HOW WOULD FINANCIAL RISK AFFECT RETIREMENT INCOME UNDER INDIVIDUAL ACCOUNTS?

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Executive Summary

A popular proposal for reforming Social Security is to supplement or replace traditional publicly financed benefits with a new system of mandatory, defined contribution private pensions. Proponents claim that private plans offer better returns than traditional Social Security. To achieve higher returns, however, contributors are exposed to extra risks associated with financial market fluctuations. This *issue in brief* offers evidence on the extent of these risks by considering the hypothetical pensions U.S. workers would have obtained during the past century if they had accumulated retirement savings in individual accounts.

The hypothetical workers are assumed to have identical careers and to contribute a fixed percentage of their wages to private investment accounts. When contributors reach retirement age (assumed to be 62), they convert their account balances into level annuities, which provide a fixed stream of annual income for life. Contributors differ only with respect to the stock market returns, bond interest rates, and price inflation they face over their careers. These differences occur because of the differing start and end dates of workers' careers.

The analysis demonstrates that pensions under private plans would usually have been adequate, but that financial market risks are empirically quite large. For example, for workers investing all of their contributions in stocks, the average pension obtained was about 53 percent of peak pre-retirement earnings but potential outcomes ranged from about 20 to 110 percent of earnings. This striking difference is due solely to differences in stock market returns and in the interest rate used in determining annuity charges. Stock market and interest rate volatility mean that workers who follow

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an identical investment strategy but who retire a few years apart can receive pensions that are startlingly unequal. For example, workers retiring in 1969 would have received a pension equal to nearly 100 percent of their pre-retirement earnings, while workers retiring just six years later in 1975 would have received only 42 percent.

Workers could reduce their risk by following a more conservative investment strategy of investing half of their contributions in stocks and the other half in bonds. However, while this approach succeeds in significantly reducing the variation in potential outcomes, the size of annual pensions would typically be about one-third lower than for workers investing solely in equities.

Finally, after workers retire, they face another risk—price inflation. While Social Security protects against this risk by indexing benefits to inflation, workers who purchase private annuities are rarely protected against inflation. All workers retiring after the mid-1930s suffered significant losses in purchasing power during retirement. For example, the real value of a pension for a worker retiring in 1966 dropped by over two-thirds between ages 62 and 80. To protect themselves against price inflation, retired workers could continue to rely on the stock market—either directly by investing some of their retirement nest egg in stocks or by purchasing a variable annuity that is linked to a portfolio that includes stocks. However, this decision would substantially increase the investment risk to which the retired worker is exposed, making the amount of pension income uncertain from year to year.

Some of the financial risks described above would also be present in Social Security if reserves of the system were invested in private securities, but a public system has one important advantage over private pensions. Because Social Security is backed by the taxing and borrowing authority of the government, it can spread risks over a much broader population of potential contributors and beneficiaries, including workers in several generations, reducing the financial risks faced by covered workers.

Introduction

The United States, like all major industrial countries, faces challenges connected with population aging. Over the coming decades, low birth rates and longer life spans will increase the number of retirees relative to the number of workers by about 40 percent. As this population shift occurs, the cost of paying for pension and health benefits will rise, boosting tax burdens and threatening the government's ability to finance other obligations. The anticipated surge in public retirement costs has made many voters and policymakers receptive to the idea of replacing part or all of the Social Security system with private pensions organized around individual retirement accounts. Champions of this reform point to the experience of countries such as Chile and the United Kingdom, which have moved in whole or in part to a system of individual accounts.

The first part of this *issue in brief* describes the differences between public and private systems and considers the main economic and political arguments for privatization. The second part provides evidence on the financial market risks inherent in a private system by considering the hypothetical pensions U.S. workers would have obtained between 1911 and 2000 if they had accumulated retirement savings in individual accounts.

Public and Private Pensions

The main goal of a pension program is to provide replacement for labor earnings lost as a result of old age, premature death, or disability. The usual way developed countries achieve this goal is with mandatory, public defined benefit systems financed under the pay-as-you-go principle. Because pay-as-you-go systems can provide generous benefits to early contributors at modest cost, they were both politically popular and hugely effective in reducing old-age poverty within a few decades after they were established. Unfortunately, the pay-as-you-go financing method is encountering serious problems in the U.S. and elsewhere

due to the large anticipated increase in the number of retirees relative to workers. In addition, between 1974 and 1995, a slowdown in the growth of labor productivity and real (i.e., inflation-adjusted) wages also slowed the expansion of the tax base used to finance the U.S. system.

The private alternative. Privatization is based on a simple idea. Instead of contributing to a collective, pay-as-you-go retirement program, workers would be required to build up retirement savings in individually-owned and directed private accounts. Workers could withdraw their funds from the accounts when they became disabled or reached the retirement age, and their heirs could inherit any funds accumulated in the account if the worker died before becoming disabled or reaching the retirement age. At the time a worker chose to start receiving a pension, some or all of the funds in the worker's account would be converted into an annuity—a stream of annual payments that lasts until the beneficiary dies. In most privatization plans, workers would be free to decide how their contributions were invested, at least within broad limits.

Private defined contribution pension plans differ from public systems in two important ways. First, the worker's ultimate retirement benefit depends solely on the worker's contributions and the success of the worker's investment plan. Second, in a private system, workers' pensions are paid out of accumulations of their own previous savings—i.e., the pensions are funded in advance of the workers' retirements. Advance funding implies that the savings accumulation in a private plan would be many times larger than the reserves needed in a pay-as-you-go public system.

In addition to these structural differences, moving from a pay-as-you-go system to one based on advance funding would entail sizable transition costs. Money must be found to pay for existing pension liabilities at the same time that workers will be asked to contribute to new private accounts. Because young workers will be required to finance pensions for retired workers and active workers near retirement, they may resist being forced to pay for their own retirement pensions as well.

Claimed advantages of a private system. Privatization potentially offers both economic and political advantages over a pay-as-you-go public system. If workers are permitted to invest their retirement savings as they choose, many will benefit by investing in portfolios tailored to their individual taste for financial market risk. In contrast, workers enrolled in a single public system are obliged to accept the portfolio choices of that system.[1] Even more important, proponents of privatization claim that workers will receive larger pensions and the economy will grow faster under a private rather than a public retirement system.

Privatization proponents suggest that workers in a funded system could reliably earn 4 percent or more a year on their contributions if these funds were invested in a mix of stocks and bonds. Under a mature pay-as-you-go public system, the rate of return is equal to the annual growth of the workforce plus the annual growth in real wages.[2] Due to the expectation of slow labor force growth and modest future growth in real wages, the expected real rate of return for workers who will retire in coming decades may be 1 percent or less in the U.S. and other industrialized countries.

Moving to private individual accounts is not essential for obtaining better returns, however. The higher return promised by private systems depends on adopting a new retirement saving strategy (advance funding) and a more aggressive approach to investing pension reserves. Both of these changes can also be accomplished by reforming the existing public pension system. Public pension systems could shift toward advance funding of pension obligations and could invest the new reserves in equities and corporate bonds.[3]

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[1] Of course, workers who wish to save more for retirement than the amount they save in the public system can choose to invest their private funds in a way that offsets the portfolio choices of the system. However, empirical studies of saving behavior suggest that, for a large percentage of workers, the overwhelming share of household saving takes the form of a home purchase and contributions to the public pension system. Many worker households have few assets aside from their home and pensions and thus cannot offset the portfolio choices of the public pension program.

[2] See Samuelson (1958) and Aaron (1966).

[3] If the public system invested in the same mix of assets that workers collectively would have chosen for their own individual accounts, the gross rate of return on public reserves would be the same as on assets in the private account system. In fact, the net return on worker contributions would almost certainly be higher in the public system, because the lower administrative cost of a collective system would allow workers to receive a larger percentage of the gross returns.

Many advocates of privatization also argue that full or partial privatization will boost saving rates. With increased saving, income growth might accelerate, making it easier for the nation to support a larger retired population. Again, however, privatization is not necessary to achieve this goal. The same increase in saving would occur if the public retirement system moved away from pay-as-you-go financing toward advance funding.

Political feasibility. Even if long-run rates of return and national saving could be increased within existing public pension systems, critics are skeptical that the funds accumulated within a public fund would actually be saved. They fear that governments would use the funds to finance deficits in other government accounts or to increase non-pension public spending. Even if the funds were saved, opponents of a funded public system fear that politicians' investment decisions would be guided by political rather than economic considerations, reducing the yield of the investments.[4] In addition, if retirement asset accumulation took place within a single public fund that owned shares in thousands of companies, public officials would have to decide how these shares should be voted, raising concerns that these decisions might be determined by political rather than economic criteria. Many advocates of privatization are distrustful of public officials' ability to vote wisely in corporate elections.

Riskiness of Pensions

A public pension system enjoys one important advantage over a private system with individual accounts. Because its benefit promises are ultimately backed by the government's power to tax, the public system can spread risks across a broader population, including workers who have not yet entered the labor force. In a private individual account system, each worker's pension depends on the level and pattern of his contributions and the success of his investment strategy. Workers who claim pensions after a long period of low returns will receive small pensions; workers who retire after periods of exceptional returns will collect large pensions.

Workers enrolled in a defined contribution pension plan face three kinds of financial market risk. First, they are exposed to the risk that the real return on their contributions may fall below the historical norm over the course of their working careers, which could leave them with too little savings to finance a comfortable retirement. Second, workers who want to ensure they will not outlive their assets may find it expensive to purchase annuities, because the market price of annuities fluctuates.[5] Finally, workers who buy level nominal annuities—which pay a fixed amount each year—are subject to inflation risk. If inflation turns out to be unexpectedly high, the worker may reach advanced old age with very little income and face destitution.

Even though financial market risks are minimal in a public system like Social Security, public systems are still subject to political, economic, and demographic risks. For example, slow wage growth deprives the system of needed taxes, which may force legislators to reduce pensions. A sharp decline in fertility slows the growth of contributions without changing the need for funds to pay for benefits in the short run. Future voters might resist paying higher taxes to support rising benefit costs. Each of these risks can potentially threaten future benefits. A private individual account system also faces the same risks, however, including the political risk. Legislatures can change the terms under which contributions to individual accounts are calculated, accumulated, redeemed, or taxed, affecting the net value of individual retirement annuities.

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[4] However, evidence from the behavior of state and local government pension plans (Munnell and Sundén 1999), suggests that political considerations have little impact on the expected rate of return of their investments.

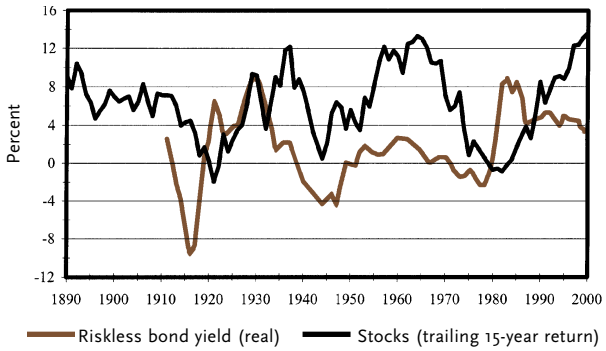
[5] The market price of annuities depends on four factors: (1) a person's expected life span when he or she purchases an annuity; (2) the amount of adverse selection among the population buying annuities; (3) the profit requirements needed to induce insurance companies to offer annuities; and (4) the market rate of interest at which insurance companies can invest their reserves. Even assuming that mortality risk among workers at the same age is identical, adverse selection among potential annuity buyers is negligible, and insurance companies would sell annuities at zero profit, workers will still pay varying prices for annuities over time because of fluctuations in market interest rates.

Effects of Financial Market Fluctuations

The remainder of this *brief* focuses on financial market risks affecting the value of pensions under a private defined contribution plan. The size of these risks is relevant to considering whether an individual account pension system can deliver dependable income replacement in old age. To assess these risks, it is necessary to calculate the value of accumulated savings available to workers at retirement, the initial annuities that they can purchase given their savings and market interest rates at the time they retire, and the real value of annuity payments over their retirements. The calculations are based on historical stock market prices and dividends, bond market returns, and price inflation in the United States for the period since 1871.[6]

Figure 1 shows real U.S. stock and bond returns over the past century. Because stock market prices fluctuate so much from year to year, the figure shows the annual rate of return on a dollar invested in the stock market 15 years before the indicated year. This method of calculation smoothes out much of the annual variability in real returns, but it still illustrates the wide variability of returns over different 15-year periods. The 15-year trailing return was negative in 1921-22 and 1980-82, but it exceeded 12 percent in the mid-1930s, 1960s, and late 1990s.

Figure 1: Real Stock and Bond Returns, 1890-2000



Source: Author's calculations using data from Standard and Poor's Composite Stock Price Index (from Schiller (1989) and updated through 2000), Federal Reserve Bank of St. Louis, and U.S. Bureau of Labor Statistics.
Note: For details on calculations, see footnote 6.

U.S. stocks have produced substantially higher average returns than bonds over the past century. In the period since 1910, the average annual real rate of return on stocks has been 7 percent.[7] The average real return on riskless bonds was only 1.6 percent in the same period. In exchange for higher expected returns, owners of stocks must accept considerably greater short-term risk. For example, the standard deviation—which measures the variation from the average—was 18.7 percent for annual stock returns but just 3.8 percent for bond returns between 1910 and 2000.

In order to calculate the effects of stock and bond yields on workers' pensions, it is necessary to make several assumptions. The analysis is based on 90 hypothetical workers. The first worker enters the workforce in 1871 and begins receiving a pension at the start of 1911; the last one begins

[6] Stock market data are based on the Standard and Poor's Composite Stock Price Index for January dating back to 1871. These stock data and some of the price and interest rate data are taken from Chapter 26 ("Data Appendix") of Shiller (1989), with most series updated through the beginning of 2000. (See http://www.econ.yale.edu/~shiller/chapt26.html.) Estimates of the long-term government bond rate are based on the average market yield on U.S. government bonds with a maturity of at least 10 years. These data are published by the Federal Reserve Bank of St. Louis for years back through 1924. (See http://www.stls.frb.org/fred/data/irates.html.) For the period from 1906 through 1923 the author formed an estimate of the riskless long-term bond rate using Macaulay's estimates of the yield on high quality railroad bonds and adjusting for default risk. To calculate real stock and bond returns, this *brief* uses Bureau of Labor Statistics (BLS) estimates of the January producer price index for finished goods for the period from 1871 to 1912. Starting in 1913, the BLS began estimating a consumer price index for urban workers. For the simulations in this *brief*, these two series have been spliced together to form a price level series for the entire 1871-1999 period. Calculations that require a projection of the price level after 1999 assume annual inflation of 2.5 percent starting in 2000. For additional details about the calculations, see Burtless (2000).

[7] The average rates of return used in this *brief* were calculated as geometric means.

working in 1960 and collects a pension at the start of 2000. All workers are assumed to have identical careers and life expectancies. They are assumed to enter the workforce on their 22nd birthday and to work for 40 years until the day before their 62nd birthday. During their careers, workers contribute a fixed 6 percent of their wages to private investment accounts.[8] Wage growth in the economy at large is assumed to average 2 percent a year after adjusting for inflation.[9] When contributors reach retirement age (62), they convert their retirement savings into level annuities. In determining the price of an annuity, an insurance company assumes it will be able to invest the worker's funds at the long-term riskless bond rate prevailing at the time of purchase. The 90 workers differ from one another only with respect to the stock market returns, bond interest rates, and price inflation they face over their careers. These differences occur because of the differing start and end dates of the workers' careers.

In light of the wide differences between stock and bond returns, workers' decisions about how to invest their pension savings can have a large effect on their pension accumulations by the time they retire. To investigate the impact of portfolio choice, this *brief* calculates pensions under two different contribution allocation strategies: 1) 100 percent stocks; and 2) 50 percent stocks/50 percent bonds.[10] All stock dividends are reinvested in stocks, and all bond interest payments are reinvested in newly issued long- or short-term bonds. The income flows from both kinds of assets are assumed to be free of individual income taxes at the time they are reinvested.

Simulation results. The value of defined contribution pensions can be calculated in a variety of ways. This *brief* relies on the replacement rate, which measures real pension income as a share of workers' real pre-retirement earnings. "Pre-retirement earnings" is defined here as the worker's average earnings between ages 54 and 58, when wages are at their lifetime peak. For a given worker, the replacement rate can differ depending on when during retirement it is measured. This *brief* estimates the replacement rate at the age workers enter retirement (age 62) and also at successive ages over the workers' retirement.

Figure 2 shows workers' initial replacement rates under the two alternative investment strategies described above. The top line in the figure shows replacement rates obtained by workers who invest all their pension contributions in U.S. stocks. The lowest initial replacement rate under this strategy, about 20 percent, was obtained by the worker retiring in 1921; the highest replacement rate, over 110 percent, was obtained by the worker retiring at the start of 2000. Since both workers have identical expected life spans and career earnings patterns, the striking difference in their replacement rates is due solely to differences in stock market returns and in the interest rate used by the insurance company to determine annuity charges.

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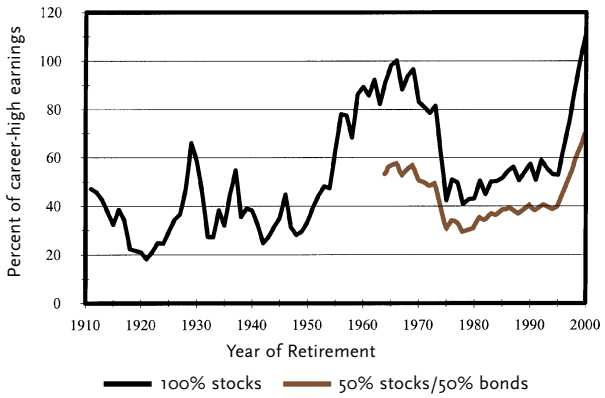
[8] Some proponents of an individual account pension system believe that a contribution rate as low as 6 percent is sufficient to provide an adequate retirement income. To calculate the pensions that would be produced by a lower contribution rate, readers can multiply the predicted pensions in this *brief* by an appropriate factor. For example, a 3-percent contribution rate would result in a pension in a particular year that is exactly one-half the pension shown for that year in Figures 2 or 3.

[9] The assumed rate of economy-wide wage growth has important effects on some of the calculations. With a slower assumed rate of growth, pension contributions and investment returns early in a worker's career become relatively more important in determining his pension, because earnings when the worker is young represent a larger percentage of the worker's lifetime wages. At the same time, with slower wage growth it is easier to attain a high pension replacement rate, where the replacement rate is defined as the real value of the pension divided by the worker's real average wages near the end of his working career. In the absence of economy-wide wage growth, these workers are assumed to have a lifetime path of real earnings that matches the age-earnings profile of employed U.S. men in 1995. Estimates of annual earnings by age and gender can be found in U.S. Census Bureau (1996).

[10] Under the latter strategy, workers allocate 50 percent of their contributions to stocks and 50 percent to bonds. They do not rebalance their savings portfolio to maintain a 50-50 split between stocks and bonds, however. A third allocation strategy—100 percent bonds—was also examined, but is not reported in detail here. Not surprisingly, the risks and returns of this approach are significantly lower than under the other two investment approaches. Interestingly, a 100-percent bond portfolio would actually produce lower expected rates of return than are projected for most workers under the existing Social Security system.

Figure 2: Real Replacement Rates for Alternative Investment Strategies



Source: Author's calculations.
Note: "Replacement rate" is the worker's initial (single-life) annuity divided by his average real annual earnings when he was 54-58 years old.

Summary statistics for some of the results presented in Figure 2 are displayed in Table 1. This table summarizes the outcomes for the 90 retiring workers under the assumption that all contributions are invested in stocks (i.e., the top line in Figure 2). The first column in the table shows the distribution of outcomes for workers who purchase a single-life annuity (i.e., an annuity that ends when the retired worker dies). The mean initial replacement rate is 53 percent, and half the replacement rates are between 35 and 66 percent. The second column shows the same set of statistics for workers who purchase a joint survivor annuity (i.e., an annuity that ends when both the worker and spouse die).[11]

The lower line in Figure 2 reflects replacement rates for single male workers who invest half of their pension contributions in U.S. Treasury bonds.[12] Workers who invest half their contributions in bonds receive an initial replacement rate that is typically about two-thirds that of workers who invest solely in equities. In comparison with stock investors, the best relative performance of bond investors occurred for workers retiring in the early 1980s, when U.S. stock market prices were very depressed. Even in that year, however, a pension based on a portfolio consisting entirely of bonds would have provided just one-half the pension provided by a portfolio consisting solely of stocks and only two-thirds of the pension provided by the portfolio generated by a 50 percent stock/50 percent bond investment strategy.

Table 1: Initial Replacement Rates of Male Workers Retiring after Forty-Year Careers, 1911-2000

	Initial Replacement Rate (percent of career-high earnings)	
	Single Life Annuity	Joint Survivor Annuity
Average	52.9	41.1
Minimum	18.2	14.0
1st Quartile	35.2	26.3
Median	47.8	37.2
3rd Quartile	65.5	51.0
Maximum	111.0	88.2
Standard Deviation	22.9	17.5

Source: Author's calculations.
Note: Pension contributions are invested entirely in U.S. Stocks.

The estimates displayed in Figure 2 and Table 1 overstate the typical pensions workers would obtain under the economic conditions prevailing between 1871 and 2000. The calculations assume that stocks and bonds can be bought, sold, and held without any transactions costs (administrative fees that are paid to the investment managers). Also, the calculations assume that 62-year-old retirees can purchase fair annuities, whereas, in practice, insurance companies impose a load charge to cover their profit requirements and adverse selection. Management costs and annuity charges would reduce the value of the pension accumulation compared with the estimates shown in the table, possibly by as much as one-fifth.

[11] A married couple purchasing a joint survivor annuity would obtain a lower annual pension payment, because the insurance company can anticipate making payments for substantially longer than would be the case if the annuity ended with the death of the male pensioner. The median joint survivor annuity is thus about one-quarter lower than the median single life annuity (37 percent versus 48 percent of the male worker's career high earnings).

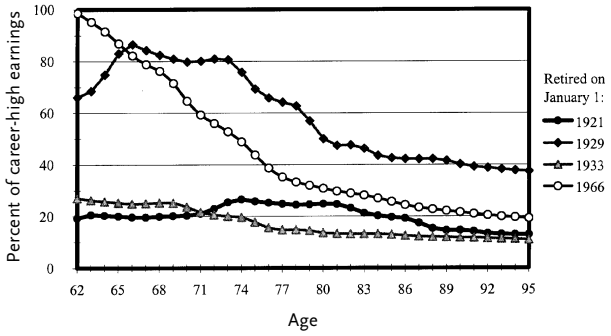
[12] Replacement rates under this investment strategy cannot be calculated for the full span of years from 1911 to 2000. Data on U.S. Treasury yields are only available starting in 1924, so the first retirement that can be examined here is one that occurs in 1964.

Some of the variation in replacement rates in Figure 2 arises because of fluctuations in the long-term interest rate, which determines the sale price of annuities at the time workers convert their pension savings into an annuity. When workers purchase level annuities from insurance companies, the companies must invest the proceeds in very safe assets, usually high-quality bonds. When interest rates are high, annuities are cheaper to buy because insurance companies expect to earn more on their investments. The nominal interest rate varied widely over the twentieth century. From 1910 through the mid-1960s, the nominal long-term rate ranged between 2 and 4 percent, and it moved sluggishly. After 1965 the rate soared, permitting insurance companies to sell annuities at a substantially lower price. Therefore, with the same retirement nest egg, a worker retiring after 1965 could purchase a larger annuity than a worker retiring before that year. The nest egg accumulated by a stock-investing worker who retired in 1982 was about the same—as a percentage of the worker's salary—as the one accumulated by a worker who retired during the worst years of the Great Depression. Yet the replacement rate of the 1982 retiree was about two-thirds larger (45 percent versus 27 percent). The reason for the difference is that the nominal interest rate was almost 13 percent in the early 1980s but just 3.5 percent in the early 1930s.

Inflation after retirement. The discussion so far has emphasized risks associated with stock and bond market fluctuations over the period workers contribute to a pension fund and at the point they convert their pension accumulations to annuities. After workers retire, they face another risk—price inflation. Public pensioners in the U.S. (and most other developed countries) have been spared this risk as a result of indexing. Workers who purchase private annuities are rarely protected against inflation.[13]

In a world where private markets fail to provide indexed annuities, retired workers face substantial risk from inflation. Figure 3 shows the real replacement rate of retired workers as they age. The figure shows replacement rates from age 62 through age 110 for U.S. workers retiring in four selected years—1921, 1929, 1933, and 1966.[14] As noted earlier, the worker retiring at the beginning of 1921 received the smallest initial pension of any worker considered here; the worker retiring at the beginning of 1966 received the largest initial pension (see Figure 2). The experiences of these two workers also differed after they retired. Prices were stable or falling during most of the 1920s and early 1930s. A worker retiring in 1921 therefore saw the purchasing power of his annuity increase over much of his retirement, rising from 19 percent to 26 percent between ages 62 and 75. In contrast, a worker retiring in 1966 saw prices climb without interruption after his retirement, causing his real replacement rate to shrink from 100 percent at age 62, to 65 percent at age 70, and to 31 percent at age 80. The experience of the worker retiring in 1966 has been more typical of U.S. experience since World War II. In fact, all workers retiring after the mid-1930s suffered significant losses in purchasing power during retirement.

Figure 3: Replacement Rates by Age and Year of Retirement



Source: Author's calculations

[13] Some American insurance companies offer "graded annuities" that increase over time. This kind of pension does not offer retired workers complete protection against inflation, however, because the annual percentage increase in the annuity is not directly linked to changes in the price level. If a worker buys a graded pension that rises 3 percent a year, the real value of the pension would still decline in each year that annual inflation exceeds 3 percent.

[14] The replacement rates are calculated for workers who invest all their pension contributions in equities. The initial replacement rates shown in Figure 3 differ slightly from those in Figure 2. The latter are calculated using the price level in the January when the worker attains age 62. The replacement rates in Figure 3 take account of changes in the price level that occur over the full calendar year when the worker is first retired. This change in price level is relevant unless the worker receives and spends all his annuity income in January.

Protections against risk. As this exercise demonstrates, replacement rates can vary enormously over relatively short periods of time when workers invest all their pension savings in equities. The replacement rate was almost 100 percent for workers retiring in 1969, but only 42 percent for workers retiring just six years later in 1975.

To reduce the uncertainty of private pensions, workers can follow a couple of strategies. First, they can invest a portion of their retirement savings in bonds rather than stocks, diversifying their investment portfolio. This strategy reduces the volatility of the worker's replacement rate, but it also significantly reduces the expected value of the annuity. Over all 20-year periods in the twentieth century, the return on U.S. bond investments was lower than the return on U.S. equities.

Second, workers can convert their retirement nest eggs into annuities over several years rather than at a single point in time, as assumed in the calculations. For example, workers could convert their nest eggs into annuities in more or less equal annual installments beginning several years before they retire. Under one plan, each worker would purchase five annuities rather than only one. The annuities would differ in size depending on stock market prices and interest rates at the moment of conversion. Since the conversion occurs in five successive years rather than only once, workers would not convert all their retirement savings into an annuity at a time when stock market prices and interest rates make it particularly disadvantageous to do so.

This strategy of phased annuitization yields a distribution of replacement rates that has less variability, but also a lower average. (The following statements assume that 100 percent of pension contributions are invested in stocks before conversion to annuities begins.) The standard deviation of replacement rates is 23 percent if the entire annuity conversion takes place at age 62, but it falls to 18 percent when annuitization is phased in over five years. The average replacement rate also drops 5 percentage points, however, falling from 52 percent to 47 percent when workers adopt the phased annuitization strategy. This decline in average replacement rates is hard to avoid. When a worker purchases an annuity, he is exchanging stock market investments for a bond market return. By converting his pension accumulation to an annuity approximately two years earlier than would be the case if a single annuity were purchased at retirement, the worker who follows a phased annuity strategy is exchanging two years of stock returns for two years of bond returns. This reduces both the variance and the expected return of his retirement savings.

To protect themselves against price inflation that occurs after they retire, workers can retain some of their retirement savings as a nest egg that continues to be invested in the stock market. Alternatively, they could purchase variable annuities based on a combined portfolio of stocks and bonds. Holding retirement savings in the form of stocks during part of retirement increases the expected return on the worker's savings. As discussed above, however, it substantially increases the investment risk to which the worker is exposed. If the ultimate goal of a mandatory pension system is to assure workers of at least a minimum real income during old age, a variable annuity backed by stock market assets is unlikely to provide any guarantee that the goal will be achieved.

Conclusion

The argument usually advanced for moving away from pay-as-you-go retirement pensions to a private individual account system is that workers could make smaller contributions and obtain higher benefits under the private system. So, according to this argument, most workers would get a better deal under the private system than under public retirement systems.

The argument has two problems. First, the contribution rates to existing public systems and to a new individual account are not comparable. Contributions to public programs include a large implicit tax to pay for the unfunded liabilities that were accumulated in the past. Virtually all of this tax will have to be paid, regardless of whether the present public system is maintained or is replaced with a new system of private accounts. To make a meaningful comparison between the contribution rates to public and individual account systems, it is necessary to either subtract this implicit tax from the Social Security contribution rate or add it to the rate needed to fund the new private accounts.[15]

Second, a defined contribution system allocates risks in a very different way than a collective defined benefit system. Under most public systems, workers born in the same year who have similar earnings records are provided similar retirement benefits. Pensions are financed with taxes imposed on current workers and their employers, and they are ultimately backed by voters' willingness to tax themselves in order to keep benefits flowing. They are usually indexed to price changes. In the developed democracies, real benefit cuts typically occur gradually and only after intense political debate.

In contrast, pensions under a private individual account system are paid out of financial market assets held in individual retirement accounts. The real value of the payment flows is limited by the current market value of assets held in the accounts. Although proponents of individual accounts are confident that workers can purchase safe assets that will yield high rates of return, U.S. experience over the past century suggests that neither the value of financial assets nor their real return is assured. Workers who follow an identical investment strategy but who retire a few years apart can receive pensions that are startlingly unequal. The investment strategy that produces the highest expected return and biggest pension is also the one that yields the widest swings in pension entitlement. Equally troubling to most aged Americans, the value of a private pension is subject to sizable inflation risk after a worker has left the labor force. Financial market and inflation risks are much more manageable in a public retirement system.

[15] In the United States, approximately 90 percent of current Social Security contributions are used immediately to pay for benefits to retired pensioners and their dependents. The contributions needed to finance these benefits must be collected whether the public retirement system is maintained or is replaced by a new system of individual accounts. It is thus incorrect to treat as equivalent the contribution rate to Social Security and to an individual retirement account. See Geanakoplos, Mitchell, and Zeldes (1998).

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The Center for Retirement Research at Boston College, part of a consortium that includes a parallel center at the University of Michigan, was established in 1998 through a 5-year $5.25 million grant from the Social Security Administration. The goals of the Center are to promote research on retirement issues, to transmit new findings to the policy community and the public, to help train new scholars, and to broaden access to valuable data sources. Through these initiatives, the Center hopes to forge a strong link between the academic and policy communities around an issue of critical importance to the nation's future.

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