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Enhancing the Security of Defined Contribution Plans

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Abstract

With the aging population, the employer-sponsored pension plan has become a more important source of retirement income. Unlike defined benefit (DB) pension plans, defined contribution (DC) plans shift the investment risk from plan sponsors to plan participants. In a low interest rate environment, many plan participants are taking more aggressive investment strategies to accumulate wealth. But the increasing level of market volatility poses a significant threat to this retirement income source. In a financial crisis, the plan account value may drop significantly. Even if the market may recover in the future, for plan participants who are close to retirement, a crisis could significantly reduce their retirement income. A panic may also lead to switching to a conservative investment strategy after huge losses. In that case, the impact of a financial crisis on retirement income will become permanent.

To protect this important source of retirement income, some level of guarantee in the DC plan is helpful. This paper discusses some key challenges of embedding guarantees in DC plans, including setting an appropriate guarantee level, designing effective cost funding and risk management strategies, and fair treatment of plan participants with different investment strategies.

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1. Introduction

Employer-sponsored pension plans are an important source of retirement income. According to a 2013 OECD pension report **[5]**, the replacement rate from public pensions is 38.3%, and the replacement rate from voluntary defined contribution (DC) plans is 37.8% for a median income earner in the United States. With the benefit of risk transfers from plan sponsors to plan participants as well as the easy portability, DC plans are becoming more and more popular. However, unlike defined benefit (DB) plans, the replacement rate from a DC plan is not guaranteed. Insufficient funding and bad investment performance can lead to a low replacement rate that could jeopardize retirement security. In addition, longevity risk is also borne by DC plan participants. If the DC account is not converted to annuities, the risk of outliving retirement assets is higher because of possible bad investment performance after retirement.

The current new economic environment paradigm also increases the risk of a low replacement rate from voluntary DC plans. The low interest rate environment causes low new investment return on the bond market, which is not attractive. DC plan participants have been increasing their equity allocation gradually after the 2008 financial crisis. Expansionary monetary policy and the low cost of share buybacks helped boost the equity market but at the same time increased market volatility and downside risk. For a long-term investor, a high equity allocation may not be very risky because he or she can wait for the next economic cycle to recover. However, for workers who are near retirement, or new retirees who have not converted their DC account to annuities, a high equity allocation could be devastating. In a financial crisis, withdrawing money from the account to cover living costs causes realized losses and reduced exposure to the capital market. When the market recovers, the gain of the remaining portfolio is likely to be lower than the loss.

With the aging population, public pensions may need to provide fewer benefits in the future after adjustment for inflation. This makes the security of DC plans more important in retirement. Given the weight of DC plans in retirement income and their high exposure to market risk, adding a certain level of guarantee can help improve retirement security.

If guarantees are provided for DC pension plans, the size of the DC pension market may lead to a very high risk exposure for guarantors. Effective risk mitigation can help reduce the loss caused by the guarantee and transfer it to the entire capital market. Risk hedging can reduce the counterparty risk of plan participants and the credit risk of guarantors so that the impact on the capital market is less material.

This paper explores possible guarantees and the appropriate guarantee level for DC plans that can maintain the necessary security of retirement income. It discusses how the guarantee cost can be funded considering the incentive of participating in the guarantee program, fair treatment among plan participants, and the burden on taxpayers. The paper also discusses possible methods to manage the risk caused by guarantees in DC plans.

2. Guarantee Level

Setting the guarantee level in DC plans is difficult. A high guarantee level leads to high-cost, high-counterparty risk and overprotection of retirement assets. A low guarantee level leads to insufficient protection of retirement assets. Because the goal is to protect retirement assets at a level that will not pose a significant threat to retirement security, a minimum replacement ratio can be relied on to determine the appropriate guarantee level. For example, if a minimum replacement ratio of 65% is assumed for a median income earner, the guarantee level can be roughly calculated as shown in Table 1.

Table 1. DC Plan Information

Public Pension Replacement Rate (1)	38.3%
Voluntary DC Plans Replacement Rate (2)	37.8%
Total Replacement Ratio (3)	76.2%
Minimum Replacement Ratio (4)	65%
Guarantee Level	$= \frac{(4)-(1)}{(2)} = 70.6\%$

Data Source: OECD Report **[5]**.

The minimum replacement ratio needs to vary by income level. Low-income earners usually need to have a higher minimum replacement ratio to cover fixed living costs after retirement. Regulators can help design, recommend, and promote the appropriate minimum replacement ratio and guarantee level for different ranges of income. The implementation may involve a long process before the market is liquid enough to accommodate requirements of different guarantee levels for different investment portfolios.

In the example above, both the replacement ratio and guarantee level are set assuming medium replacement rates. For employees with the same income level but different DC plan contribution levels, the required guarantee level to achieve a minimum replacement ratio varies. For example, if the voluntary DC plan replacement rate is 20%, the guarantee level will be 133.5%.[1] If the voluntary DC plan replacement rate is 60%, the guarantee level will be 44.5%.[2] Allowing the guarantee level varying by DC plan contribution level is not practical and does not recognize the increased level of retirement security from higher DC plan contributions. Guarantee levels based on average or medium replacement rates should be used as the guideline with the focus on the aggregate retirement security. The guarantee level will also be reasonable because it will not be too high to be affordable and too low to be economically meaningful.

Details of a DC plan guarantee program could also have material impacts on the cost and risk:

1. *Length of guarantee.* For plan participants with a long time horizon till retirement, providing a guarantee over the entire pre-retirement period could be costly and to some degree

[1] Guarantee Level $= \frac{Minimum\ Replacement\ Ratio - Public\ Pension\ Replacement\ Rate}{Voluntary\ DC\ Plans\ Replacement\ Rate} = \frac{65\%-38.3\%}{20\%} = 133.5\%$

[2] Guarantee Level $= \frac{Minimum\ Replacement\ Ratio - Public\ Pension\ Replacement\ Rate}{Voluntary\ DC\ Plans\ Replacement\ Rate} = \frac{65\%-38.3\%}{60\%} = 44.5\%$

unnecessary. For example, for a 30-year-old employee, the guarantee period is around 35 years assuming the retirement age is 65. The cost of a guarantee can be high because of the high uncertainty and less liquid market for long-term guarantees. On the other hand, the time period is long enough for a market recovery. The average economic cycle after World War II has been about seven years **[4]**. Even if young plan participants experience investment losses, the losses of a diversified portfolio are likely to recover before retirement. The cost of a guarantee in the early stage of the plan can be saved to make more contributions to the pension plan. Most people start to plan for retirement seriously about 10 years before retirement. Losses experienced close to retirement may be realized because money needs to be withdrawn for retirement income. Providing guarantees for only five to ten years before retirement could be a better option considering basic needs and cost efficiency. However, two potential issues exist for shortening the guarantee period:

a. For workers who have changed jobs, the current employer may not be willing to cover its share of the cost for account value accumulated during previous employment. The problem can be addressed with a proper tax-saving incentive and the benefit of attracting talent.

b. If the guarantee period starts during a financial crisis, the starting DC plan account value is low. A guarantee level based on a percentage of the low account value is not enough to achieve the target minimum replacement ratio. Considering the average duration between a peak and a trough in an economic cycle has been about seven years since World War II, the guarantee level can be set as a percentage of the average of account values in the last seven years.

2. *Frequency of guarantee renewal.* Once a contribution to a DC plan is made, guarantees can be provided for the entire pre-retirement period or renewed annually. A long period guarantee has less uncertainty such as a rising cost of the guarantee in the future. But the market is less liquid for long-term guarantees, and the counterparty risk is higher. Renewal of the guarantee allows more flexibility for both plan sponsors and plan participants, but the cost varies significantly by market conditions. In a financial crisis, the cost of a guarantee may not be affordable because every investor is looking for hedging downward risk. Technical difficulties may also exist for the guarantee renewal. If past investment performance led to a much higher asset value than expected, setting the guarantee value at renewal according to the asset value at that time could increase the guarantee to an unnecessarily high level. If past investment performance led to a much lower asset value than expected, it could decrease the guarantee to an unacceptably low level. For a shortened time horizon that starts from five to ten years before retirement, a five to ten year guarantee is a good choice. The market is liquid, and no renewal is needed before retirement.

3. *Guarantee on systemic risk.* Systemic risk is a big threat to retirement security. Retirement assets experienced large losses during the 2008 financial crisis. Theoretically, it makes more sense to guarantee retirement assets only in systemic events. Losses caused by nonsystemic events have narrow scopes and less impact. Some hybrid market instruments such as contingent convertible bonds allow risk transfer mostly in systemic events. The trigger of conversion could be based on some prespecified systemic events or industry-wide events, or

determined by governments **[6]**. If guarantees for DC plans are triggered only in systemic events, this can reduce the cost of guarantee. However, it may be difficult to objectively decide whether the criteria of triggering are met in practice. Further studies are needed to assess the feasibility of guarantees solely on systemic risk.

4. *Longevity risk.* Longevity risk can be transferred to insurance companies when the DC plan account value is converted to a life annuity. An efficient and liquid market already exists for longevity risk. Therefore, it is not the focus of the proposed guarantee program.
5. *Choice of guarantee levels.* In a more complete and liquid market, plan participants may have the choices of different guarantee levels. To avoid unnecessary overprotection and cost funding, the extra cost of higher than necessary guarantees needs to be covered by plan participants.

3. Guarantee Cost Funding

The guarantee cost could be seen as an extra burden on plan participants and may discourage participation in the guarantee program. It could be worse during a financial crisis when plan participants have less income and the cost of guarantees increases significantly due to higher market volatility. Even when the guarantee is in the money, plan participants may have to drop out of the program and use the saved guarantee cost to cover more basic life needs. During the 2008 financial crisis, the lapse rate of variable annuity products increased even though the guarantees were in-the-money. Therefore, the funding scheme of the guarantee cost needs to be carefully designed to encourage participation in the guarantee program and maintain the participation rate throughout economic cycles.

Three possible sources of guarantee funding are government, plan sponsors, and plan participants:

1. The government can provide the funding for guarantees in DC plans. This is an unlikely option because eventually taxpayers are paying for the funding while the benefits are taken by only a subgroup of taxpayers. Given the size of DC plan assets, the required guarantee cost funding could be too large to be covered solely by the government. On the other hand, to encourage offering and buying guarantees in DC plans, the government can offer tax credits for guarantee cost funders. For plan sponsors paying part of the guarantee cost, the cost should be fully deductible for taxable income calculation and may earn extra tax credits, such as 20% of the guarantee cost. Plan participants who pay for part of the guarantee cost should get full tax credits when reporting personal income tax. Using this approach, the impact on tax income will be gradual and less severe than direct funding from the government.
2. Plan sponsors can share part of the guarantee cost. In most employer-sponsored DC plans, plan sponsors usually match the contribution of employees up to a certain percentage. It is expected that plan sponsors would share the cost of guarantees, and it could also encourage the participation of employees in the guarantee program. Sharing the cost could also be seen as a benefit of employment to attract talent. Like DB plans, this provides a certain level of comfort for retirement security. Unlike DB plans, the cost is not solely on plan sponsors and is less uncertain.

3. Plan participants can share part of the guarantee cost as well. Having the guarantee cost funded by other parties will lead to full participation in the guarantee program, but it will also increase the risk of retirement assets because more participants will choose riskier investment strategies given the protection from the guarantee. With plan participants sharing part of the cost, a balance can be achieved between the investment risk and the participation rate of the guarantee program.

A straightforward method is that plan sponsors will pay for the guarantee cost associated with employers' contribution, and plan participants will pay for the cost associated with employees' contribution. In the case that the participation in the guarantee program is low, plan sponsors can increase their share of the cost to encourage more participation. Favorable tax rules are also needed to encourage both plan sponsors and participants to take part.

Some DC plan participants may be reluctant to enroll for the guarantees. The benefits of the guarantee program need to be fully communicated with plan participants to encourage participation. DC plans with automatic enrollment generally have higher participation rates **[1]**. Automatic enrollment is another strategy to increase the participation rate of the guarantee program, although participants can opt out the guarantee program.

4. Fair Treatment

Most DC plans allow employees to decide their own asset allocations and investment strategies. According to their willingness and ability to take risk, some may choose a risky plan, and some may choose a conservative plan. If the guarantee cost is fully funded or partly funded based on a fixed share by plan sponsors, plan participants with riskier investment strategies will receive more subsidy because the cost of the guarantee is higher for riskier portfolios. These funding structures will penalize people having less risky retirement assets and encourage people to invest in riskier assets with higher expected return and volatility. Fair treatment among plan participants can help reduce an undesired impact on asset allocations.

In addition, the contribution rate of each employee varies. Some may choose to contribute more than the minimum requirement. If the plan sponsor pays for all or a fixed percentage of the guarantee cost, plan participants with higher contribution rates will receive more subsidy.

A fair guarantee cost funding structure needs to consider both the difference of asset allocations and the difference of contribution rates. A possible funding structure is that the plan sponsor will pay for the cost of the guarantee for the sponsor's contributions to the plan based on a prespecified asset allocation. The prespecified asset allocation can be set as the median asset allocation of all plan participants. The guarantee level should be an appropriate level as discussed in Section 2. If the plan participant chooses a higher guarantee level, the extra cost needs to be paid by him- or herself. If the plan sponsor wants to encourage higher participation rate in the guarantee program, it can adjust the subsidy by a universal factor to maintain fairness.

The following example compares three funding structures: fully funded by the sponsor (Approach A), partly funded by the sponsor based on a fixed percentage (Approach B), and partly funded by the sponsor based on the sponsor's contribution and the cost of guaranteeing a typical asset allocation plan (Approach C).

Example

Two employees A and B have joined the DC plan guarantee program; see Table 2.

Table 2. DC Plan Information

	Employee A	**Employee B**
Salary (Contribution Base)	$90,000	$70,000
Employer's Contribution Rate	3%	3%
Employee's Contribution Rate	7%	3%
Current Plan Assets	$100,000	$50,000
Accumulated Contribution	$75,000	$40,000
Asset Allocation	Bond 30% Equity 60% Others 10%	Bond 55% Equity 40% Others 5%
Cost of Guarantee (% of Assest)	1.5%	1%
Cost of Guarantee Benchmark* (% of Assets)	1%	1%

* The cost of guarantee rate used to calculate the plan sponsor's payment for guarantee cost.

For simplicity, it is assumed that the contribution rates remain the same since inception. Therefore, out of Employee A's accumulated contribution and current plan assets, 30% (3%/(3%+7%)) were from the employer and 70% were from the employee. Out of Employee B's accumulated contribution and current plan assets, 50% (3%/(3%+3%)) were from the employer and 50% were from the employee. In practice, past contributions need to be tracked to calculate the share between the employer and the employees. Table 3 illustrates the guarantee cost funding using the three approaches.

Table 3. DC Plan Guarantee Cost Funding

	Approach A		Approach B		Approach C	
Description	Fully funded by the sponsor		Partly funded by the sponsor based on a fixed percentage (50%)		Partly funded by the sponsor based on a fair structure	
Employee	A	B	A	B	A	B
Plan Assets	$100,000	$50,000	$100,000	$50,000	$100,000	$50,000
Total Cost of Guarantee (CoG)	$1,500	$500	$1,500	$500	$1,500	$500

CoG by Employer ($)	$1,500	$500	$750 ($1,500×50%)	$250 ($500×50%)	$300[a]	$250 ($500×50%)
CoG by Employee ($)	$0	$0	$750 ($1,500×50%)	$250 ($500×50%)	$1,200 ($1,500−$300)	$250 ($500×50%)
CoG by Employer (%)	100%	100%	50%	50%	20%	50%
CoG by Employee (%)	0%	0%	50%	50%	80%	50%

a. Plan Assets ($100,000) × CoG Benchmark (1%) × Employer's Share of Contribution (30%)

In this example, Employee A's total asset is twice the size of Employee B's. Employee A's portfolio is riskier, and his or her personal contribution rate is much higher. For Approaches A and B, the employer pays more guarantee cost for Employee A than for Employee B even after removing the impact of asset size (Approach A: $1,500/2 > $500; Approach B: $750/2 > $250.) For Approach C, the funding structure is fairer because Employee A is paying a higher percentage of the guarantee cost because of a higher personal contribution rate and riskier asset allocation.

5. Credit Risk Management

Counterparty risk is a key risk of DC plan guarantees. The size of U.S. DC plans is about 8% of the total capital market.[3] In a financial crisis, guarantors of DC plans may have financial distress as well and not be able to fulfill the liability. In that case, plan sponsors may be seen as secondary guarantors even though the responsibility does not hold legally. Plan sponsors may face additional cost and liquidity requirements that lead to lower stock prices, a worsening financial market, and high guarantee payments. The downward spiral could increase market volatility and systemic risk. Counterparty risk needs to be carefully managed to ensure the successful exercise of the guarantee and adequate solvency of the guarantors.

1. The size of DC plan assets makes it important to have access to the entire capital market to transfer the risk of guarantee. A single industry such as the insurance industry will not have enough capital to absorb such a material risk in an extreme event.
2. The guarantee level cannot be high so that most guarantees are out-of-money put options. In this way, the chance of guarantee exercise and the amount of guarantee payoff will be low to reduce the impact on financial market stability and systemic risk.
3. Regulatory capital requirements need to be set up for guaranteeing DC plans. Stringent capital rules can help reduce the chance of failing a guarantee payment. Like the capital requirement for variable annuity products, advanced techniques such as stochastic models and stress testing can be used to determine the amount of required capital.
4. Guarantors can utilize financial derivatives such as equity index put options, futures, interest rate floors, and swaptions to hedge the risk. For longer-term risk transfer, securitization can

[3] At the end of 2013, U.S. DC plan assets totaled $5.9 trillion **[3]**. The U.S. capital market size including bonds, equities, and bond assets was $72.7 trillion **[2]**.

be used. Like catastrophe bonds, structured products can transfer guarantee risk to investors. If a guarantee payment occurs, investors may lose some coupon payments and even principals.

5. The total size of the guaranteed DC plan assets will affect the supply-and-demand relationship of the market and increase the cost of hedging and risk transfer. Gradual implementation, a broad market, and financial innovations are needed to mitigate the market impact.

With proper approaches to addressing high credit risk, DC plan guarantees can be managed to achieve the goal of increasing retirement security.

6. Conclusion

The weight of employer-sponsored DC plans in retirement assets and their high exposure to market risk indicates that a certain level of guarantees is necessary for retirement security. The guarantee level does not need to be high, and the guarantee period can be shortened to control cost, encourage participation, and discourage excessive risk taking. The cost could be shared between plan sponsors and plan participants with government providing tax credits to encourage participation in the guarantee program. The cost-sharing structure needs to ensure fair treatment for different investment strategies to mitigate its impact on investment strategy and risk appetite. Management of the risk associated with guarantees is important so that counterparty risk is low and the exercise of the guarantee will not trigger another crisis in extreme scenarios. A liquid market for guarantee risk transfers and a relatively low guarantee level are important for the success of DC plan guarantee programs.

7. References

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