TECHNICAL PAPER

Risk sharing in a voluntary retirement plan

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Introduction

In 2008, the Economic Policy Institute published a retirement plan by Dr. Teresa Ghilarducci that demonstrated how a portable retirement account plan with pooled investments could provide a guaranteed lifetime income in retirement. The Guaranteed Retirement Account (GRA) plan is a type of hybrid plan (Ghilarducci 2008) that aims to be more secure and efficient than 401(k)-style individual account plans, and more sustainable and portable than traditional single-employer pensions.[1]

Many recent reform initiatives, including Auto IRA plans set up by state and local governments, are designed to expand coverage to small business employees, independent contractors, and other workers who frequently fall through the cracks of the employer-based system in the United States. Auto IRA plans in California and other states encourage or require employers who do not sponsor retirement plans to facilitate contributions to individual retirement accounts (IRAs) set up by state and city governments (Pew 2016; Fisher and Ghilarducci 2017; Georgetown CRI 2021). While these plans focus on convenience and affordability, there has been less attention paid to the risks faced by participants in these plans.

The GRA plan uses pooling and other methods borrowed from traditional pensions to manage risk. Pooling spreads individual risks or opportunities across a group or across time so that participants face something closer to average costs or earnings. In the retirement context, two big risks associated with prefunding retirement are the risk of retiring during a market downturn and the risk of outliving one's savings.

Pension funds shield participants from investment and longevity risks by pooling the retirement funds of workers who retire during bull and bear markets and have different lifespans. Though participants in individual account plans can also engage in risk pooling by investing in mutual funds and purchasing life annuities, individual strategies are not as efficient or effective as those available to participants in group plans.

Since pooling does not eliminate all risks for pension plan sponsors and many employers are unwilling or unable to take on long-term pension liabilities, Dr. Ghilarducci proposed having the federal government

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[1] In this technical paper, "individual account plans" refers to 401(k)-style plans where retirement outcomes depend on investment returns. The description can also apply to Individual Retirement Accounts (IRAs) that are often composed of funds rolled over from 401(k) plans. "Traditional pensions" refers to employer pensions that provide secure lifetime benefits according to formulas that typically take account of a worker's salary history, years of service, and age at retirement. In the United States, "defined contribution" (DC) is often used to describe 401(k) plans, whereas "defined benefit" (DB) is often used to describe traditional pensions. However, these categories can be confusing when discussing hybrid plans that combine features of both, especially in an international context. For example, most "collective defined contribution" (CDC) plans in the Netherlands provide salary-based benefits that resemble traditional pensions, but employer contributions are fixed, at least in the short run. These and similar plans are also sometimes referred to as "target defined benefit" plans. Other types of CDC plans, including Danish ATP plans, resemble individual account plans but with pooled investments and some risk sharing. Turner (2014) and Eagle, Jadav, and Fadayel (2020) describe these and other types of CDC plans. In this technical paper, these two types of hybrid plans will be referred to as "shared risk pensions" and "notional account plans," respectively. ("Notional" refers to the fact that the accounts are for record-keeping purposes only.) However, the lines between these and other types of hybrid plans are blurry and shifting. Under a "new pension contract," for example, CDC plans in the Netherlands are expected to switch from a shared risk pension model to a notional account model, with benefits tied to interest credits rather than salaries.

bear some investment risk by guaranteeing a minimum rate of return, while costs and risks associated with changes in average life expectancy would be borne by participants. A key feature of the GRA plan was a reserve fund that would serve to equalize rates of return across retiree cohorts. The GRA plan helped pave the way for similar proposals aimed at workers who lacked access to employer plans with secure benefits.

The question posed in this technical paper is whether risk sharing is feasible and desirable in the absence of other reforms proposed in the GRA plan. The GRA plan is ambitious. In addition to risk-sharing features, it calls for universal access, seamless portability, mandatory employer and employee contributions, low administrative expenses, and a flat refundable tax credit that would offset all or most of the cost for low-wage workers. Does it make sense for state-sponsored Auto IRA plans to offer guaranteed lifetime benefits similar to those proposed in the GRA plan if it is not politically possible to adopt other key features of the plan, especially mandatory contributions and a progressive subsidy?

A tentative conclusion is that guaranteeing a rate of return and automatically converting all savings to lifetime income at retirement are not recommended in the absence of other reforms. A rate-of-return guarantee is not secure unless backstopped by the federal government or combined with a conservative investment strategy that makes offering the guarantee costly yet redundant. Meanwhile, lifetime benefits can be unfair to low-income participants with shorter life expectancies in plans that lack Social Security's progressive benefit formula or other features that offset this disadvantage.

However, using a reserve fund to smooth investment returns is worth revisiting despite challenges in a voluntary system. In the absence of a federal guarantee, a reserve fund with a stable inflation-adjusted rate-of-return target (or "target rate fund") could be used to smooth fluctuations in investment earnings and reduce disparities in retirement outcomes between generational cohorts. The target rate credited to accounts would initially be lower than expected investment returns to build up a reserve. It would be adjusted infrequently after the build-up phase to provide intergenerational risk sharing and enable participants to project their income in retirement with some degree of confidence.

The plan's investment strategy would be similar to that of other plans that target a rate of return without recourse to variable employer contributions. Thus, the target rate would be somewhat lower than that of traditional pensions but higher than the return on plans that provide a guaranteed return backed by conservative investments, such as the TIAA traditional annuity. The Canada Pension Plan (CPP), which has a stable real target rate of around 3.4% on newer contributions, is one useful model. A key feature of CPP's investment strategy is taking advantage of a long investment horizon to increase risk-adjusted returns (CPP n.d.a).

At retirement, participants could be defaulted into lifetime benefits offered by the plan. Annual statements to participants would project lifetime benefits, but participants should have the option of opting out of full annuitization. Benefits would compare favorably with life annuities sold commercially, which are priced to cover transaction and overhead costs and based on lower yields from fixed-income investments.

There are disadvantages to allowing participants to opt out of risk-sharing mechanisms in a voluntary plan, but these may be outweighed by fairness and other considerations. Some workers, often with good reason, may not want to convert their savings to lifetime benefits, which could discourage participation in a voluntary plan. The plan would also be less attractive to participants during an initial

build-up phase, when the target rate of return would be lower than the expected rate of return.[2] Conversely, there would be greater incentive to participate when the reserve fund was full or interest rates were low, so measures would need to be taken to prevent destabilizing inflows and outflows.

This technical paper will revisit the GRA and other hybrid retirement plans that combine elements of individual account plans and traditional pensions, focusing on how they manage risk. Some, like the GRA plan, aim to equalize retirement outcomes without the aid of variable employer contributions. However, many existing plans have the advantage of mandatory or quasi-mandatory participation, which helps stabilize funding. For this reason, these plans are useful but not perfect models for a voluntary system.

Risk is a major impediment to funding retirement

The goal of retirement planning is to smooth living standards over a lifetime. One rule of thumb is that a typical worker needs to replace 70% of preretirement income in retirement,[3] though the target replacement rate can be lower or higher depending on how health, parenting, and other expenses are factored into the equation; whether to discount future consumption because of mortality risk; and how leisure is weighted, among other factors. Social Security will replace less than 40% of preretirement earnings for an average earner retiring at age 65, and most retirement experts agree that many workers are not on track to close the remaining gap.

Risks associated with advance-funded retirement plans include investment, longevity, inflation, and salary risks. Knowing how much to contribute to a retirement plan to meet a target income replacement rate is challenging due to uncertainty about future earnings, investment returns, the timing and length of retirement, and how much the purchasing power of accumulated savings or pension benefits will be eroded by inflation. This technical paper focuses primarily on investment and longevity risks, assuming for simplicity that payout strategies can be designed to at least partly offset inflation. It compares the GRA and other hybrid plans where replacement rates are not as sensitive to salary risk, which is greater for participants in traditional pensions when benefits are tied to earnings with a specific employer.

Most people are risk-averse when it comes to retirement. By definition, this means they would not risk their retirement nest eggs on a fair bet, though most people are willing to bear some risk for higher expected returns. Almost everyone who expects to rely on a tax-favored retirement plan to maintain their standard of living in old age is somewhat risk averse, and we do not need to concern ourselves with the exceptions because there is no public policy rationale for encouraging speculative investment in retirement accounts.

Many employers are not willing or able to take on long-term pension liabilities, but individual account plans expose participants to risks that could be avoided in pooled and professionally managed plans. By some estimates, contributions to individual account plans need to be nearly twice as high as

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[2] In theory, a government entity or other plan sponsor with an indefinite investment horizon and low borrowing costs could loan the fund money to set up the reserve, but this likely would face political opposition.

[3] The target replacement rate is generally assumed to be less than 100% for most people because retirees can substitute leisure for consumption—for example, by cooking more meals at home instead of eating out. In addition, retirees do not have work expenses, often have smaller households, are no longer saving for retirement, and may have paid off student loans or mortgages. However, these factors are not present for all households— low-income households may have less flexibility to reduce expenses, and medical expenses tend to increase with age.

contributions to traditional pensions to achieve a similar level of retirement security (Almeida and Fornia 2008; Morrissey 2009).[4] Though some of this is due to higher overhead costs associated with individual accounts, much is due to the need to save more to guard against the risk of retiring during a bear market or outliving one's savings.

Economists have attempted to model and quantify risk aversion. One measure of risk aversion is the risk-free investment an individual would accept in exchange for a risky investment with a higher expected return, with risk measured by the standard deviation of expected returns. Simple textbook models do not necessarily conform to human behavior, however, because people are not consistent in their risk aversion. For example, while economists often assume that risk aversion is symmetrical, researchers have found that people are often more concerned with avoiding losses than eager to take a chance on gains (Benartzi and Thaler 1995).

Perhaps more intuitively, risk aversion can be understood as how much retirement savers are willing to sacrifice in expected returns to reduce the risk of bad outcomes. Retirement savers may, for example, focus on ensuring that their incomes in retirement will cover basic living expenses such as food, housing, and utilities. This intuitive measure is sensitive to the choice of threshold, however, because conservative investment strategies increase the risk of moderately poor outcomes but decrease the risk of extremely bad ones.

Risk aversion implies that equalizing retirement outcomes is welfare improving. This is the motivation behind theoretical "overlapping generations" models demonstrating the potential advantages of redistributing across generational cohorts (Gollier 2008; Cui, De Jong, and Ponds 2009). While these models are not very realistic, they do highlight the real-world problem that some cohorts fare much better than others simply based on the year they retire. For example, workers who retired in the wake of the 2008 financial crisis would have about half as much in their retirement accounts as similar workers who retired near the peak of the dot-com bubble, even if both cohorts contributed similar amounts and followed recommended investment practices (Davis and Madland 2013).

Risk aversion is not absolute. It does not imply that most retirement savers would be better off investing entirely in virtually risk-free[5] Treasury bonds, though some financial economists suggest that they should (Light 2009). Such an investment strategy is very expensive, especially with Treasury yields as low as they are today.[6] Similarly, there is some debate among experts about whether individual annuities that protect retirees against outliving their savings are worth their high cost (see, for example, Dushi and Webb 2004; Webb 2021). Rather than all or nothing, risk aversion exists on a continuum, with most retirement savers willing to accept some risk in exchange for better expected outcomes.

Some retirement savers are more risk-averse than others. Low-wealth households are generally more risk-averse than households that have larger financial cushions to protect themselves against destitution

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[4] This is an inherently imperfect comparison, since most participants in individual account plans who manage to amass enough savings to guard against the risk of longer-than-average lifespans will be able to leave money to heirs, while the longest-lived will run out of money before dying.

[5] U.S. government bonds are assumed to be virtually risk free since the U.S. government is unlikely to default on its obligations, periodic congressional brinksmanship around raising the debt limit notwithstanding.

[6] At current yields, most U.S. Treasury bonds do not even keep up with inflation. Investing in a single asset class also forgoes the "free lunch" of higher risk-adjusted returns provided by portfolio diversification.

(Wachter and Yogo 2010; Cupák et al. 2020; Egan, McKay, and Yang 2022 Kim, Hanna, and Ying 2021; Meeuwis 2022). While it makes sense that retirement savers with fewer resources to fall back on invest more conservatively, this has the effect of exacerbating wealth inequality. A key advantage of traditional pensions is that they take differences in risk aversion out of the equation.

Investors with indefinite investment horizons can take greater risks than those who need to access funds at specific times. An extreme example is someone who saves up to make a balloon mortgage payment and could lose their home if they invest in risky assets. In the retirement context, individuals are advised to invest more conservatively as they approach retirement because they have less opportunity to make up the difference by working longer or saving more if investment returns fall short of expectations. This is generally less of a problem for pension funds because new contributions from active workers partly or fully offset benefit payments to retirees, which typically represent a small share of pension assets in a given year.

A related challenge for individual retirement savers is that the timing of returns matters. Individual retirement savers are less affected by low or high returns early in their careers than late in their careers, after they have accumulated substantial savings. In contrast, pension funds combine the funds of workers who work and retire at different times and so are not as exposed to sequence-of-returns risk.

Retirement challenges related to affordability and financial literacy compound problems related to risk. Barriers to achieving retirement security include upside-down tax subsidies that favor high-income households; high fees that erode investment returns in individual account plans; and myopia, imperfect knowledge, and poor decision-making among participants in individual account plans. These challenges interact with risk in complex ways. For example, many retirement account participants are unaware that tax subsidies for retirement are based on the income tax that would otherwise be owed on the internal buildup of investment earnings.[7] The subsidy reflects participants' tax brackets and their investment risk tolerance, both of which favor higher-income households.[8]

People find assessing risk challenging, causing them to avoid or misjudge important decisions. For example, only half of Americans surveyed could correctly answer that investing in a stock mutual fund usually provides a safer return than buying a single company's stock (Lusardi and Mitchell 2009).

While they value the secure lifetime benefits provided by Social Security and traditional pensions, few retirement savers buy life annuities, an apparent paradox that helped inspire the field of behavioral economics (Benartzi, Previtero, and Thaler 2011). Converting savings to life annuities requires people to overcome informational and psychological barriers. It can feel like tempting fate—what economist Olivia Mitchell has described as the fear of getting hit by a bus after buying an annuity (Hershfield and Fox 2019). It is human nature to avoid difficult decisions even if risks associated with not making a decision

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[7] The subsidy takes the form of a tax deferral, such that taxes are not paid on contributions or investment earnings until funds are withdrawn in retirement. This is advantageous compared with investments outside of tax-qualified plans, where investment earnings are taxed annually. Roth plans have a similar effect—the subsidy amounts to taxes not paid on internal buildup—if the participant's marginal tax rate does not change.

[8] Many low-income participants, who sometimes face a higher overall tax burden than high earners, receive little or no tax benefit from participating in these plans because they are subject to payroll and other taxes but do not owe income tax (Toder, Harris, and Lim 2009; CBO 2021).

are worse. There are also rational reasons to avoid purchasing annuities that will be discussed later in this paper.

People who lack secure incomes in retirement are reluctant to tap their savings, unnecessarily lowering their standard of living (Blanchett and Finke 2021). Retirees' reluctance to tap savings is especially acute when it comes to home equity, which many retirees treat as sacrosanct (Sass 2017). Excessive penny-pinching occurs even though many people underestimate their life expectancy in retirement (Perlman et al. 2020; O'Dea and Sturrock 2019).

There are limits to risk-management strategies

Risk reduction is generally costly because marginal investors are risk-averse. Marginal actors are those who determine the market price of a good, asset, or insurance premium because they would not participate in the transaction if the price were either higher, in the case of the buyer, or lower, in the case of the seller. All else equal, marginal investors prefer assets with more predictable returns because there are limits to portfolio diversification and other risk management techniques. Since marginal investors will pay more for safer assets, this lowers these assets' expected rate of return.

In some cases, people or businesses can offset opposing risks, as in the case of life insurance companies selling life annuities. However, if financial markets are efficient, these opportunities have already been exploited. The price of insuring against such risks therefore reflects not just the risk itself but also the relative size of markets for insuring against opposing risks.

Investment portfolios can be matched to an investor's risk tolerance. In simple models, the riskiness of an investment portfolio depends on the ratio of stocks to bonds because the return on diversified bond funds tends to be lower but less variable than the return on diversified stock funds. Thus, in these models, bond-heavy portfolios have lower expected returns but also a lower probability of very bad outcomes.

Pooling entails the sharing of losses or gains so that participants achieve average outcomes. With a simple coin flip example, if heads are worth $100 and tails are worth nothing, an individual can end up with either $100 or nothing. However, the payout to a group of participants who evenly divide their earnings will approach $50 as the group gets larger. Pooling can serve to spread losses as well as gains. In the insurance context, a classic example is Lloyd's of London, which was formed to spread the risk of maritime disasters across groups of underwriters.[9]

Diversification is like pooling, but with the added goal of avoiding risks that move in tandem. While this is not an issue with random coin flips, investors often seek to diversify across asset classes, such as stocks and bonds, or across geographic regions.[10] Mutual funds, especially low-cost index and exchange-traded funds, make it easy for even small investors to own a representative share of the broader market, and thereby minimize risks associated with individual securities.

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[9] In the insurance context, spreading risk also makes it less likely that insurers will go bankrupt and be unable to pay claims.
[10] Investing in other countries, however, adds exchange rate risk that may offset any risk reduction from diversification.

There are limits to risk pooling and diversification. Though risk pooling can spread idiosyncratic risks among participants in a group plan, it cannot guard against systemic risk—the risk that the group is atypical or that conditions are changing. A pension plan, for example, may base contributions and benefits on average life expectancy as determined by actuaries, but participants in the plan may differ from those in other plans or from past participants in the same plan by chance or due to unforeseen circumstances. While actuaries factor in expectations about mortality improvements over time, whether these expectations are met depends on many unpredictable factors.

Even fully diversified investors face market risk. Swings in market valuations may be caused by broader economic or geopolitical forces or simply "animal spirits," as John Maynard Keynes described investors' irrational exuberance or pessimism. So, while diversification is not inherently costly, investors will pay more for assets that are less or negatively correlated with the larger market.

Though economic theory suggests an unavoidable tradeoff between risk and expected returns, reality is more complicated. Financial economics can help us understand the role of risk in retirement, but simple theories can be unrealistic or misused. In particular, models that ignore differences in risk aversion and investment horizons do not always provide useful policy guidance.

According to Modern Portfolio Theory, the difference between the expected return on a risky asset and the return on a risk-free Treasury bond—the risk premium—reflects not only the likelihood of gains and losses on the asset itself, but also the extent to which the asset's returns move in sync with broader market returns. In fact, in the Capital Asset Pricing Model that follows from this theory, an asset's risk premium is entirely based on the covariance of the asset's return with the market return, such that if a risky asset's return is uncorrelated with the market return, the return on the risky asset will be the same as the return on a risk-free asset. The intuition behind this is that the idiosyncratic risk associated with such assets can in theory be diversified away by owning many similarly uncorrelated assets such that it is equivalent to a risk-free asset and priced accordingly.

The Efficient Market Hypothesis posits that asset prices reflect available information, so it is impossible to beat the market except by luck or with access to private information. The hypothesis is based on the idea that predictable differences in risk-adjusted returns will be quickly eliminated by arbitrage—investors buying or selling assets and changing their relative prices until the anomalies are eliminated. This "wisdom of the crowds" argument is the rationale behind the advice that most investors should invest in index funds and engage in other low-cost passive investment strategies rather than buying individual stocks or investing in actively-managed mutual funds. The Efficient Market Hypothesis is not based on the assumption that all investors behave rationally, which research in behavioral economics has convincingly refuted. For the hypothesis to be true, it only requires that enough investors behave rationally to eliminate arbitrage opportunities.

The Efficient Market Hypothesis remains the subject of debate, but many experts agree that it is close enough to reality to support a passive investment strategy by most investors. Investing in balanced or target date funds[11] composed of index funds or similar passive investments has become the standard advice offered to participants in individual account plans. Thus, the Thrift Savings Plan for federal employees, often cited as a model for other plans, offers low-fee target date funds composed of broadly

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[11] Target date funds shift to more conservative asset allocations as workers approach retirement.

diversified index funds for a range of asset classes. Likewise, many state- and city-sponsored Auto IRA plans have taken steps to steer participants to low-cost passive investment options.

However, active management still makes sense for many pension funds and other institutional investors. Not everyone can be a passive investor for the Efficient Market Hypothesis to hold. Some large and sophisticated investors must engage in active investment management and oversight activities to ensure that prices reflect changing conditions and to discipline corporate managers who underperform or engage in self-dealing.

The Efficient Market Hypothesis may be a good approximation of reality, but it is not reality. An apparent exception to the rule that markets equalize risk-adjusted returns is that "value" stocks with low prices relative to earnings appear to outperform "growth" stocks, whose high prices are based on expectations of higher future earnings—an anomaly that can persist if there are enough irrationally enthusiastic investors in some high-profile growth stocks to keep them overvalued. Thus, the Canada Pension Plan investment board, for example, takes an active "value-conscious" approach, seeking to buy undervalued stocks and avoid overvalued ones (CPP n.d.b).

Despite these caveats, there are potentially useful lessons that can be drawn from models that assume the marginal investor is rational and markets are efficient. One is that "you get what you pay for," such that the market price for risk reduction is generally independent of how it is achieved. Thus, if a retirement fund were to purchase derivatives or an insurance policy to protect against investment returns falling short of actuarial assumptions or a guarantee, this would offer no obvious advantage over simply investing conservatively, though the distribution of net expected returns might differ in ways that make the strategy more or less suitable for funding retirement.[12] For example, constructing a "collar" to smooth the edges off investment returns will result in a rate of return that approaches the risk-free rate as the collar narrows (Munnell et al. 2009; Stubbs and Rhee 2012; Gale, John, and Kim 2016). There may be exceptions to this rule, however. Investment managers at the Danish ATP plan, for example, claim that their approach—which combines a liability hedging portfolio and a leveraged investment portfolio—protects participants against losses while outperforming a benchmark portfolio that offers no such protection (Gosvig, Kronborg, and Reitzel Heegaard 2019).[13]

In practice, purchasing a rate-of-return guarantee from a third party would be more costly than simply investing conservatively because the price would have to cover the seller's overhead and transaction costs, including costs associated with negotiating and enforcing an agreement about how the fund is invested. A retirement plan could also achieve similar results without involving a third party by using a reserve fund. The Center for American Progress's SAFE plan, for example, assigns investment returns above a designated ceiling to a reserve fund that is tapped when returns fall below a floor.

Based on historical returns, the federal government would have incurred little or no direct cost from providing a GRA-like guarantee. However, critics have focused on the theoretical cost of purchasing a guarantee in financial markets. The GRA plan included a 3% real rate-of-return guarantee backed by the

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[12] A hedge composed of derivatives sacrifices returns above a ceiling to pay for a guarantee against returns falling below a floor, whereas an insurance premium is a fixed amount paid for the same protection. Investing in a portfolio that includes risk-free assets is another way of guaranteeing a minimum return. With any guarantee provided through market mechanisms, the guarantee cannot be higher than the risk-free rate.

[13] The ATP plan is a hybrid plan with similarities to the proposed GRA plan.

federal government. It is extremely unlikely that a retirement saver who contributed to a retirement account invested in equities over the course of a long career would have had an average real rate of return of less than 3% based on the distribution of historical returns (Munnell et al. 2009; Stubbs and Rhee 2012).[14] Critics nevertheless say there would be a significant opportunity (or "economic") cost of providing such a guarantee based on the hypothetical price the government could charge investors for the same protection instead of offering it free to retirement savers (Gale, John, and Kim 2016).

Purchasing a rate-of-return guarantee from a third party could significantly lower net returns without offering any real protection to long-term participants. As Munnell et al. (2009) showed, while it is highly unlikely that a stock investor would average real returns above 3% over 43 years based on the distribution of historical returns, [15] this is higher than the 2% real risk-free rate that the authors assumed at the time—the highest guarantee that could be purchased based on derivative pricing models. The reason it can be expensive to hedge a guarantee that is unlikely to be binding is partly due to the length of investment horizons and the uncertainty of future investment returns decades into the future. The marginal investor cares that cumulative real returns may average below 3% for shorter periods even if he or she is fairly confident that they will average above 3% over 40 or more years. Of course, there is reason to believe that investment returns will be lower in the future due to a secular decline in interest rates, but the significant cost of insuring against cumulative returns falling below a low floor does not depend on an assumption of declining returns.

Another reason for the high cost of a guarantee that is unlikely to be binding in the long run is that while the likelihood of experiencing stock market losses decreases with the length of the investment horizon, the magnitude of potential losses also increases. This is true even if investment returns are distributed normally, without the negative-skewed "fat tail" that some experts argue better describes stock market returns.[16] It also holds true if there is some reversion to the mean, such that the market "corrects" bull and bear markets more than would happen through random chance. However, the models that predict that the size of potential losses increases with the length of the investment horizon are purely stochastic and do not tie stock market returns to corporate earnings or other real-world factors. In the real world, if anyone should invest in the stock market, it is pension funds and other institutional investors with indefinite investment horizons. Nevertheless, theoretical models serve as a useful caution against the idea that any long-run investor can safely invest in a stock-heavy portfolio.

While there may be little point in a retirement fund purchasing a rate-of-return guarantee, it does not follow that pension funds or the government should not provide or backstop guaranteed benefits. It makes sense for pension funds or government entities to offer explicit or implicit rate-of-return guarantees if they are less risk averse than the marginal investor, who has a shorter investment horizon.

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[14] A somewhat lower guarantee would be prudent going forward given the likelihood that future returns will be lower than historical ones.

[15] In this technical paper, the "average" rate of return refers to the geometric mean (the fixed rate that would produce the same outcome) rather than the arithmetic mean (the sum of annual investment returns divided by the number of years). The geometric mean can differ from the arithmetic mean because the timing of high and low returns matters and because of "volatility drag," wherein alternating high and low returns produces worse outcomes than if the arithmetic mean of these returns was attained every year.

[16] That is, there is evidence that extreme bear market conditions occur more often than would be expected by chance.

There should nevertheless be a public purpose behind a free government-backed guarantee, since otherwise critics are right that governments might as well sell them to the highest bidder.

The argument against government-backed rate-of-return guarantees resembles an argument often waged against pensions for teachers and other public-sector workers—namely that funds for guaranteed benefits should be invested in guaranteed assets. Critics of public-sector pensions often claim that their cost is significantly understated based on how much it would cost to fund pensions if assets were invested in risk-free government bonds rather than a balanced portfolio of stocks and bonds.

While it is true that the normal cost of public pensions does not account for the risk passed on to future taxpayers, this greatly exaggerates the cost of funding pensions for two reasons. First, it assumes government entities and other plan sponsors have no way to control costs if investment returns fall short—that is, they assume that the cost of these benefits is set in stone. Second, it assumes taxpayers are as sensitive to risk as the marginal investor, and would choose to invest in risk-free Treasuries to avoid any risk at all.

The cost of pension benefits can be adjusted going forward even if accrued benefits are guaranteed. The normal cost of future pension benefits is based not just on rate-of-return projections, but also assumptions about future salary growth and other factors that can be controlled if rate-of-return projections prove optimistic or pessimistic. To put this in concrete terms, school districts facing higher pension costs after a market downturn can offset this by curtailing teacher raises that are factored into the cost of these benefits. Similarly, layoffs affect the value of accrued benefits tied to final average salaries. As noted earlier, many school districts and other government employers went even farther in the wake of the 2008 financial crisis, requiring teachers and other workers to contribute more toward their pensions and suspending cost-of-living adjustments, effectively cutting accrued benefits as well.

Just as the normal cost of pension benefits is based on factors that can change in response to over- or underfunding, a GRA-like rate-of-return guarantee is not set in stone. The goal of a guarantee is to provide a stable and reliable return for as long as possible. However, no government can make indefinite promises—it must be able to adjust the guarantee going forward, even if every effort is made to avoid changes that retroactively affect accrued benefits. In short, a critique based on models that assume everything is fixed for 40 or more years and therefore must be funded with risk-free assets exaggerates the cost of secure, but not immutable, benefits.

Basing the cost of public pension benefits on the risk-free rate also assumes, implausibly, that taxpayers are indifferent between investing pension funds in a balanced portfolio or in risk-free assets. Critics note that future taxpayers may face higher or lower costs for teacher pensions if rate-of-return expectations are not met. But few taxpayers would choose to triple the cost of benefits by investing in Treasury bonds, even if this would shield them from the effect of future shortfalls or surpluses. There is, of course, some risk shifting to future generations who have no say in this decision, but they in turn will pass on some risk to those who follow.[17]

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[17] Future taxpayers also benefit from education and other social investments, whether as students themselves or through social returns to education.

A similar argument can be made about taxpayers backstopping a GRA-like rate-of-return guarantee. While taxpayers might be willing to pay a modest amount to avoid taking on this risk, this is undoubtedly less than what it would cost to hedge or insure the risk through a third party, keeping in mind that taxpayers face both upside and downside risks.

Who should bear investment risk?

All investors face the risk of bear markets, but pension funds and other institutional investors are less vulnerable to temporary downturns than individual investors with finite investment horizons. Pension funds can ride out bear markets because they invest on behalf of workers who retire at different times and typically pay out only a small share of funds in the form of benefits in any given year unless they have a rapidly shrinking ratio of active workers to retirees. In contrast, individual retirement savers build up and then spend down funds over specific time periods and so are more susceptible to timing risk—the risk of experiencing a bear market when their savings peak around retirement and when they have less time to make up losses by saving more. Individual savers who convert account balances to income streams also face the risk of doing so when annuity rates are low.

Governments are uniquely positioned to guarantee benefits. Governments are long-lived entities with the power to tax, the ability to borrow at lower rates, and indefinite investment horizons that enable them to withstand market fluctuations. Governments also consider old-age poverty and other social costs of retirement insecurity in their decision-making. For these reasons, it makes sense for a federal agency to insure pension plans; for public-sector employers to offer secure pension benefits; and for the federal government to provide rate-of-return guarantees on retirement savings as proposed in the GRA plan.[18]

The counterargument to an expansive view of the government's role is that cost sharing across generations can result in cost *shifting* to future generations. In this view, policymakers who are beholden to taxpayers, plan participants, or other stakeholders have an incentive to lowball the cost of funding or guaranteeing future benefits, leaving future generations to pay the price. Without wading too deeply into this debate, suffice it to say that many government functions—including public education, public health, and Social Security—have intergenerational aspects that demand a level of trust and competence in government. And even if there is some cost shifting, future generations will be better off with an efficient government program than an inefficient individual account plan.

It is also worth noting that those who emphasize the potential for intergenerational cost shifting appear less concerned with other ways the government subsidizes retirement for some people at the expense of others. Tax subsidies for individual account plans—$119 billion in 2021 (OMB 2022)—overwhelmingly go to high-income households (Toder, Harris, and Lim 2009; CBO 2021). They do little to promote retirement security because these households would save regardless, and the subsidy mostly causes these households to shift funds to tax-preferred accounts rather than increase their saving (Benjamin 2003; Chernozhukov and Hansen 2004; Engen and Gale 2000; Engen, Gale, and Scholz 1996; Heim and Lurie 2014).

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[18] These are also arguments in favor of social insurance programs such as Social Security. In addition to spreading risk across populations and generational cohorts, social insurance can help spread costs over individual lifespans.

Traditional pensions encourage retention and provide workers with secure income in retirement

Most traditional pensions are designed to reduce turnover and smooth the transition to retirement by basing benefits on years of service and the worker's final average salary with the employer. For example, a typical benefit formula is something like 1.5% times years of service times five-year final average salary at a designated normal retirement age. A 30-year worker would therefore replace 45% of her average earnings in the five years before retirement for a total replacement rate of 80% if their Social Security benefit replaces 35%. This type of benefit formula rewards workers who remain with an employer until they retire, when their salaries are usually highest,[19] and makes it easy for workers to estimate their income replacement rate at retirement.

Multiple-employer pensions, many organized with the help of unions, are common in industries where employment relationships are often short-lived. Benefits in these plans are often based on a percentage of career-average earnings or a flat dollar amount per year of service and are unaffected by job changes if workers take other jobs in the system.[20] This has tradeoffs for employers and workers. Career-average or flat-dollar formulas make it easier for actuaries to predict benefit costs because projections are less sensitive to wage growth and turnover assumptions than final-average-salary pensions. However, these benefit formulas may not be as effective for promoting recruitment and retention. For workers, these formulas mitigate the impact of job changes or job loss but make it more difficult to project how their retirement income will compare with preretirement earnings.

Traditional pensions shield participants from investment and longevity risks[21] by risk pooling and by adjusting employer contributions in response to changing conditions. Since there are limitations to risk pooling, employers who sponsor traditional pensions retain long-term pension liabilities. The federal government also bears some risk by insuring pensions through the Pension Benefit Guaranty Corporation (PBGC), which guarantees pension benefits up to specified amounts if a plan sponsor no longer can keep up with necessary payments and stay in business.

Pension fund contributions are based on actuarial assumptions about long-run investment returns, life expectancy, inflation, and salary growth, among other factors. If these assumptions are not met, contributions are increased to make up the difference. In private-sector pensions in the United States, this responsibility falls on employers. In pensions for public-sector workers, employees typically also contribute to these plans and may face increased contribution rates, though their contributions are typically fixed in the short run.

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[19] A worker who changes employers mid-career will have somewhat lower benefits than one who stays with the same employer for their entire career, since half the service credits earned by the mobile worker will be multiplied by lower mid-career earnings. This assumes both workers have the same earnings, years of service, and pension benefit formulas in all jobs.

[20] Some nonunionized private-sector workers, such as employees of religious organizations and universities, are also in multiple-employer pensions, as are many public-sector workers. For example, teachers and other local government employees often participate in statewide pension plans. However, public-sector multiple-employer plans are typically aimed at reducing administrative costs rather than accommodating mobile workers, so benefit formulas often resemble those in single-employer pensions.

[21] Most public-sector pensions, along with Social Security, provide inflation-adjusted benefits, whereas private-sector pensions typically do not.

Workers indirectly bear pension risks. While cost increases do not directly affect participants in private-sector pensions, they may cause employers to squeeze salaries or other benefits. Workers also face the risk that they will stop accruing benefits if their employer freezes their pension or they lose their jobs. While employment risks impact the retirement security of all workers, those whose benefits are tied to formulas based on years of service and final average salaries are more exposed to this type of risk. Similarly, while accrued pension benefits in the public sector, like those in the private sector, are generally viewed as guaranteed, these protections vary by state. As previously mentioned, many public-sector workers faced increased contributions and cuts to cost-of-living adjustments in the wake of the 2008 financial crisis (Brainard and Brown 2018).

Pension funds do not simply assign investment and longevity risks to employers: They also smooth the cost of funding pensions over time. Volatility is reduced by basing asset valuations on smoothed investment returns and by gradually eliminating, or "amortizing," projected surpluses or deficits over time. Gradual adjustment is essential because fluctuations in investment earnings can easily exceed the normal cost of pension benefits.[22] Smoothing also indirectly helps workers because it is unlikely that employers would absorb highly volatile costs without passing these risks on to workers in some fashion, or freezing pensions altogether.

Pension funds are better equipped to manage investment risk than individual retirement savers. Pension funds and other institutional investors with indefinite investment horizons can take on more risk than workers saving for retirement who need to access funds within limited time frames. Even adjusting for risk, professionally managed funds appear to outperform individual investors by avoiding common errors, such as failing to rebalance and panic selling. Institutional investors also have access to a broader range of investments and can spread fixed costs, including the cost of expertise, over a wider base (Fornia and Rhee 2014; Millard, Pitt-Watson, and Antonelli 2021).

Pension funds and other long-term investors can reduce risk and increase risk-adjusted returns by holding bonds to maturity and investing in long-duration bonds. Though bond prices are sensitive to interest rate fluctuations, holding bonds to maturity eliminates all except default risk. Long-term investors also benefit from the fact that yields are usually higher for long-duration bonds.

Pension funds can diversify into illiquid investments such as real estate, infrastructure, or private equity. Due to high transaction costs, these investments generally require large financial commitments that are not suitable for small investors but may increase portfolio diversification for pension funds and other institutional investors. Illiquid investments may confer higher risk-adjusted returns to compensate investors for the fact that the asset is not easily tradeable. These opportunities exist because some types of investments, such as major infrastructure projects, are complicated to evaluate or require long-term planning and implementation, and so are not suitable for small investors.

Illiquid investments such as private equity, hedge funds, and venture capital typically promise low correlations with standard asset classes as a hedge against market downturns, but these advantages

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[22] The normal cost is the estimated cost of funding pension benefits accrued in the current year, factoring in turnover, salary growth, and other assumptions about the future. Required contributions can be more or less than the normal cost if there is amortization of a deficit or surplus.

may be exaggerated. Alternative investments raise transparency and other governance issues and may not deliver on promised advantages when successful strategies are repeated with diminishing returns.

While longer investment horizons increase risk-adjusted returns for bondholders and allow investors to diversify into illiquid investments, stock investors do not reduce their exposure to risk over time, as noted by economist Paul Samuelson a half-century ago (Samuelson 1963, 1997). This may seem counterintuitive, since the risk of losing money decreases with the length of the investment horizon. This is because the average expected return on stocks is positive, and the likelihood that negative returns will overwhelm positive ones decreases with the number of returns. However, realized outcomes will tend to diverge more from expected outcomes over longer horizons. And while the risk of losses decreases over time, the magnitude of potential losses increases.[23]

Pension funds counter some of the destabilizing effect of volatile stock returns by rebalancing portfolios and making other adjustments. Pension funds increase risk-adjusted returns and reduce the impact of stock market fluctuations through periodic rebalancing—buying or selling assets to maintain a target portfolio allocation, such as a 50–50 stock-bond mix. Individual account plan participants can also rebalance automatically using balanced and target date funds. Rebalancing prevents investment portfolios from shifting to riskier allocations in bull markets or to more conservative allocations in bear markets. Rebalancing may also increase risk-adjusted returns if it results in buying low and selling high.

Additional strategies, such as reducing equity allocations when high price-to-earnings ratios suggest the presence of a bubble, may also improve risk-adjusted returns. As previously mentioned, pension funds can also take advantage of a long investment horizon to invest in higher-yielding long-duration bonds, hold fixed-income investments to maturity to reduce risk, and invest in alternative assets that provide an illiquidity premium.

Pension funds also rely on variable contributions to gradually eliminate projected surpluses and deficits. Portfolio diversification and rebalancing can only go so far to counter the destabilizing effect of volatile stock returns, so pension funds also use variable employer contributions to amortize deficits or surpluses. In some theoretical models, pension funds with stable or growing memberships can invest heavily in equities because they can adjust contributions and ride out bear markets (Gollier 2008; Cui, De Jong, and Ponds 2009). However, these models ignore regulatory and other constraints on risky investment strategies and assume investment returns have known probability distributions.

Pension practitioners often engage in stochastic modeling to assess the likelihood of outcomes based on assumed values for investment returns. The probability of outcomes occurring may be based, for

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[23] As a simple illustration of how cumulative returns diverge over time, imagine that stock returns are equally likely to be -1% or +3% in any given year, such that the average expected return is 1%. Thus, the expected outcome with an initial \$1,000 investment is approximately \$1,105 over 10 years ($1,000*(1.01^{10})$) and \$1,489 over 40 years ($1,000*(1.01^{40})$). Over 10 years, roughly 5% of investors will lose money, a share that approaches zero (0.1%) over 40 years. However, the average amount the realized outcome differs from the expected outcome is 6% after 10 years and 13% after 40 years (author's analysis based on 10,000 Monte Carlo simulations). This is also true for a normal probability distribution (with or without some mean reversion) and results from the fact that multiplying a random sample of numbers from a known distribution, unlike adding a sample of such numbers, causes greater divergence from the expected outcome as the sample size increases. Thus, while a longer investment horizon decreases the likelihood of losses, it also increases the magnitude of potential losses.

example, on the mean and variance of returns on similar investment portfolios over the past 20 years. But market outcomes are not purely probabilistic or forces of nature. They also reflect human behavior, policy interventions, and societal trends. For example, stock returns may decline because productivity has slowed; bond yields may decline due to expansionary monetary policy; and the prices of both types of assets may be driven up by a global savings glut (see, for example, CEA 2015).

While it is simplistic to assume that future investment returns are easily predictable based on past returns, it is also a mistake to assume that they are completely untethered to historical patterns or the state of the economy. Though financial markets are famously susceptible to "the madness of crowds," they also reflect economic factors such as corporate profits and inflation that are easier to predict and should be factored into assumptions. This suggests that while only stable governments with the ability to tax can offer ironclad guarantees of future payouts, it is reasonable for pension funds and others to include risky assets in balanced portfolios. In the event of a global financial collapse that upended all assumptions, pension underfunding would be the least of anyone's worries.

Individual retirement savers are more limited in their ability to manage risk

Individual account plans include 401(k) and similar plans where participants' retirement outcomes are tied directly to investment returns. These plans are more common in the private sector than in the public sector. A prescribed amount is contributed each year to an investment account, often in the form of a voluntary employee contribution and an employer match. For example, employers may contribute 50 cents for each dollar contributed by workers up to 6% of salary for a total contribution rate of 9% if the worker takes full advantage of the match. Individual account plans usually leave it to participants to figure out how much they can spend in retirement to avoid outliving their savings, though 2019 legislation encourages these plans to offer annuity options.

When most private-sector employers made the switch from traditional pensions to individual account plans in the 1980s, this was promoted as a way of giving workers more choice in how they invested for retirement. However, the poor investment performance of many 401(k) savers and the recent trend toward hands-off investing has shown that most workers are less interested in managing their investments than ensuring a secure retirement, and the shift from pensions to individual accounts has made it harder to achieve this goal.

Even individual savers who follow recommended practices are more exposed to risk than participants in group plans. Individual retirement savers can diversify their investments through mutual funds, take advantage of other investors' expertise through passive investment strategies, and insure against long lifespans by buying annuities. Even if they do everything right, however, they face investment timing risks and higher costs for annuities not faced by participants in traditional pensions.

Participants in individual account plans cannot engage in intergenerational risk sharing and are more exposed to sequence of returns and other timing risks. Individuals who need to build up and then tap retirement savings over a defined period are less equipped to weather financial market volatility than pension funds that pool investments on behalf of workers who retire at different times. Those who convert savings to annuities also face the risk that annuity rates are low when they purchase the annuities.

Target date funds limit risk, but at a cost. Target date funds, which invest heavily in stocks in the early years and gradually reduce stock allocations as the target retirement date approaches, are the most commonly selected option among new 401(k) participants (ICI 2021; Vanguard 2021). The rationale for a target date approach is that younger workers have more time to make up the difference by saving more if investment returns fall short of expectations. The strategy is costly, however, because expected returns decline as account balances grow. Based on past returns from Thrift Savings Plan index funds, the expected return on a target date fund that "glides" from a 70–30 to 30–70 stock-bond allocation is about 5% lower than the expected return on a balanced 50–50 portfolio, even though the average allocation in the target date fund is the same (author's analysis based on Monte Carlo simulations).[24] However, the unluckiest participants would fare better in the target date fund which, like a bond-heavy portfolio, guards against the worst outcomes.

The pros and cons of target date funds are poorly understood. Many retirement savers mistakenly believe that it is safe to load up on stocks when they are young because investment returns will average out over time. In fact, a longer investment horizon increases not just the expected value of stock holdings at retirement, as would be expected with cumulative positive returns, but also the average difference in the value of these holdings from their expected value. This is not surprising, since we generally expect that as things grow larger variations in size are also magnified. But even a scaled measure of dispersion—the coefficient of variation—increases as stocks are held longer. This matters because target date fund investors with stock-heavy allocations may be lulled into a false sense of security and not realize that they may need to adjust their saving rate or retirement date in response to poor performance (Dillian 2020). On a more positive note, target date funds can offer diversified stock-bond portfolios with automatic rebalancing, helping less sophisticated investors who in the past often took an-all-or-nothing approach to risk and failed to rebalance.

Individual account participants are also disadvantaged in the payout phase

Insurance products sold to individuals are more expensive. A pension fund providing lifetime benefits can do so more cheaply than an individual purchasing a life annuity because the pension fund avoids insurance company overhead and transaction costs. Providing benefits to groups of workers who are automatically enrolled in a plan also avoids problem of adverse selection—in this case, the fact that people who buy life annuities tend to be healthier and longer-lived than the average person, driving up the cost for all prospective buyers.[25]

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[24] Stock and bond returns in this simulation are based on historical returns on the Thrift Savings Plan "S" and "F" funds, respectively. This is a conservative estimate of losses from a target date approach because it assumes that contributions increase by 3.8% each year for 40 years based on the Social Security Administration's long-run wage growth assumption. In practice, an individual worker's wage growth is usually steeper over the course of a career than the average wage growth because of returns to experience. The 70–30 to 30–70 glide path is also more conservative than many target date funds that go from 90–50 to 50–50. The steeper the wage growth and target date glide path, the higher the cost of reducing risk by shifting to a more conservative asset allocation.

[25] Adverse selection in individual markets is a big reason why health, disability, and life insurance are often provided by employers in the form of group benefits, or by governments in the form of social insurance, rather than being purchased by individuals. Adverse selection can be a big enough problem that certain types of insurance, such as long-term care insurance in the United States, become unaffordable for most people. While this is not the case for life annuities, adverse selection does contribute to higher costs for individuals.

In addition, annuity payouts depend on underlying investments that are strictly regulated by state insurance commissioners to ensure obligations can be met without recourse to state guaranty funds. In practice, this means that life insurance companies invest mostly in bonds, so buying annuities means forgoing higher risk-adjusted returns from investing in a diversified portfolio that includes stocks.

Purchasing an annuity also exposes individual retirement savers to timing risk because payouts depend on the annuity rate at the time of purchase, which can vary considerably from month to month. Thus, annuity buyers face a timing decision that can negatively or positively affect their lifetime income by hundreds of thousands of dollars.

Hybrid plans offer participants less security than traditional pensions, but more than individual account plans

Hybrid plans combine elements of individual account plans and traditional pensions. Motivations behind the design of hybrid plans include accommodating employers unwilling or unable to take on long-term liabilities; ensuring the sustainability of pension schemes in the face of demographic and other changes; improving the retirement security of workers in individual account plans; and creating a system suited for a mobile workforce.

Hybrid plans take advantage of risk pooling while apportioning remaining risk across stakeholders. They include shared risk pensions, where benefits resemble traditional pensions but are not fully guaranteed, and notional account plans, where benefits resemble accruals in individual account plans but investments are pooled and collectively managed. The Shared Risk Pension Plan in New Brunswick and the ATP Plan in Denmark are good examples of these two types of plans, but many hybrid plans do not fall neatly into either category, and there are other ways to classify plans. What most hybrid plans have in common is that they expose participants to less risk than individual account plans while limiting employers' long-term liability.

Some hybrid plans were designed to be more employer-friendly versions of traditional pensions, while others were more worker-friendly alternatives to individual account plans. Actuaries and other practitioners involved in hybrid plan design often seek to reapportion risk among stakeholders in the name of sustainability. This is particularly true of hybrid plans that were intended as alternatives to traditional pensions, including the New Brunswick plan (Munnell and Sass 2013). Other hybrid plans were designed to provide more secure benefits to workers currently in individual account plans. New hybrid plans in the United Kingdom, for example, were developed by Royal Mail workers and their union; they were dissatisfied with the individual account plan that had replaced their traditional pension (Jadav, Eagle, and Hamilton 2019).

Hybrid plans evolve in response to changing conditions and priorities. Hybrid plans in the Netherlands, for example, first transitioned from a shared-risk pension model with benefits based on final average salary to one with benefits based on career-average salary. Under the proposed New Pension Contract, the plans would shift to a notional account model with limited risk-sharing through a reserve fund (Westerhout, Ponds, and Zwaneveld 2021; van Bilsen, Mehlkopf, and van Stalborch 2022).

Hybrid plans are gaining wider recognition in the United States. Interest in these plans has moved beyond actuaries and other pension practitioners to think tanks such as the Brookings Institution and Georgetown University's Center for Retirement Initiatives, both of which released reports about these

plans in 2021 (Iwry et al. 2021; Millard, Pitt-Watson, and Antonelli 2021). The authors of these reports include leaders of the movement for state-sponsored Auto IRA plans, suggesting that a balancing fund and other risk-sharing features might be adopted by such plans in the future.

'Shared-risk' plans resemble traditional pensions, but participants bear some risk

Shared-risk pensions provide lifetime benefits tied to salaries and years of service, but full benefits depend on funding. The New Brunswick plan, for example, has guaranteed benefits tied to a worker's career-average salary. "Ancillary" benefits tied to the worker's final average salary and cost-of-living adjustments are contingent on adequate funding.[26] The Variable Defined Benefit pension design developed by the United Food and Commercial Workers union and adopted by the state of Maine for local government employees also has guaranteed and contingent benefits (Blitzstein 2014). Other shared-risk pensions, including those in the Netherlands, provide no explicit guarantee, but benefits are adjusted as necessary according to prescribed rules.

The defining feature of shared-risk pensions is that risks are assigned in advance rather than after the fact. While many public pension plans suspended cost-of-living adjustments (COLAs) in the wake of the 2008 financial crisis, the New Brunswick plan explicitly makes COLAs contingent on funding *ex ante* ("conditional indexation"). In this and other hybrid plans, such as the Michigan Public School Employees' Retirement System, benefits are adjusted in response to changes in life expectancy (Brainard and Brown 2018). A challenge in shared-risk plans is that the more successful they are at avoiding benefit cuts, the less participants expect cuts, leading to a backlash when the unexpected happens, as occurred in the Netherlands in the wake of the 2008 financial crisis (Bovenberg and Nijman 2012).

Policymakers and practitioners generally prefer to cut future benefits over accrued benefits, especially benefits retirees already are receiving. Younger participants have more time to adjust to pension cuts by saving more; and cutting benefits retroactively amounts to a breach of trust if older workers and retirees paid for benefits directly through contributions or indirectly by accepting lower salaries. Accrued benefits are often protected by law, but they can be reduced in bankruptcy or if they are deemed to be benefit enhancements, such as COLAs, that were not implicitly or explicitly guaranteed.

Despite the priority accorded to the accrued benefits of older workers and retirees, some policymakers and practitioners support including these groups in risk-sharing arrangements in the name of sustainability. The rationale is that while pensions and employers may be better equipped to handle risk than workers and retirees, concentrating too much risk in a single institution or group of stakeholders can harm retirement security if plans become severely underfunded or younger generations are asked to bear the full brunt of adverse shocks.

While it might seem preferable to assign risk to stakeholders ahead of time rather than cut benefits in a crisis, risk sharing diminishes a major selling point of traditional pensions: that workers can look forward to predictable and secure benefits. Risk sharing in public pensions is also questionable because governments are well suited to bear long-term risks. In the United States, at least, severely underfunded

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[26] Turner (2014), Iwry et al. (2021), Doonan and Wiley (2021), and Millard, Pitt-Watson, and Antonelli (2021) describe the risk-sharing features of these and other hybrid plans. Similar types of plans that go by different names in different countries include "Defined Ambition" pensions in the Netherlands, "Collective Money Purchase" plans in the United Kingdom, and "Target Benefit" plans in Canada.

public pensions are almost always the result of political irresponsibility rather than unforeseeable risks, and secure pension benefits have long been used to recruit workers drawn to careers in public service and make up for lower pay. However, shared-risk pensions may be a necessary compromise, as public pension underfunding often provides a political opening for more drastic and ill-considered reforms.

From an economic if not legal or political standpoint, it is better to reduce starting benefits than to eliminate or suspend COLAs if the goal is to maintain living standards in retirement. However, there is often less resistance to reducing or suspending COLAs than cutting initial benefits, whether because the impact of inflation on living standards is not fully understood by the public or because there is a bias toward present consumption because health and mortality risks increase with age. Given this political reality, a middle ground—offering benefits that normally increase over time but may not always keep up with inflation—is likely the least objectionable way to include retirees in risk-sharing arrangements.

Notional account plans resemble individual account plans, but with pooled risk and investments

Other hybrid plans, including cash balance plans in the United States and the proposed GRA plan, resemble individual account plans with pooled investments, tying benefits to a rate of return rather than salaries and years of service. A benefit formula based on contributions and investment returns reduces the number of risk factors compared with one based on salaries and years of service. Reducing risk factors is especially useful when a system cannot be stabilized with variable contributions. In voluntary plans, aligning costs and benefit accruals also reduces the temptation for workers or employers to game the system by participating only when the value of additional benefits exceeds the contribution, which for traditional pensions occurs at older ages.

The GRA plan was loosely modeled on cash balance plans in the United States and similar notional account plans in Europe and elsewhere. Cash balance and other notional account plans can be tailored to the needs of mobile workers because the benefit is not tied to tenure or salary with a particular employer. Like individual account plans, participants accrue savings based on contributions and a rate of return. In cash balance plans, these take the form of "pay credits" and "interest credits" assigned to notional accounts, though funds are pooled and professionally invested. Unlike 401(k)-style individual account plans, employers usually bear the full cost of cash balance plans in the United States, and participation is automatic.

Cash balance plans can reduce employer risk with variable interest credits. While the plan sponsor must guarantee a positive rate of return, interest credits may be tied to variable benchmarks, such as Treasury yields.[27] Employers can eliminate investment risk by investing in the same asset that serves as the benchmark, but many prefer to reap the expected risk premium associated with a more diversified portfolio. Cash balance plans are required to offer annuities as the default payout option, though most participants take lump-sum distributions.

Cash balance plans can align costs and benefit accruals. In cash balance plans, as with traditional pensions, contributions are a fixed share of salary based on the average cost across participants. In traditional pensions, however, the actual cost of funding benefits increases with age, so the cost for an

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[27] Cash balance plans are legally considered "defined benefit" plans in the United States even though retirement outcomes can vary depending on investment returns because the employer commits to a minimum benefit that is ultimately backed by the Pension Benefit Guaranty Corporation.

individual worker can be more or less than the average cost.[28] This can also be true of cash balance plans, as employers can favor younger workers by offering a higher interest credit or favor older workers by offering a higher pay credit. However, if employers set the interest credit equal to the expected return on fund assets, the required contribution will on average equal the pay credit for workers regardless of age, avoiding a predictable mismatch between contributions and costs for workers at different stages of their careers. This also reduces the number of actuarial assumptions, eliminating the need to project salary growth or employee turnover. However, because cash balance plans cause workers to accrue retirement benefits more slowly as they approach retirement, they pose challenges for workers' retirement planning.

The GRA and similar proposals are aimed at workers who lack access to employer plans with secure benefits

GRA benefits resemble cash balance benefits, with a stable interest credit approaching the expected return on plan assets. In the original GRA plan, contributions equal to 5% of earnings up to the Social Security taxable maximum,[29] split equally between employers and workers, receive a minimum interest credit of 3% above inflation guaranteed by the federal government, with the credit approaching the long-run expected return on investment.

A GRA board of trustees is tasked with reducing disparities in retirement outcomes between generational cohorts using a reserve fund. In flush years, investment returns above the guaranteed rate are held in the reserve fund until the board determines that it has accumulated a sufficient buffer to withstand a down market, at which point excess returns are distributed to retirees. Under normal circumstances, the reserve fund helps stabilize retirement outcomes without triggering the guarantee. However, a long or steep decline in investment returns requires the government to make good on the guarantee, perhaps also resetting it going forward.

The GRA plan helped pave the way for other plans with similar mechanisms for intergenerational risk sharing. These plans include the National Conference on Public Employee Retirement Systems' (NCPERS) "Secure Choice Pension" (Kim 2011); the Center for American Progress's Secure, Accessible, Flexible, and Efficient (SAFE) Retirement Plan (Davis and Madland 2013); and Sen. Tom Harkin's "Universal, Secure, and Adaptable" (USA) Retirement Fund (U.S. Senate HELP Committee 2012). While details differ, these plans have in common pooled investments, the use of a reserve fund or similar mechanism to spread investment risk between birth cohorts, and a stream of payments retirees cannot outlive, like traditional pensions. Unlike most traditional pensions, however, retirement outcomes in these plans reflect contributions and long-run investment returns rather than formulas based on salaries, years of service, and retirement ages. The GRA and Secure Choice Pension plans include a guaranteed minimum investment return, but the USA Retirement Fund and SAFE plans do not.

Comparing the GRA and SAFE plans helps illustrate the pros and cons of different approaches

The Center for American Progress's SAFE plan, which places bounds on annual investment returns to protect participants against losses, provides less intergenerational risk sharing than the GRA plan but

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[28] Costs increase with age and tenure because salary increases are multiplied by an increasing number of service credits, and because contributions for older workers accrue investment returns over fewer years.
[29] The Social Security taxable maximum is $147,000 in 2022.

may be more sustainable. The SAFE plan does not assume a federal role in backstopping benefits, making it a potentially useful model for Auto IRAs. It also leaves little to the discretion of the fund's board, insulating the board from charges of favoring some cohorts at the expense of others, but making it more difficult to change tack in response to evolving conditions or lessons learned.

The SAFE plan smooths short-run returns but is less effective at equalizing retirement outcomes than the GRA plan. The SAFE plan's collar mechanism assigns investment returns above an 8% ceiling to a reserve fund that is tapped in years with negative returns. Accounts also receive bonus payments if the reserve fund grows large enough. The authors note that this would prevent retirement outcomes from varying widely from year to year, as happened to cohorts who retired before and after the 2008 financial crisis. However, they also estimate, based on stochastic modeling, that a lucky participant in the 95th percentile of retirement outcomes would end up with an income replacement rate six times larger than an unlucky participant in the 5th percentile, not much better than their estimate for an "ideal" low-cost 401(k) (Davis and Madland 2013).[30]

It is easier to avoid swings in annual account balances than to share risk between cohorts who retire decades apart. The SAFE plan prevents workers from seeing the value of their savings fall precipitously as they approach retirement, as many older workers experienced during the 2008 financial crisis. It accomplishes this without reducing expected returns when savings are at their peak, the main disadvantage of target date funds. However, a variable return within a wide collar is not very effective at reducing disparities in retirement outcomes that result from many years of above-average or below-average returns. In contrast, the GRA plan targets long-run returns: Rather than narrowing the range of annual returns, as the SAFE plan does, the GRA plan credits notional accounts with a guaranteed return that approaches the long-run return on fund assets.

A GRA-style reserve fund with a target rate would function similarly to one with a federal guarantee approaching the expected rate of return. Calling the interest credit a target rather than a guarantee also makes it clear that it can be adjusted in response to changing conditions, similar to how pension actuaries periodically adjust rate-of-return assumptions after conducting experience studies.

Adjusting a guarantee or target rate of return may be necessary to avoid ballooning surpluses or deep deficits. A reserve fund mechanism with a stable target interest credit works best when the expected rate of return is stable and market volatility amounts to pure "noise." But even in such an idealized model, a GRA-like fund can run out of money or balloon to enormous size after sustained bull or bear markets if the target rate cannot be adjusted. Theoretical models assume that a depleted fund would be able to borrow to meet benefit obligations and eventually return to solvency with new contributions and investment returns. These models also assume that enormous surpluses are not a problem if the goal is minimizing the number of retirees with poor outcomes, as opposed to equalizing retirement outcomes across generations (Gollier 2008). In the real world, however, large deficits or surpluses would

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[30] With an "ideal" 401(k), the 95th percentile participant would have a replacement rate around seven times larger than that of the 5th percentile participant. This may not be a perfect apples-to-apples comparison, because the SAFE plan also has higher replacement rates across the distribution. For example, the median (50th percentile) replacement rate is 58%, versus 49% with the ideal 401(k). Though some of this is due to a higher assumed annuity rate in the payout phase, it is also possible that SAFE plan participants are more exposed to equity risk, in which case the amount of risk reduction achieved is greater than it appears. This is difficult to gauge because the ideal 401(k) is invested in a target date fund that is not described in detail.

not be tolerated for long, and it is difficult to differentiate *ex ante* between transitory shocks and lasting shifts in economic conditions. Targeting long-run returns is a more effective way to equalize retirement outcomes across distant generations than smoothing annual returns, but there is a tension between equalizing outcomes across generations and adjusting to changing conditions before a situation becomes unmanageable. In a GRA-like plan, how frequently the target is adjusted would depend on the board and the public's tolerance of large reserves or deficits.

While a reserve fund is designed to equalize outcomes when long-run returns are relatively stable, one with a naïvely backward-looking estimate of the long-run rate of return could exacerbate intergenerational inequality if long-run returns are trending down. This risk can be minimized if the plan begins with a lower target rate, with retroactive adjustments or bonuses to compensate early participants if realized returns are better than expected—that is, if excess returns are more than enough to fund the reserve. Under the Netherlands' New Pension Contract, for example, limited risk sharing is achieved by diverting up to 10% of contributions to a solidarity fund until the plan has built up a reserve equal to 15% of liabilities (Westerhout, Ponds, and Zwaneveld 2021; van Bilsen, Mehlkopf, and van Stalborch 2022). Similarly, the SAFE plan sets the ceiling of the collar low enough to build up a reserve fund, using bonus payments to prevent it from growing inexorably. In both plans, the first generation of participants does not inherit risk but pays a price in the form of a lower expected return for the risk it passes on to future generations. If expected returns are realized, future generations will on average be spared this expense, but will both inherit and pass on risk.

Recent proposals suggest there may be limited scope for intergenerational risk sharing. The Netherlands' New Pension Contract, for example, proposes a relatively small (15%) "solidarity reserve," while the SAFE plan begins distributing bonuses when the plan is 110% funded.[31] Plans that do not formalize the risk-sharing mechanism, such as the Canada Pension Plan, may tolerate more volatility. As a rule, real-world plans rely more on portfolio strategies to reduce risk than theoretical models designed to demonstrate the potential advantages of intergenerational risk sharing (Gollier 2008; Cui, De Jong, and Ponds 2009). The theoretical models also assume mandatory participation.

The tension between sustainability and secure benefits extends to the payout phase. At retirement, GRA and SAFE balances are converted to monthly benefits based on average life expectancy at retirement, insuring participants against individual longevity risk. Benefits in both plans are adjusted for changes in average life expectancy. In the GRA plan, these are based on the same stable interest credit received by active participants, whereas in the SAFE plan, the annuity rate is based on the expected return on a separate fund with a more conservative portfolio allocation than the fund for active participants. Borrowing a feature of shared-risk pensions, SAFE plan benefits normally escalate by 2% annually, but these and any additional adjustments necessary to keep up with inflation are conditional on plan funding.[32] Both the GRA and SAFE rates would compare favorably to market annuity rates tied to more conservative investments.

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[31] The bonuses are initially small but escalate with the size of the surplus.
[32] Sixty-five percent of the investment fund for active workers in the accumulation phase would be invested in stocks and 35% in bonds. In contrast, 35% of the annuity fund for retirees would be invested in stocks and 65% in bonds. While investment returns in the accumulation fund would be variable within the 0% to 8% collar, payouts

Is risk sharing feasible and fair in the absence of other reforms proposed in the GRA plan?

The GRA plan is ambitious. In addition to risk-sharing features, it calls for universal access, seamless portability, mandatory employer and employee contributions, low administrative expenses, and a flat refundable tax credit that would offset all or most of the cost for low-wage workers. Does it make sense for state-sponsored Auto IRA plans to offer guaranteed lifetime benefits similar to those proposed in the GRA plan if it is not politically possible to adopt other key features of the plan, especially mandatory contributions and a progressive subsidy?

While Auto IRA plans would be greatly improved with GRA-like features, these may not be politically realistic without federal action. State and local governments have no control over federal tax subsidies, may not be able to mandate employer contributions to retirement plans, and would find it difficult to guarantee investment returns for retirement savers because they face balanced budget constraints and other impediments.

California and Connecticut considered a reserve fund and guarantee in the design phases of their plans.[33] In California, the reserve fund option under consideration came with a guarantee against cumulative losses, or guarantee of principal (Secure Choice Retirement Savings Investment Board 2014).[34] In response to a request for comment, the financial industry weighed in on the side of more conventional options, while six nonprofit institutions, including the Economic Policy Institute and The New School (where Dr. Ghilarducci heads the Schwarz Center for Economic Policy Analysis), supported the reserve fund with guarantee. In Connecticut, the state considered various ways to offer an annually predetermined guarantee, but in the end decided that the cost was prohibitive (CRSB 2016).

The California and Connecticut debates remain relevant, even though both states ended up selecting target date funds as default investments (Morrissey and Eisenbrey 2012; Overture Financial 2016; Georgetown CRI 2021). The lack of support for risk-sharing options is not surprising considering how they were presented, with a reserve fund tied to costly guarantees that would have little practical impact on many participants. Neither a guarantee of principal nor a low annual guarantee would do much to equalize retirement outcomes across generations. However, the cost of a guarantee, whether

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would be based on the expected return on the annuity fund (5% in nominal terms at the time of writing), with some variability depending on plan funding. Payments would normally increase by 2% per year, conditional on 90% funding, but retirees could receive a bonus if the plan's funded ratio exceeded 110%. Because the benefit is structured as an escalating payment, the risk sharing would mostly take the form of lower or missed COLAs rather than nominal benefit cuts.

[33] Employer-sponsored plans may be prohibited from offering rate-of-return guarantees backed by reserve funds or other forms of risk sharing, but that is not the case for state-sponsored Auto IRAs. The Employee Retirement Income Security Act (ERISA), which governs employer-sponsored retirement plans in the for-profit sector, requires that all investment returns net of administrative costs be used for the benefit of participants. This has been interpreted as a prohibition against using a reserve fund to equalize outcomes between retiree cohorts (Turner and Rajnes 2003; Gale, John, and Kim 2016). However, individual account plans for public-sector and nonprofit workers do not fall under ERISA, and some do offer rate-of-return guarantees (Turner and Rajnes 2003, 2009). Similarly, Auto IRA plans set up by state and local governments are not employer-sponsored plans and therefore not covered by ERISA, despite a failed attempt by financial industry and small-government lobbyists to impose ERISA restrictions on these plans (ICI 2016; Berg and Antonelli 2021).

[34] This was described as a "capital preservation-oriented investment offering with a gain/loss reserve."

purchased from a financial provider, achieved through a conservative investment strategy, or some combination of the two strategies, would have reduced participants' net returns.

Risk sharing should be undertaken with clear goals and an awareness of limitations and tradeoffs

The goals of risk sharing in hybrid plans include ensuring the sustainability of retirement systems, reducing inequality between generations, and providing retirees with secure incomes in retirement. Individual account plans are inherently sustainable because they promise nothing, but they are inefficient because they forgo the benefits of spreading investment risk across generations and longevity risk across individuals. This presents opportunities for improving retirement account plans through risk-sharing mechanisms, but there are limitations and tradeoffs, especially in a voluntary system.

Intergenerational risk sharing raises sustainability issues

The biggest challenge in intergenerational risk sharing is that investment returns are not simply "noisy" but fundamentally uncertain, and risks associated with stock investing do not decrease over time. There are practical limits to how much plan assets can fluctuate in relation to liabilities without leading to destabilizing inflows and outflows and threatening sustainability. For these reasons, it is easier to reduce fluctuations in annual investment returns, as the SAFE plan does, than to equalize outcomes between cohorts who retire decades apart, as the GRA plan aims to do.

Though challenging, intergenerational risk sharing is worth attempting, but requires using a reserve fund in combination with other strategies aimed at stabilizing investment returns. Thus, while some theoretical models suggest that plans with reserve funds could increase stock allocations beyond what would be prudent for individual retirement savers (Gollier 2008), practitioners typically advocate a continued reliance on fixed-income investments to reduce volatility (e.g., Blitztein 2014).

Risk sharing is more than insuring against the worst outcomes. A guarantee of principal, as provided by German "Riester" plans (Turner 2014), among others, may give peace of mind to highly risk-averse individuals but does not provide meaningful risk sharing between retiree cohorts, because the guarantee is rarely binding for career participants.

Guaranteeing annual rather than cumulative returns, meanwhile, is an inefficient way to reduce disparities in retirement outcomes. By one estimate, a 0% floor on investment earnings would cost six times as much if applied annually rather than after 40 years. Though the guarantee would be binding at least once in most 40-year periods, roughly four out of five participants would be better off risking negative returns than paying for the guarantee (Antolín et al. 2011).

Even if an annual floor on investment returns is attained by means of a reserve fund rather than by costly measures such as investing conservatively or purchasing a guarantee from a third party, it may not be very effective at reducing inequality in retirement outcomes. And while there can be value in insurance that protects against catastrophic outcomes even if most buyers do not recoup the cost of the premium, it is inefficient to insure against annual losses if the goal is equalizing cumulative returns.

An infrequently adjusted target interest credit approaching the projected long-run investment return is a middle ground between setting a low floor on annual returns, which does little to equalize outcomes, and offering a fixed guarantee approaching the projected return, which is unsustainable unless backstopped by the federal government.

Such a "target rate fund" can be tailored to different goals. It can prioritize sustainability with more frequent target rate adjustments or intergenerational risk sharing with a more stable rate. Similarly, a lower target rate relative to the expected return makes it less likely that participants will be blindsided by retirement outcomes that fail to meet expectations, but may make outcomes more unequal as bonus payments or other adjustments will be required to prevent ballooning surpluses. Finally, as with any funded retirement plan, the investment portfolio can be adjusted to increase expected returns or minimize risk.

Plans with intergenerational risk-sharing features have existed for decades in the Netherlands and other countries. Most offer pension-like benefits tied to salaries, which are riskier to offer than benefits tied to investment returns or interest credits as in the GRA and SAFE plans.[35] Rather than an unproven model, therefore, a target rate plan can be considered a simpler and potentially more sustainable version of hybrid plans already in existence, including plans like the Canada Pension Plan, where stable investment returns are embedded in cost estimates if not directly included in benefit formulas. Existing systems, however, usually have the advantage of mandatory or quasi-mandatory participation.

Voluntary plans would have to take steps to limit destabilizing inflows and outflows. State Auto IRA plans could, for example, offer a target rate fund as the default investment but limit participant access to funds before retirement, making participation in the fund conditional on willingness to leave money untouched and accept lower-than-market returns during bull markets. In down markets, plans could apply a lower target rate only to new contributions, deterring opportunistic participation. Though not a perfect analogy, the Canada Pension Plan has a somewhat lower implicit target rate for "base" contributions and for additional contributions above the base rate that began in 2019 (CPP n.d.c).[36]

Automatic annuitization raises fairness issues

The biggest challenge with managing longevity risk is doing so in a way that does not exacerbate inequality. Secure lifetime income provides peace of mind and improves retirees' standard of living because it encourages retirees to spend rather than scrimp (Blanchett and Finke 2021). However, large disparities in life expectancy by income make lifetime benefits regressive in the absence of other provisions that disproportionately benefit lower-income participants (Waldron 2007; Cristia 2009; Olshansky et al. 2012; Bosworth and Burke 2014; National Academies 2015). Social Security has features that favor low earners, such as survivor benefits and a progressive benefit formula that replaces a higher share of income for low earners. Many employer-provided pensions, meanwhile, group relatively homogeneous groups of workers, such as teachers or building trades workers. But mandatory annuitization in Auto IRA plans would raise serious fairness concerns, since these plans are funded entirely by workers and many low earners receive little or no tax benefit from participating in these or other tax-qualified plans.

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[35] The Netherlands is in the process of moving away from a salary-based formula to a notional account model to reduce the number of risk factors.
[36] The "base" CPP refers to contributions continuing at rates used before 2019, and "additional" CPP refers to additional contributions that started in 2019. The CPP assumes that base and additional CPP accounts will earn, respectively, a net average real rate of return of 3.95% and 3.38% over a 75-year period. The CPP refers to these as "necessary" rates of return rather than targets (CPP n.d.c).

Ideally, the problem of regressive redistribution should be addressed in ways that provide secure benefits at retirement without introducing adverse selection. Absent progressive subsidies that offset the cost of contributions, as in the GRA plan, this could be done with targeted benefits. For example, a life annuity with a capped death benefit or minimum benefit guarantee could make a plan less regressive, help low-income families cope with the loss of a breadwinner, and help overcome psychological barriers to annuitization.

Optional annuitization may lessen regressive redistribution if low-income participants who opt out do so because they are aware of their heightened mortality risk. Converting lump sums to lifetime income at retirement also helps, since life expectancy at retirement is more equal across income and racial groups than life expectancy at younger ages.[37] This assumes that family members inherit accounts when a worker dies before retiring, helping to offset the loss of a breadwinner. Similarly, partial annuitization is less regressive than full annuitization and can give participants more flexibility if they face health or other emergencies or want to retire debt. Many experts recommend deferred annuities that begin at older ages because they are relatively inexpensive yet help participants who might underestimate their life span or underspend out of fear of doing so. However, this assumes retirees can manage their savings before receiving the annuity, a task that requires the ability to project and adjust to investment returns.

Account balances should be converted to lifetime benefits without relying on third-party providers. This requires plan actuaries to estimate the present cost of benefits based on assumptions about life expectancy and investment returns. Though this requires professional expertise and may entail some risk, it is simpler than determining the present cost of traditional pension benefits based on future salary, tenure, rate of return, and other assumptions.

Innovative strategies for converting account balances to lifetime income are a hot topic among practitioners, though discussions typically focus on flexibility and efficiency rather than fairness.[38] Some of these strategies are designed to address the problem of low annuity rates and timing risk, but would also mitigate the fairness problem. John et al. (2019), for example, recommend pooled managed payout funds invested in portfolios with risky assets that use a reserve fund and other mechanisms to provide relatively stable payments over fixed periods. Though these funds do not protect against longevity risk because the payout is over a defined period, they can be combined with inexpensive deferred annuities that begin paying after the fund has been depleted. This strategy also illustrates that the tension between secure benefits and sustainability extends to the decumulation phase of retirement planning.

Traditional pensions also have other advantages that appeal to most workers. These pensions are mostly funded by employers, though there is cost sharing in the public sector. Even if we assume that some or all of the cost of pensions is directly or indirectly passed on to workers, pension funds generally achieve higher investment returns net of fees than individual savers, making it unlikely that many workers could do better on their own. Unequal life expectancy is also less of a problem when pensions group together similar workers, such as building trades union members or teachers. And even if workers

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[37] For the 1950 birth cohort, for example, life expectancy at birth was 62.9 years for Black females and 66.5 years for white males. However, for those surviving to age 65, remaining life expectancy in 2015 was 19.6 years for Black females and 18.0 years for white males (CDC 2018).

[38] See, for example, John et al. (2019), and Gale, Iwry, and John (2021).

indirectly pay for pension benefits with lower salaries, they are likely to have chosen these jobs in part because they place a high value on secure benefits.

In the payout, or "decumulation" phase, as in the saving or "accumulation" phase, there is also a tension between providing secure and predictable benefits and sustainability. While uncertainty related to cohort life expectancy can be minimized by basing payments on remaining life expectancy when workers retire rather than trying to project life expectancy decades into the future, some uncertainty remains. More challenging is balancing retirees' need for secure and predictable income while still taking advantage of the equity risk premium.

Conclusion

The revival of interest in risk sharing in government-sponsored Auto IRA plans is a welcome development but requires addressing issues specific to voluntary plans that do not have recourse to variable employer contributions. Options are also limited in the absence of other necessary reforms, such as fixing upside-down tax subsidies that disadvantage lower-income workers. To advance the discussion, we offer some tentative conclusions about risk sharing in these plans:

1. Without federal backing, a guarantee is more costly than it is worth. Whether a guarantee is backed by the retirement fund or provided by a third party, it will restrict investment options and lower expected returns.

2. A reserve fund can be paired with a stable target that approaches the expected return on plan assets. A plan with a stable target can relieve employers of long-term liabilities while taking advantage of pooling to increase risk-adjusted returns and smooth retirement outcomes across generations. A target would face less political resistance than a guarantee and can work for state- and city-sponsored plans. Though not as reassuring to participants as an ironclad guarantee, a stable target can help equalize retirement outcomes to provide a measure of predictability and improve welfare.

3. A pooled fund with voluntary participation should have an investment portfolio that is less risky than a fund with variable employer contributions but riskier than an individual account participant. Any mechanism for intergenerational risk sharing will be imperfect, because investment returns are uncertain and large deficits and surpluses are not tolerated for long.

4. Voluntary plans with stabilized returns must take measures to prevent participants from gaming the system. Risk sharing is possible but more limited in voluntary plans with mobile workers. For such a system to work well, workers would ideally participate for their entire careers—or at least at random times. In a voluntary system with a stabilized interest credit, participants may be tempted to come and go depending on the status of a reserve fund, how the interest credit compares with market returns, and other factors. Auto enrollment, early withdrawal restrictions, and other measures may be required to prevent participants from gaming the system in ways that could wreak havoc on plan funding.

5. Mandatory annuitization is questionable in the absence of provisions that benefit low-income participants. While plans should offer lifetime benefits as the default option, mandatory annuitization is unfair to low-income workers with shorter life expectancies who are already disadvantaged in the current retirement system. Optional annuities are not ideal, but a pooled GRA-like fund could offer them at a higher annuity rate than the market rate for individual annuities.

We should not give up on a more ambitious reform agenda. In particular, if low-income workers with shorter life expectancies were compensated through a progressive tax subsidy or other means, full annuitization would not be unfair to low-income workers with shorter life expectancies.

The simplest and most important reform is expanding Social Security. Social Security is the largest and most secure source of retirement income for most people. It is largely a pay-as-you-go system,[39] and therefore little affected by the vagaries of financial markets.[40] Social Security expansion is outside the scope of this technical paper, which focuses on filling gaps in the employer-based system. However, Social Security expansion and reforming the employer-based system should be seen as complements, not substitutes.

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[39] Social Security's trust fund serves mainly to accommodate baby booms and busts rather than prefund retirements.
[40] The implicit return on Social Security contributions reflects economic growth, which in turn depends on population and productivity growth rather than more fickle investment returns.

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