for computing the optimum level of B_t, since the form of the function $L(\mathbf{B})$ is unknown.

However, it is possible to characterize the stochastic steady state when the optimal strategy is pursued. This may be done as follows. The optimum feasible strategy at time s is given by some function $B_s = f(\mathbf{B}_s, X_s)$, which is clearly monotone increasing in X_s. The maximum attainable value of X_s will be given by $f(\mathbf{B}_t, 1)$, which as shown below does not depend on $\mathbf{B}$. It is clear that ultimately the value of $\mathbf{B}_t$ must approach this limit. The steady state may then be characterized by solving for $f(\mathbf{B}, 1)$.

Equation (6) reveals that the optimum choice of B^* does not depend on $\mathbf{B}$. It can be solved easily in this case. Suppose $f(\mathbf{B}, 1) = B^*$. Then in all future periods $B = B^*$. If $X < B^*$, the "no-cut constraint" ensures this equality. If $X > B^t$, the equality is ensured by the monotonicity of the function $f(\mathbf{B}, X)$. This means that it is easy to evaluate $f(B^*)$. It is given by

(7) $$E\sum_{0}^{\infty} \beta^t R(B^*) = E\frac{[R(B^*)]}{1 - \beta}.$$

Differentiating (7) and using (6) yields the first-order condition

(8) $$1 - \frac{\beta}{1 - \beta}[B^*(1 + a) - a] = 0.$$

It follows that B^* is given by

$$B^* = \frac{1-\beta}{\beta(1+a)} + \frac{a}{1+a}. \tag{9}$$

Several inferences can be drawn from equation (9). Note first that the steady-state level of benefits B^* can be greater or less than the expected benefit level when full discretion is maintained. By choosing appropriate parameter values in (9), any level of B may be found to be optimal. As the value of the discount factor β increases, the level of benefit declines. This is because when the future counts more highly the cost of constraining one's policy choices is more severe. As one would expect, increases in the value of a also reduce the steady-state value of B.

The stylized model here illustrates an obvious principle that cutting off one's options is undesirable, and a more subtle one that imposing a "no-cut" constraint on a program may reduce its expected funding level. Obviously, the model would accommodate a number of extensions. But it seems unlikely that these qualitative results would be upset by introducing factors such as an upward drift in the expected desired level of funding X_s or allowing it to be serially correlated.

It is difficult to assess the relevance of the effects stressed here. Certainly the current policy debate on social security makes it plausible that the program would be cut in real terms, if this were possible without legislative action. This suggests the importance of the precommitment aspect of indexation stressed here. The failure of Congress to rescind double indexing's effects strongly supports the importance of precommitment effects. Whether or not no-cut commitments have the restraining effects on spending suggested here is more problematic.

9.2 Inflation Indexation and Private Pensions

There are at least two important indexation issues in connection with defined-benefit private pensions. First there is the question of indexing benefits for persons who are already retired. At the present time, most private pensions in the United States provide beneficiaries with level nominal annuities. While adjustments are sometimes made for the effects of inflation, these are rare and relatively small. A second issue is in the calculation of benefits. At present, in most plans, workers' vested benefits are a fraction which depends on years of service and their current salaries. Actual benefits received from a firm depend on a worker's final year salary at that firm. These two aspects of pension indexation are considered separately below.

9.2.1 Indexed Retirement Benefits

It is widely believed that private pensions should offer indexed retirement benefits. For example, the President's Commission on Pension

Policy (1980) "encourages private and state and local pension plans to provide some form of inflation protection for retirees." The failure of private pensions to offer indexed options is a puzzle. Feldstein (1981) suggests that the development of indexed pensions would not have been desirable because workers already had a substantial degree of inflation protection from social security. His analysis assumes that the capital market compensates individuals for bearing inflation risk. The basis for this supposition is not at all clear. Both the issuers and holders of nominal instruments bear risk from inflation uncertainty. There is no obvious reason why the holders rather than issuers of nominal instruments should be compensated for bearing this risk. Indeed, the fact that mean realized returns on bonds and bills have been essentially zero over the last 50 years tends to suggest that the capital market does not compensate individuals for bearing inflation risk.

At the outset, it is useful to consider as a benchmark the special case of a perfect capital market, in the presence of a safe real asset, and unchanging opportunity sets for investors. In this case all individuals in equilibrium will hold some combination of the safe asset and the market portfolio. There is no optimal degree of pension indexing; any form of pension asset is as good as any other. If a firm issues safe real pensions, it will find that its shareholders hedge by purchasing the safe asset. Its pension beneficiaries draw down their holdings of the safe asset and switch their portfolios toward more risky assets. The form of the pension benefit is a matter of irrelevance. This theorem can clearly be proven under much more general assumptions, similar to those that have been used to provide proofs of the generalized Modigliani-Miller theorems. In order to find any effects of alternative indexing arrangements, it is necessary to introduce some capital market imperfections.

The natural imperfection to introduce is a restriction on short sales. This has at least two potentially important effects. First, it may be impossible for individuals to undo the effects of their pension plan. In general, this would require drawing down or selling short their assets held by their pension funds. This consideration, taken by itself, would tend to suggest that efficient private pension arrangements would make benefit levels contingent on the returns on widely traded assets. Second, in general it will be impossible for all individuals to hold the market portfolio. Because of moral hazards, individuals are likely to be locked into holding much more of their wealth in the form of their own homes and human capital than would be included in fully diversified portfolios. This suggests that they would prefer their pension assets to have returns that are negatively correlated with the returns on assets that they are locked into holding.

Hurd and Shoven (this volume) assess the vulnerability of the portfolio of assets held by the elderly to the effects of inflation. They conclude that even when nominal pensions are included, the aged are for the most part well hedged against unexpected inflation. It is likely that their results understate the extent to which the aged are protected from inflation. A very sizable fraction of the wealth of the aged is represented by the gross value of their homes. Both economic theory and empirical evidence (Poterba 1981; Summers 1981*a*) suggest that owner-occupied housing prices should rise much more than point for point with unexpected inflation. This inference is supported by the recent sharp decline in real house prices.

These factors suggest that nominal pension liabilities may in fact reduce the real uncertainties associated with the wealth position of the aged. Of course, efficient pension arrangement cannot be discussed without also considering the risks borne by corporate shareholders. This aspect of the problem is considered below, after a discussion of the role of indexation in vesting provisions.

9.2.2 Indexed Vesting Provisions

Bulow (1982) has made the important observation that in a competitive labor market a worker's marginal product in each period should equal the sum of his wage and his accrual of vested pension benefits. More generally, his argument suggests that some set of market forces determine an optimal time path for compensation. This optimal compensation path will in general be independent of what pension arrangements are made. If pension benefits are vested in nominal terms, they represent a nominal asset to workers and nominal liability to firms. If the rate of inflation rises, the value of the worker's already accrued pension asset declines. There is no reason why this should be associated with higher subsequent compensation any more than one would expect workers' compensation to be increased just because other parts of their portfolio performed badly.

The common argument that pensions are effectively indexed during the accrual phase, because benefits are tied to final year salaries, is wrong, as Bulow (1982) points out. It ignores the fact that wages and pension accruals are determined jointly. Market forces determine a path of total compensation not a path of wages. If inflation increases and pension rules remain static, so that the rate of growth of pension accruals increases, the rate of wage growth will decline.

Thus, under current institutional arrangements pension wealth is a nominal asset for all workers, not just those who have already retired. At current high rates of interest, the value of the asset is likely to be small for most young workers. As just emphasized, we should not expect the nonindexation of vested benefits to have any effect on the path of compensation. Hence there is no reason to expect that indexing pensions would have any effects on patterns of labor turnover or allocative efficiency. Again by the same arguments made above, in a perfect capital market indexation would have no real effects.

Table 9.3 presents some evidence on the balance sheets of different age

Table 9.3 **Composition of Wealth by Age Group, December 31, 1962**
(Percentage Distribution of Dollar Aggregates)

	Age of Head (Years)			
Form of Wealth	35–44	45–54	55–64	65 and Over
Net home	31	33	25	22
Automobile	5	4	2	1
Business	23	23	20	12
Liquid assets	10	11	13	16
Investment assets	22	26	38	47
Miscellaneous assets	9	3	2	1
Total	100	100	100	100

Source: Dorothy S. Projector and Gertrude S. Weiss, *1966 Survey of Financial Characteristics of Consumers* (Washington, D.C.: Board of Governors of the Federal Reserve System, August 1966).

groups. The data suggest that the younger part of the population is likely to be even better hedged against inflation than the aged. This inference is strengthened by the observation that the "net home" item in table 9.3 is likely to involve much more offsetting gross home value and mortgage debt for younger households. This implies that the provision of nominal pensions is unlikely to impose serious risks on young workers.

9.2.3 Risk Bearing by Firms

The question which remains to be examined is the impact of alternative pension indexing arrangements on the risks borne by the ultimate owners of pension liabilities. The proximate owners are corporation. The ultimate owners are mainly corporate shareowners, but also other corporate creditors, and taxpayers through the Pension Benefit Guaranty Corporation. Given capital market imperfections, it is reasonable to expect that corporate shareowners will be less well hedged against inflation than will pension beneficiaries. Data in Blume, Crockett, and Friend (1974) confirm that ownership of corporate stock is concentrated among the very affluent. Hurd and Shoven (this volume) report that inflation vulnerability increases with affluence. This inference is strongly confirmed by the data in table 9.4 on the composition of wealth by income class. The share of liquid assets and investment assets (mainly stocks and bonds) rises sharply with income.

The same point may be made more directly. Despite the fact that pension liabilities are nominal, corporate equity returns are systematically negatively related to unexpected inflation. In Summers (1981*b*) I show that this is quite consistent with rationality on the part of investors. A 1% increase in the permanent rate of expected inflation is estimated to

Table 9.4 **Composition of Wealth for Different Income Classes**
(Mean Amount of Equity in Specified Assets for All Units in Group)

	Total Wealth	Own Home	Auto-mobile	Business, Profession (Farm and Nonfarm)	Portfolio of Liquid and Investment Assets: All	Liquid Assets	Invest-ment Assets	Miscel-laneous Assets
All units	20,982	5,653	644	3,881	9,688	2,675	7,013	1,116
1962 income								
0–2,999	7,609	3,204	154	1,454	2,732	1,455	1,277	65
3,000–4,999	10,025	3,390	399	1,261	4,867	1,707	3,160	109
5,000–7,499	13,207	4,495	629	2,286	4,588	1,872	2,715	1,210
7,500–9,999	19,131	7,075	858	2,279	8,610	2,675	5,934	310
10,000–14,999	28,021	9,566	1,364	4,387	12,424	4,448	7,975	379
15,000–24,999	62,966	15,053	2,041	10,229	32,082	8,824	23,258	3,560
25,000–49,999	291,317	32,528	2,835	61,986	141,733	20,404	121,329	52,237
50,000–99,999	653,223	38,298	2,292	277,383	316,988	37,298	279,691	18,263
100,000 and over	1,698,021	88,248	4,282	286,732	1,224,004	59,382	1,164,622	94,755

Source: Dorothy S. and Gertrude S. Weiss, *Survey of Financial Characteristics of Consumers*, 1966.

reduce the present value of real cash flows to shareholders by 3.46% due to tax effects. This calculation does not take any account of pension obligations. Since in most cases pension plans are overfunded, taking account of pension assets and liabilities would increase the estimated negative effect of inflation. If firms offered indexed pensions, the negative effect would be increased still further.

The discussion in this section suggests that the failure of the private market to develop inflation-indexed pensions is not surprising. In a perfect capital market, indexation arrangements would have no real effects. If capital markets are imperfect, one would expect arrangements to evolve which lead to the sharing of otherwise undiversifiable risks. The holders of pension assets appear to be positioned so that they gain from unexpected inflation. The corporations which issue pension liabilities appear, because of a nonindexed tax system, to be in the position of nominal creditors. This means that efficient risk sharing calls for the issuance of nominal pension liabilities. It is interesting to note that similar considerations can explain why indexed bonds have not been issued.

9.3 Indexing to Other Aggregates

Almost all practically oriented discussions of indexation focus on indexing benefits to the general price level. The motivation for this choice is rarely clearly specified. The implicit argument for price-level indexation seems to be that this provides full insurance because real benefit levels are guaranteed. To state this argument is to realize its limitations. Presumably, we care about the real standard of living of pension and social security beneficiaries, rather than their benefit levels from the programs. Only for individuals wholly supported by a given nonadjustable program is there a potential argument for inflation indexation of benefit levels. The discussion in the preceding section made the point that insuring program benefit levels may actually increase the risk borne by beneficiaries if benefits would otherwise have covaried negatively with the assets in beneficiaries' portfolios.

This raises the more general point that if the goal is to provide insurance to beneficiaries, it will in general be desirable to link changes in benefits to changes in the opportunity set faced by consumers. Benefits should be varied so as to play the role of the hedge portfolios in Merton's (1973) intertemporal capital asset pricing model. Of course, the qualifications suggested in preceding sections about whether indexing can have any real effects apply equally in this context. Similarly, the cost of any insurance is that the insured risks are foisted onto the holders of pension liabilities.

These points may be illustrated in a more formal way. Consider the problem of the representative aged consumer. For simplicity, I assume that the horizon is known with certainty and that future prices are known with certainty, so that there exists a safe real asset. The consumer's problem is to

$$\max \int_t^T U(C_s)e^{-\delta(s-t)}ds \text{ s.t. } A_t + \int_t^T B_s e^{-i(s-t)}ds = \int_t^T P_s C_s e^{-i(s-t)}ds, \tag{10}$$

where A represents assets, B represents benefits, and i is the nominal interest rate. This problem gives rise to an indirect utility function of the form

$$U = V(A_t, i, \mathbf{P}_t, \ldots, P_T, \mathbf{B}_t, \ldots, \mathbf{B}_T). \tag{11}$$

It is not difficult to verify that the indirect utility function (11) is homogeneous of degree 0 in A and the vectors $\mathbf{P}$ and $\mathbf{B}$. If for simplicity it is assumed that the rate of inflation is constant, (11) can be rewritten as

$$U = H\left(\frac{A_t}{\mathbf{P}_t}, i_t - \Pi, b_t, \ldots, b_T\right), \tag{12}$$

where π is the rate of inflation and the lower-case values of $\mathbf{B}$ represent real benefit levels. It is immediately apparent from (12) that changes in the rate of inflation will not affect the attainable level of utility only if, first, they do not affect real benefit levels, $\mathbf{B}_t$; second, they leave the real interest rate, $i_t - \pi_t$, unaffected; and, third, they have no effect on real wealth. Conventional indexing schemes are directed at ensuring that the first of these conditions is met. In the preceding section I considered the implications of the fact that the third condition is unlikely to be satisfied. The analysis here, however, suggests that, if it is to ensure beneficiaries' standard of living, indexing must take account of all changes in real wealth and in the real interest rate.

The effect of changes in the real interest rate is of particular interest. Conventional price indexes try to measure the change from period to period in the cost of attaining some level of utility. Normally this is done by finding the change in the purchase price of a fixed bundle of goods. The logic of this procedure is not clear once one recognizes that consumers "spend" most of their income on future consumption. If the price of a washing machine goes down, a consumer is usually thought better off. Has he not also gained if the price in terms of today's dollars of the bundle he plans to buy next period goes down? This suggests that in evaluating the welfare of the aged some sort of intertemporal price index should be employed.

There is another way of looking at the problem which leads to a similar conclusion. Consider an individual who desires a constant real consumption stream and holds all his wealth in the form of an indexed real annuity. Such an individual is exposed to no real risk because his annuity payments exactly match his consumption stream. However, if real interest rates fluctuate, the market value of such a real annuity will vary. The asset will appear risky when risk is measurable in the standard way. This paradox is easily resolved. When real interest rates rise, the value of the annuity declines and so does the price of future consumption. The value of the annuity measured relative to a proper intertemporal cost-of-living index (as described below) remains constant. The same analysis could be applied to the situation of an individual who owns his home, which fluctuates in value as the real interest rate changes.

Pollak (1975) shows how the standard theory of cost-of-living indexes can be extended to the intertemporal case. My goal here is more modest. In an effort to illustrate the potential importance of changes in the real interest rate, I calculate alternative estimates of a Laspyres intertemporal cost-of-living index. The assumed market basket is a constant stream of real consumption over a 10-year period. The purchase price of such a real annuity is given by

$$\mathbf{P}_A = \frac{\mathbf{P}_t(1 - e^{-r_tT})}{r_t}, \tag{13}$$

where r_t is the real interest rate at time t and T is the annuity horizon. The change in the intertemporal cost-of-living index is given by

$$\%\Delta\ \mathbf{P}_A = \%\Delta\ \mathbf{P}_t + \%\Delta \frac{(1 - e^{-r_tT})}{r_t}. \tag{14}$$

The first term in (14) corresponds to the ordinary inflation rate. The second corresponds to the change in the price of future consumption.

The major problem in estimating the intertemporal price index given in (13) is measuring the long-term real interest rate. In the empirical work reported below, the actual ex post rates of inflation were used in calculating the long-term real interest rate. For periods after 1981, when actual inflation data were unavailable, expected inflation as measured in the Livingston survey was used. These data are described in Carlson (1977). Obviously, the use of such a perfect foresight inflation measure is somewhat problematic. Preliminary investigations using the econometric measures of expected inflation developed in Summers (1981*a*) reached qualitatively similar conclusions.

Estimates of the percentage change in the intertemporal cost-of-living index are shown in table 9.5 along with the rate of CPI inflation. It is clear that movements in real interest rates are an important element affecting the intertemporal index. In the 3 years when CPI inflation was greatest, 1974, 1978, and 1979, the intertemporal index showed only very small increases. This was because the sharp increases in real interest rates reduced the price of future consumption. Increasing real interest rates contributed −7.1% in 1974, −4.7% in 1978, and −6.7% in 1979 to the

Table 9.5 **Alternative Cost-of-Living Indexes**

	$\%\Delta$CPI	$\%\Delta P_A$
1953	0.637	−0.151
1954	−0.501	1.424
1955	0.359	0.357
1956	2.862	1.977
1957	3.019	1.076
1958	1.771	3.672
1959	1.508	0.110
1960	1.478	3.628
1961	0.671	3.034
1962	1.215	1.982
1963	1.661	5.215
1964	1.216	5.645
1965	1.935	4.318
1966	3.348	1.759
1967	3.041	3.768
1968	4.718	4.172
1969	6.103	5.383
1970	5.482	6.114
1971	3.365	10.112
1972	3.423	6.433
1973	8.775	2.656
1974	12.200	5.105
1975	7.013	5.399
1976	4.822	7.604
1977	6.769	8.255
1978	9.032	4.278
1979	13.319	6.638

Note: Calculations described in text. Yearly values were calculated on a December–December basis.

intertemporal inflation rate. Overall, the correlation between the rate of inflation as measured using the standard CPI and as measured using the intertemporal index was only .45. These crude calculations indicate the importance of aggregate factors other than the price level which may affect consumers' well-being.

It is important to be clear about the legitimate uses of an intertemporal price index like the one developed here. The index provides a correct basis for assessing the change in welfare for a given change in prices and interest rates for an individual who has no future income streams. Even here there is a small problem unless individuals are infinite lived, since the length of their horizon is changing. The more serious issue involves future incomes. It would be appropriate to compare the present value of future incomes to the price index developed here. It should be clear that in such a calculation the effects of a change in the interest rate on the present value of future streams and on the price of future consumption would work in opposite directions. The adjustments under consideration will be important only when the duration of the individual's future consumption and income streams differ significantly. The data in Hurd and Shoven (this volume) suggest that only about half of the wealth of the "young aged" is in the form of future streams of income. This suggests that the price index considered here is likely to be very relevant to assessing their well-being.

Once one contemplates the possibility of indexing benefits to a price index of this general type, other possibilities suggest themselves. Why not also index benefits to changes in real wealth which also change the opportunity set, or to developments which affect future income? Efforts to integrate private pensions and social security represent one small step in this direction. Such indexing schemes involve the same issues of discretion and capital market behavior. It does seem clear, however, that there is no strong logic which supports indexation of benefits to the current price level as against other alternatives.

A second implication of these results is that in making portfolio choices the aged should be concerned about real returns relative to an intertemporal price index like that considered here. Assets should be more highly valued if their returns are positively correlated with the price of future consumption. I plan to address this issue in more detail in future research.

9.4 Conclusions

The analysis in this chapter supports three principal conclusions. First, indexation of both public and private pensions is likely to have only minor effects on real economic behavior. The presence of provisions for discretionary adjustment and the workings of capital markets suggest that indexation provisions will be largely neutralized by other offsetting adjustments.

Second, the effects of increased indexation may well be perverse. The precommitment aspect of public indexing means that the ultimate effect of indexing provisions may be to reduce the size of public pensions. The nonindexation of private pensions probably represents efficient risk sharing. It appears that pension beneficiaries are much better hedged against inflation risks than are the bearers of pension liabilities.

Third, if insurance is the motivation for indexation provisions, there is no reason why such provisions should be confined to inflation. Only under very restrictive assumptions will inflation indexing provide full insurance. In particular, an important source of exogenous uncertainty facing the aged involves the price of future consumption. Changes in an estimated intertemporal cost-of-living index diverge significantly from those in the conventional CPI.

In his contribution to this volume, Robert Merton advocates a novel solution to some of the problems discussed here. He proposes that social security benefits be indexed to the level of aggregate consumption. He argues that, in addition to providing inflation protection, such a plan would offer a form of "standard of living" insurance. In general, the level of consumption is likely to be a proxy for the opportunity set facing consumers. This notion is justified formally in Merton (1973) and Breeden (1979).

Merton's proposed social security plan is self-financing and requires only very infrequent adjustment. The self-financing character of the plan reduces substantially the precommitment problems stressed here. Merton's indexing scheme provides for both increases and decreases in benefit levels, so the "no-cut" constraint is unlikely to bind. It also implicitly makes benefit levels depend on both the level of wealth and real rates of return.

There are, however, a number of types of shocks which are likely to affect real consumption but not optimal benefit levels. These include changes in the taste for leisure, changes in demographic composition of the population, changes in life expectancy, and changes in the distribution of income. The importance of these shocks relative to others causing fluctuations in aggregate consumption is an empirical question. If they are significant, it may be preferable to design indexes based on estimated changes in the opportunity set of the representative aged consumer. The intertemporal cost-of-living index presented here represents a start in this direction.

Notes

1. Indexing in the design of the benefit formula may well cause greater horizontal equity.
2. Though the discussion here focuses on social security, it is clearly applicable to other public pensions such as those for veterans and federal employees.
3. This condition is necessary. In order to talk meaningfully about the effects of indexation it must be assumed that benefit packages have equal value in all cases.

Comment John Bossons

The debate about whether indexed pensions could add significantly to the welfare of individuals is difficult to resolve. With respect to the indexing of private pension benefits, the obvious question for an economist to ask is, "If their potential benefits are considerable, why do they not already exist?" The obvious answer pointing to innovation costs and externalities is not really an answer; it is necessary to show both that such costs are substantial and that they outweigh potential benefits to the private innovator. The fact that the creation of an entire set of new financial markets would be required to permit intermediation by financial institutions implies a potential for externalities which can leave a substantial gap between social benefits and the benefits which can accrue to private innovators. Nevertheless, the possible existence of such externalities merely points out a way to rationalize the nonexistence of indexed financial instruments.

Summers argues that such rationalizations are irrelevant because the potential benefits are in fact small for the entire set of individuals participating in private pension plans. While I disagree with his conclusion, he correctly emphasizes the necessity of differentiating between mere redistributions of risk and contracting innovations which reduce nondiversifiable risks for participants in both sides of a financial market. His argument rests on three empirical propositions:

1. Indexation is "merely" a repackaging of risk.
2. Capital markets are sufficiently perfect and complete that most individuals can undo whatever portfolio decisions are made by pension plans, so that generalizations of the Modigliani-Miller theorem can be invoked.
3. The composition of nonpension wealth for pensioners and shareholders is such that nominal pensions are if anything negatively correlated in real terms with the return on nonpension wealth for both pensioners and shareholders.

The last empirical point is in turn based on several empirical "facts": (*a*) the results reported by Hurd and Shoven, in their chapter in this volume, on the "relatively high" extent to which elderly persons are protected from inflation; (*b*) an observed positive correlation with inflation of real returns on assets into which market constraints (transactions costs) are likely to "lock in" individuals; and (*c*) an observed negative correlation with inflation of real returns on shares. Given these empirical "facts" and a focus on single-period portfolio optimization, it is no surprise that indexed private pensions do not exist; the same arguments may be used to rationalize the fact that corporations do not issue indexed bonds. In

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either case, if Summers's arguments were correct, there could be some small social benefit (at least for some market participants) in establishing markets in indexed financial instruments, but these benefits would be unlikely to outweigh the costs of creating the markets.

I do not agree with this conclusion, and want to emphasize the importance of several factors which Summers ignores in this chapter. Both the empirical "facts" and their implications need to be examined more carefully. As with many second-best questions in policy analysis, one's conclusions depend critically on what constraints are taken as given.

The first point I want to make is that the observed correlations of real returns with inflation may be largely due to the distortions introduced by the lack of indexation in the tax system. The magnitude of these distortions is well known, in part due to work by Feldstein and Summers.[1] Assuming a positive correlation of expected and actual inflation rates, these distortions introduce negative correlation with inflation for real after-tax income to shareholders and positive correlation with inflation for the real after-tax return on owner-occupied housing. If the tax system were completely indexed, these tax sources of correlation between real returns and inflation would disappear. It is of course possible to argue, as Summers does, that the observed failure of the private market to develop indexed pensions and/or to issue indexed bonds may be the result of observable correlations between asset returns and inflation. However, to the extent that these are the result of nonneutralities in the tax system, the "efficiency" of nonindexed pensions in the current context is only a second-best form of efficiency. The observed private nonissuance of indexed bonds may be one of the important social costs of the failure to correct the definition of taxable income for errors introduced by inflation. While it may be second best to stay with nonindexed private pensions given a nonindexed tax system, I would rather interpret this conclusion as yet another argument for tax indexation.

My second point is that an ability of the average retired individual to invest in a portfolio that is relatively well hedged against inflation does not imply that there are no potential social benefits from the introduction of indexed pensions. Hurd and Shoven's results imply that there is no pressing inflation-induced redistribution away from the elderly in the aggregate which might "require" indexed pensions (or new government transfer programs) to offset such a redistribution. But to conclude that this implies no potential social benefits from indexed pensions misses the point. Here I want to argue two propositions. First (and less important), I would argue that the portfolio reallocations reported in the Hurd-Shoven chapter (in particular, from stocks and long-term bonds to liquid assets) reflect the results of a welfare-reducing change in investment opportunities resulting from the nonexistence of a market in indexed long-term bonds. Second, the most important missing market is a market in indexed annuities. As Summers emphasizes, it is relatively easy for individuals to modify their asset and debt portfolios in order to "undo" pension portfolio decisions. It is much more difficult for individuals to combine an optimal portfolio with differing desires for bequests.

The most important potential social gain from the introduction of indexed bonds and pensions is that they make possible the development of a private market in indexed annuities. The nonexistence of such a market requires households to save more than they otherwise would, in order to insure against the risk of living longer than expected. While the extent of the aggregate welfare loss resulting from this market failure may be reduced by the offsetting effects on personal savings of tax distortions that reduce the return on savings, it is still true that the distributional effects of the market failure may be substantial. Even taking into account offsetting tax distortions that at least partly neutralize impacts on aggregate saving, the nonexistence of a market in indexed annuities may have a substantial welfare cost.

With incomplete capital markets, the "benchmark" case of a perfect capital market with a safe real asset has little relevance for the policy questions that are at issue. It is of course obvious that in such a benchmark case there is no social benefit from any degree of pension indexing. The problem with putting much stress on this benchmark is that no safe real asset exists. Moreover, the essence of the lifetime planning problem is its multiperiod nature, with an uncertain planning horizon. Analyzing this problem using one-period portfolio models ignores the importance of the insurance components of the capital markets.

Having said this, I must return to the obvious question cited at the beginning of my comment. If the benefits from indexed annuities are potentially significant, why haven't they been created by the market? One possible answer is that markets in indexed bonds over a spectrum of maturities need to be created in order for insurance companies to be able to offer indexed annuities efficiently; the innovation costs in simultaneously establishing an entire set of markets are obviously nontrivial. An alternative answer is that, on the margin, the market is innovating in this respect by starting to offer variable annuities. However, even this innovation is costly, in part because of the number of dimensions along which market demand seems to be differentiated. These dimensions (tilt, combination with put and call options reflected in floors and ceilings, etc.) are partly discussed in Bodie and Pesando's contribution to this volume. I will not pursue them here, other than to note that this multidimensionality makes market research and annuity design harder and hence raises innovation costs.

To summarize, I am arguing that to call indexation merely a *repackaging* of risk is to miss the real potential benefit of indexation. Repackaging is an appropriate way of characterizing the question of the effects of introducing indexed pensions in the absence of the creation of a market for indexed bonds. However, if indexed bonds are introduced along with indexed pensions, the situation is changed in two respects. First, a safe real long-term asset would be provided for investors (such as pension funds) whose preferred habitat is long term. No such asset now exists.[2] Second, the ability to obtain indexed annuities would permit households to insure against the risk of living longer than expected. These two institutional changes would entirely change the attainable risk-return trade-offs faced by households and their private intermediaries.

Up to this point, I have focused my comments on Summers's conclusions regarding the indexation of private pensions, both because of the importance of the problem and because the issues raised lie behind other questions dealt with in his chapter. I turn now to the questions of the index to be used and of the indexing of public pensions.

The choice of index is an important issue, though of secondary importance relative to whether *any* private indexed annuities are offered. It is worth noting that three quite different bases for indexing have been suggested by the various contributors to this volume: (1) a general consumer price index (the conventional alternative); (2) a price index for domestic product (i.e., a consumer price index corrected to exclude the effects of changes in the terms of trade); and (3) an index of per capita consumption (the Merton proposal). The first two are more similar to each other than either is to the third.

Summers makes a number of interesting points in supporting the Merton proposal. I want simply to note that there are a number of sources of changes in per capita consumption, some of which would clearly result in redistribution across generations. For example, a change of taste with respect to leisure/labor choice in the existing working generation would cause redistribution between that generation and the elderly. It is not clear that it is efficient to combine these changes with other changes in average consumption against which this indexation would insure. I agree with Merton's comment that the question is empirical, in that taste changes of the younger generation *may* be an empirically unimportant component of the variance in aggregate consumption. But it is important to recognize that this is an issue, and that within the political process the choice of index may introduce moral hazard considerations.

A final comment on this issue is that one factor which will affect the cost of creating markets for indexed bonds and annuities is the ease with which new contracts can be understood by potential buyers. Index-linked contracts are relatively easily understood by market participants if the index is the familiar consumer price index; they will for some time be less easily understood (and so harder to introduce) if the index is per capita aggregate consumption. Even if a per capita consumption index were preferable ignoring transitional costs, this benefit could be more than offset by higher innovation costs.

The issues Summers raises concerning the indexation of public pensions are very different, and basically are concerned with the effect of indexing on the politics of determining real benefit levels. As such, the relevant questions involve models of the political process.

I do not agree with Summers's position, but want to note that there are two ways of looking at this, depending on one's relative weighting of advantages and disadvantages as well as on the extent to which a public pension scheme is funded. The advantage of defining benefits (and contributions) in real terms is that a political decision to change these terms is clearly identified as a real change and not confused by being mixed up with the inflation-induced real changes that would occur in an unindexed public pension scheme in the absence of political decisions. This has two effects. It enhances political accountability, through helping to clarify public understanding of the issues. It may reduce the uncertainty of future real benefits and contributions, although this is arguable. These issues are the same as the arguments for indexing tax rates. The disadvantage is the point made by Summers: namely, that there is inevitably a ratchet effect on benefits (and contributions) that is more binding in an indexed scheme. There seems to be widespread evidence of demand for ratcheted indexing. This is reflected in the design of private contracts discussed by Bodie and Pesando as well as in the design of public plans.

The weights I give to these offsetting factors may be conditioned by my nationality. Canada's public pensions are funded to a greater degree than is social security in the United States; in this case, revealed social preference has traditionally given more weight to certainty. In the case of a nonfunded scheme, the size of the future transfers is uncertain whether public pensions are indexed or not.

In conclusion, I want to stress the interaction between the provision of indexed private pensions and the political demand for publicly administered pensions. One of the relevant indicators of the demand for indexed pensions is the extent to which political pressures for the expansion of public pensions are increased during inflationary periods. Such expansion has occurred in the United States (even if accidentally, through superindexation), and political pressure for such expansion has built up Canada. One of the major potential efficiency losses from the nonindexation of private pensions may occur from a consequent expansion in unfunded public pensions (with consequent potential effects on aggregate private savings) or in funded public pensions (with a consequent shift in control over investments from the private sector to the state). In this connection, the public's perception of the issues may well underrate the extent to which indexation of pensions may be achieved in the private sector through the creation of new markets for indexed bonds and annuities. Efficiency gains from private pension indexation may include the prevention of inefficient political responses to public perceptions; these gains are no less important if the public perceptions are wrong.

Note

1. See, for example, chapters 8 and 9 in Feldstein (1983).
2. The closest existing asset is a portfolio of Treasury bills; see Fischer's chapter in this volume. Treasury bills are an inefficient substitute for a safe real long-term asset for two reasons. First, the ex ante variance of real returns on bills is nonzero. Second, the expected return on bills is held down by their liquidity; in effect, long-term investors are forced to pay for an inefficient degree of liquidity in their portfolios.

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