

Pooled annuity fund design and management of retirement risk

Professor Catherine Donnelly,
Heriot-Watt University

C.Donnelly@hw.ac.uk

3 March 2026









UK pension system

- Pillar 1:
 - Pay-as-you-go system.
 - “Basic State Pension” of ~£12 000 p.a.
 - ~50% of current minimum wage.
 - ~33% of current UK median wage.
 - Contribute based on earnings between two thresholds.
 - About 35 years of contributions needed to get full Basic State Pension.
- Pillar 2:
 - Funded occupational pension plans.
 - Defined benefit pension schemes in decline,
 - 4% of private sector schemes open to new members in 2024.
 - Defined contribution (DC) currently main alternative.
 - Minimum total contribution rate of 8% of salary.



What is a CDC scheme in the UK?

-  Pension scheme that pays benefits to its members.
-  Main benefit is a lifetime income in retirement. Level of income is not guaranteed, though aims to increase with CPI.
-  Contributions are fixed.
-  No requirement for employers or members to eliminate funding `deficits`.
-  No buffer allowed.
-  Members collectively share risks in the scheme.

UK trust-based pension schemes



Scheme type	Contribution levels	Benefit levels	Who bears the risk?	Who decides the level of risk?
Defined Contribution (DC)	Fixed	Vary	Members via lump sum variability	Whoever constructs the default investment fund
Collective Defined Contribution (CDC)	Fixed	Vary	Members via income variability	Trustees
Defined Benefit (DB)	Vary	Fixed	Employers via contribution variability, but members in more extreme scenarios	Trustees and employers



CDC scheme types in the UK

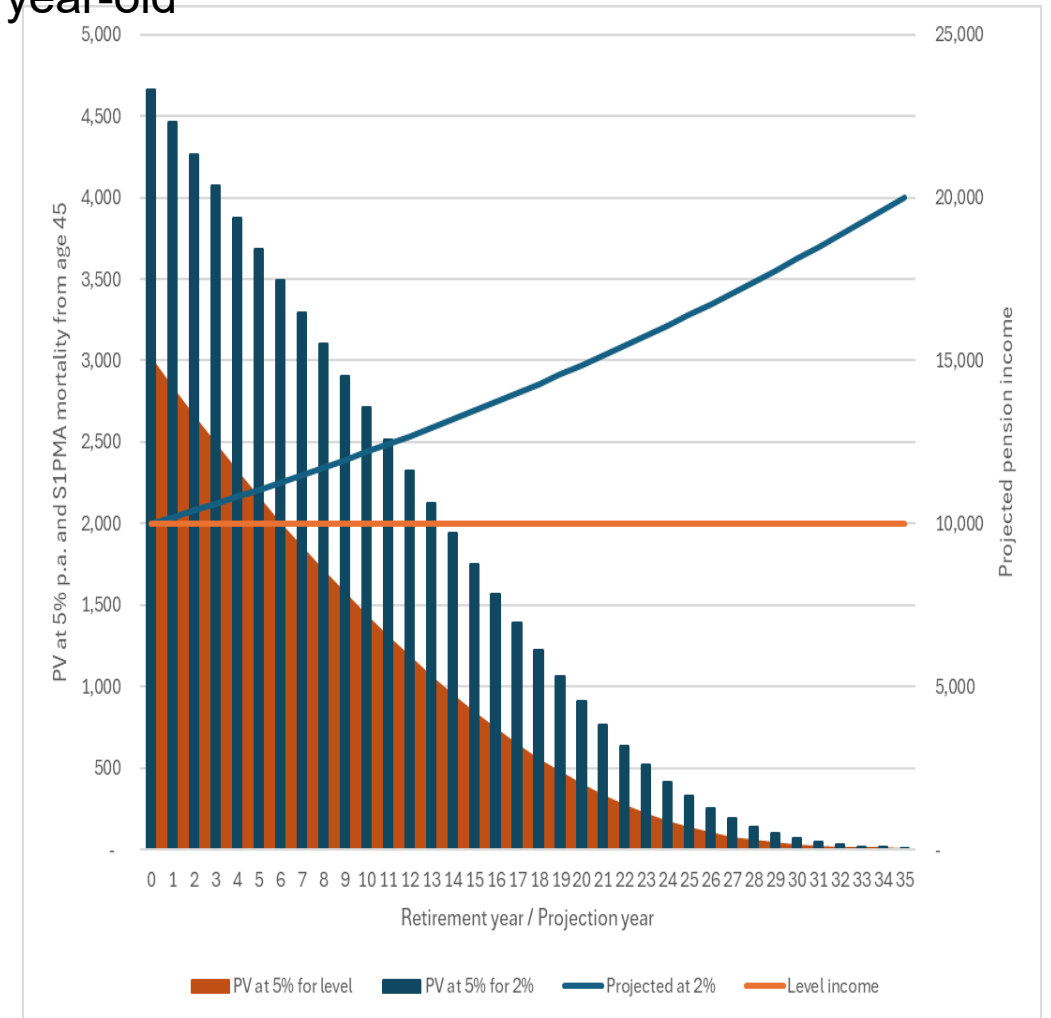
- Royal Mail Collective Pension Plan is the only current CDC plan in the UK
 - Whole life, single employer scheme.
- 2026: Multi-employer, whole life schemes allowed.
- ~2027/2028: Decumulation / retirement-only CDC schemes (“r-CDC”) likely allowed.
- Only trust-based schemes allowed.

How are benefits adjusted in UK CDC schemes?

- The level of members' income varies with scheme experience.
- In UK, variation materialises through either:
 - Annual pension increases for nominal benefit increases, or
 - Nominal benefit cuts for nominal benefit decreases.
- Scheme valuation projects the accrued pension at the current rate of annual pension increases.
 - Pension increase adjustment spreads variation over expected future lifetime.
- Different approaches outside the UK.



Bars show 45% fall in asset value to move to 0% p.a. pension increases from 2% p.a, for 45-year-old

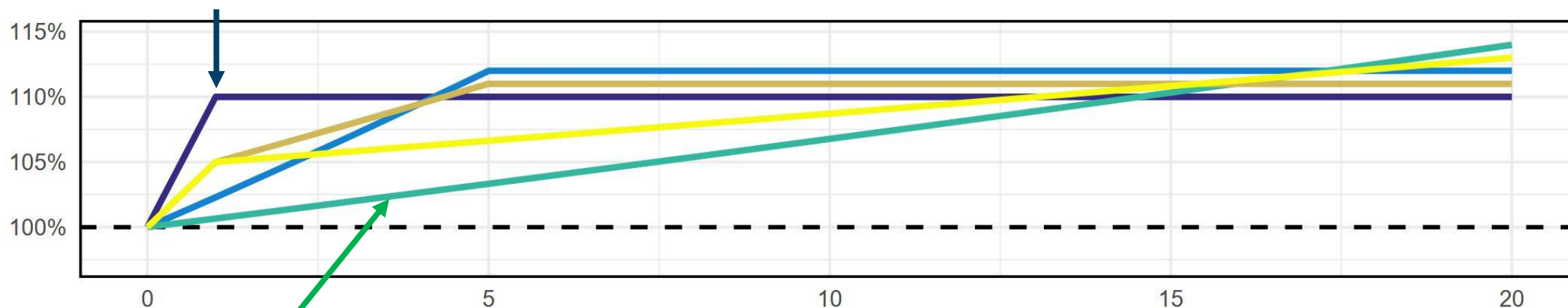




Different approaches to recognition of scheme experience

- Imagine the scheme asset value jumps +10%. How do the benefits change?

Australian Retirement Trust's Lifetime Pension:
Benefit level moves up +10%.



UK CDCs:

Annual pension increases move up ~0.5% p.a.



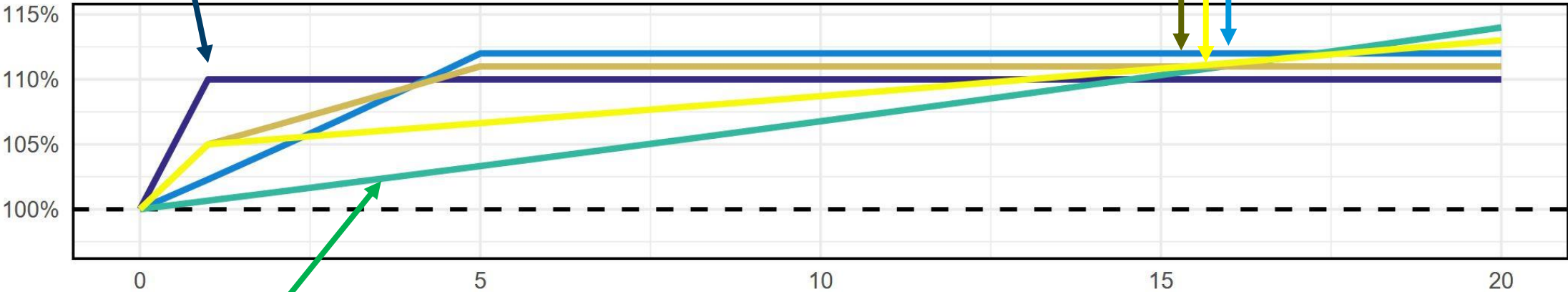
Different approaches to recognition of scheme experience

- Imagine the scheme asset value jumps +10%. How do the benefits change?

Something in between:
Hybrid recognition (BDDS, 2026).

Immediate recognition of experience

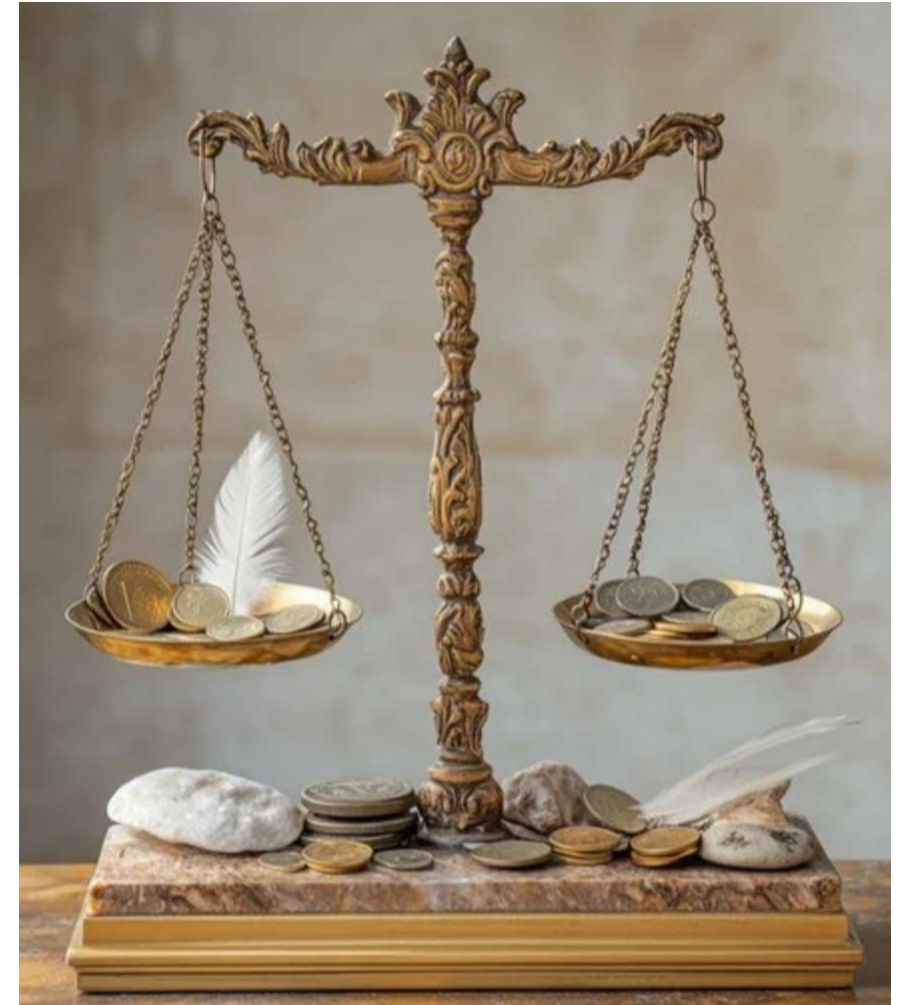
→ Benefit payments absorb experience



Gradual recognition of experience → Asset value absorbs experience

Different approaches to recognition of scheme experience

- Immediate recognition of experience →
 - Less inter-temporal risk-sharing,
 - More volatile benefit levels.
- Gradual recognition of experience →
 - Smoother benefit levels,
 - More inter-temporal risk-sharing.
 - Changes the risk profile of young and old members (*cross-sectional*)
 - Older members have lower benefit volatility, borne by younger.
- Hybrid recognition – proposed & explored in BDDS (2026).



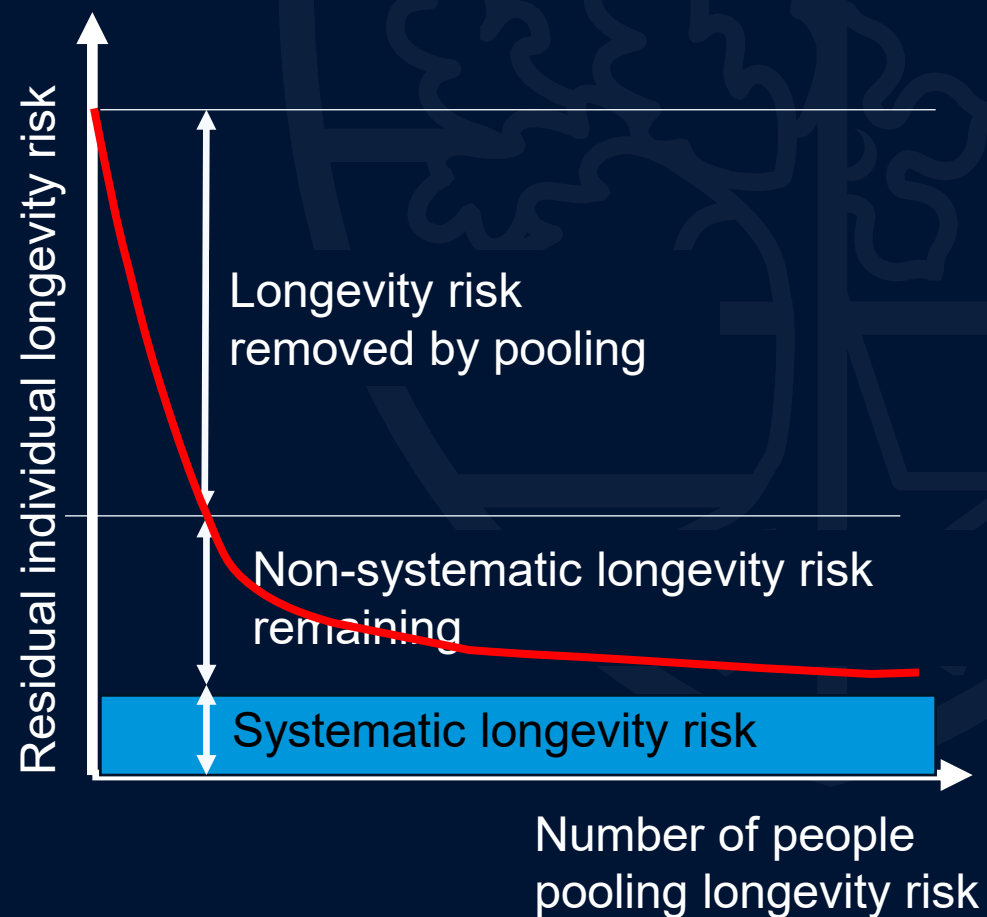


In risk-sharing structures,

Most of longevity risk is
diversifiable
(cross-sectional risk-sharing)

3,000-5,000 members for
diversification in mature scheme.

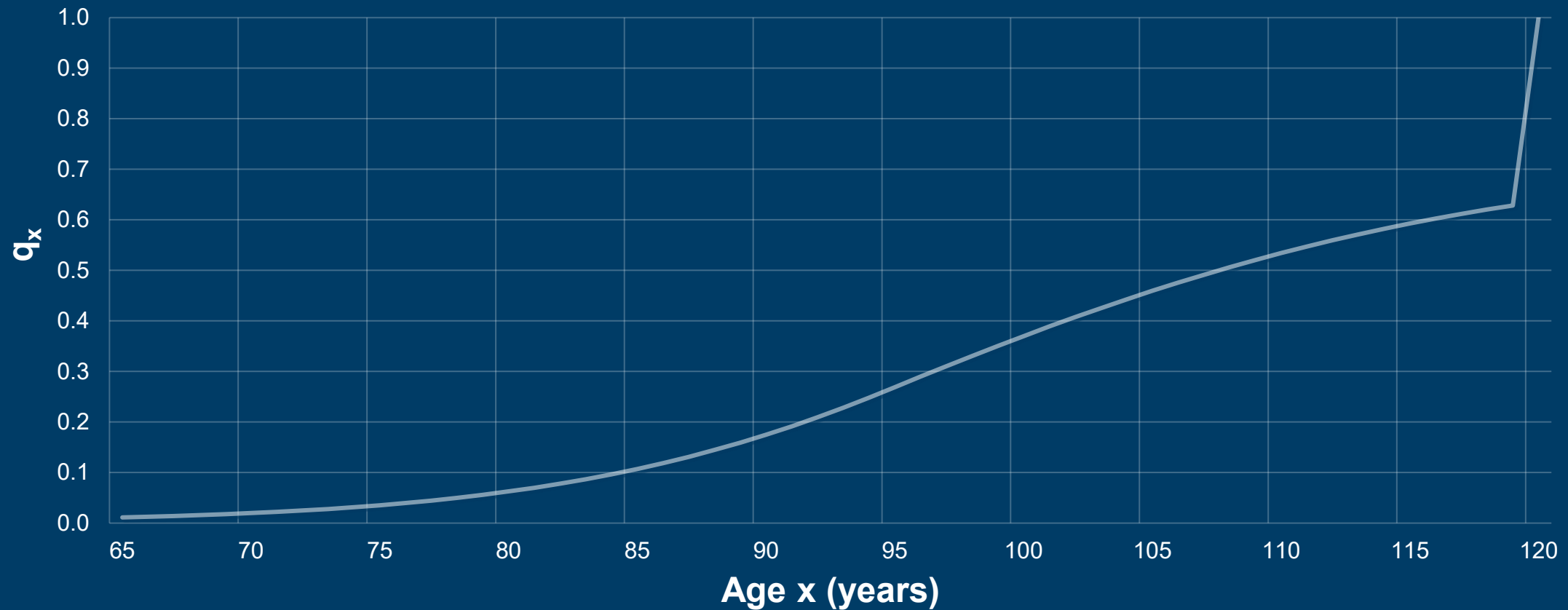
Fewer in the starting phase.
[Donnelly 2023]



Additional annual return due to sharing longevity risk
 \approx Annual chance of death



ANNUAL PROBABILITY OF DEATH FOR UK MORTALITY TABLE S1MPA

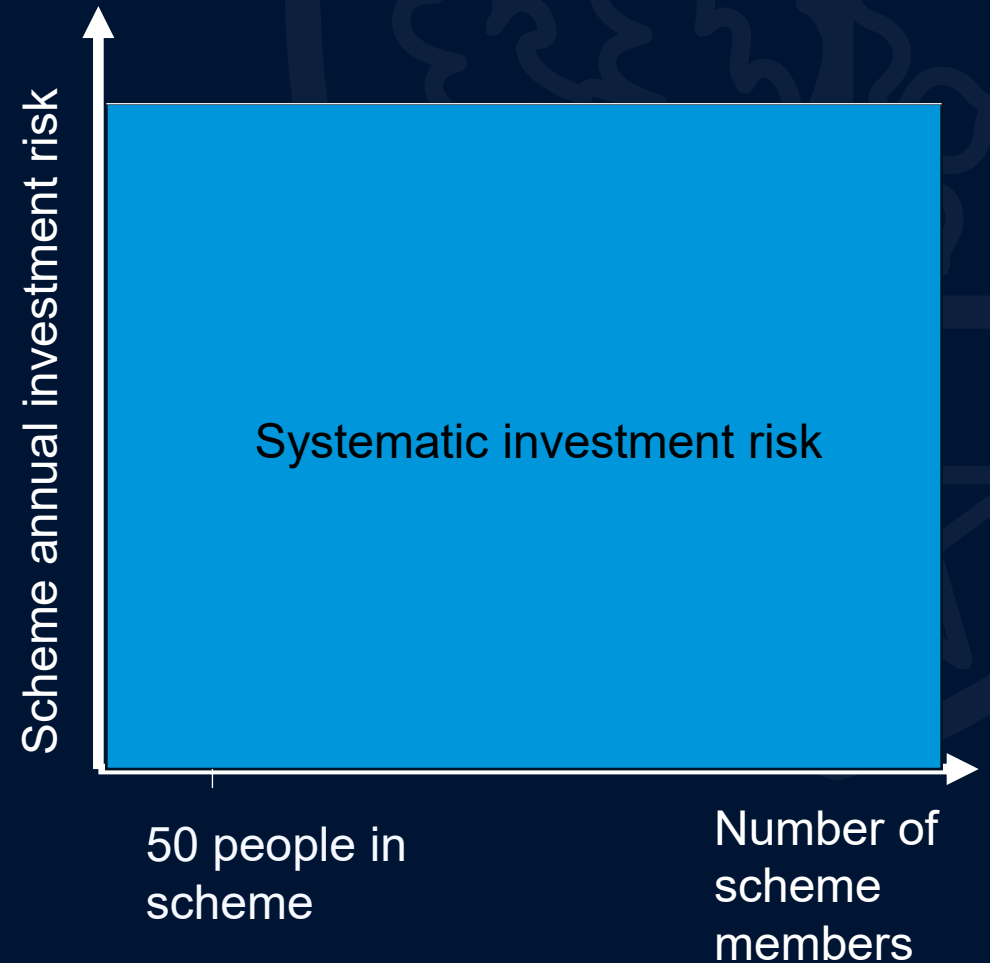




But...

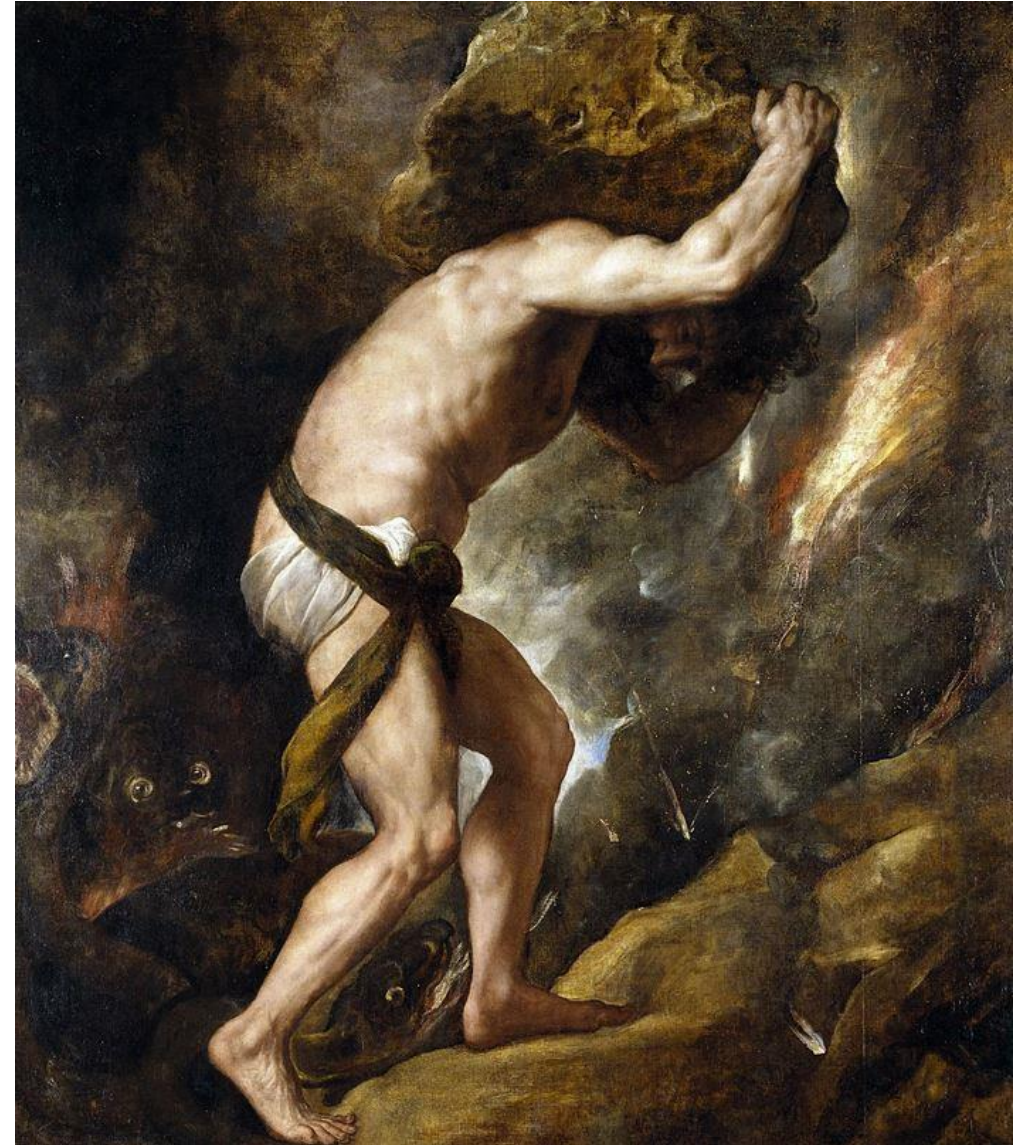
Investment risk is not diversified by pooling.

Risk management is critical.



Some challenges for the UK CDC scheme growth

- Disjointed savings and investment choices and journey for individuals, weak understanding.
- Pension pots scattered across different providers (>2/3 savers) - Pensions Dashboards Programme?
- Pension Schemes Bill 2025 proposes all trust-based DC schemes must offer a default decumulation pathway by 2028 → Too early for retirement CDC schemes?
- Growing industry's confidence in CDC schemes
 - Lack of understanding among professionals about what is going on “under the bonnet”.
 - Royal Mail Collective Pension Plan unique design has driven regulations – drag on innovation?
 - No risk management framework for CDC schemes.





References

- Armstrong, J., Dalby, J., and Donnelly, C. (2026). **Intergenerational cross-subsidies in UK Collective Defined Contribution funds.** *Annals of Actuarial Science. To appear.*
- [BDDS] Bégin, J.-F., Desai, V., Donnelly, C. and Sanders, B. (2026) **Capital preservation or pension smoothing? A general framework for collective pension plan designs.** *Working paper.*
- Donnelly, C. (2023). **Research findings around inter-generational risk-sharing in a collective defined contribution pension scheme.** *IFoA-commissioned report.*
- [Donnelly 2023] Donnelly, C. (2023). **Heterogeneity among new entrants to a pooled annuity fund.** *IFoA-commissioned report.*
- Zhang, X. and Donnelly, C. (2023). **Joint life income in a pooled annuity fund.** *IFoA-commissioned report.*
- Donnelly, C. (2022). **Inter-generational cross-subsidies in the UK's first CDC pension scheme.** *IFoA-commissioned report.*
- Bernhardt, T. and Donnelly, C. (2021). **Quantifying the trade-off between income stability and the number of members in a pooled annuity fund.** *ASTIN Bulletin 51(1).*

My papers can be found here: <https://researchportal.hw.ac.uk/en/persons/catherine-donnelly/publications/>