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How can people share their longevity risks?

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Joint work with Thomas Bernhardt (Heriot-Watt), Montserrat Guillén (U.Barcelona), Jens Perch Nielsen (Cass) and John Young.

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Question for audience

- Which option best describes tontines?

Option A	Aren't they illegal?
Option B	Last survivor takes all - watch your back!
Option C	Higher retirement income than drawdown.
Option D	Never heard of them.

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Tontines, by other names

Collective Defined Contribution

What is a tontine?

- A tontine is a structure to pool longevity risk.
- A pure tontine has no guarantees – the pool of people bear the longevity risk.
- The purpose of modern tontines is to pay an income for life.

Imagine yourself…

What to do?

Seeking advice…

Age 70 with £100K pot

	Pure modern tontine			
Annual income	£7,100			
Age at which out-live savings	120 years			
Money left to heirs	Nothing			
Calculation basis				
(Mortality, Investment returns), [allocation to tontine]	*(S1PMA-2, 2% p.a.), [100% allocation].*			

Age 70 with £100K pot

	Pure modern tontine	Modern tontine with bequest		
Annual income	£7,100	£6,600		
Age at which out-live savings	120 years	120 years		
Money left to heirs	Nothing	20% of pot at death		
Calculation basis				
(Mortality, Investment returns), [allocation to tontine]	*(S1PMA-2, 2% p.a.), [100% allocation]*	*(S1PMA-2, 2% p.a.), [80% allocation]*		

Age 70 with £100K pot

	Pure modern tontine	Modern tontine with bequest	Life annuity	
Annual income	£7,100	£6,600	£6,000	
Age at which out-live savings	120 years	120 years	Never	
Money left to heirs	Nothing	20% of pot at death	Nothing	
Calculation basis				
(Mortality, Investment returns), [allocation to tontine]	*(S1PMA-2, 2% p.a.), [100% allocation]*	*(S1PMA-2, 2% p.a.), [80% allocation]*	*(S1PMA-2, -0.3% p.a.)*	

Age 70 with £100K pot

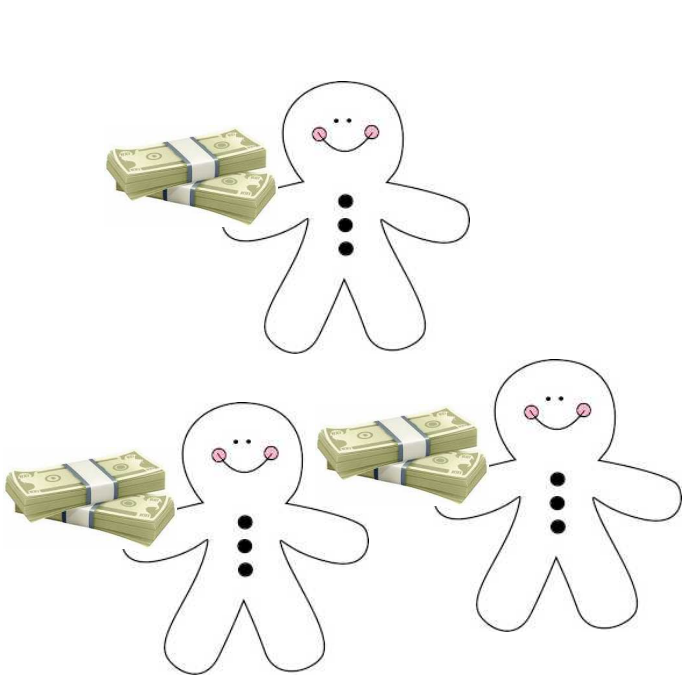
	Pure modern tontine	Modern tontine with bequest	Life annuity	Income drawdown
Annual income	£7,100	£6,600	£6,000	£6,600
Age at which out-live savings	120 years	120 years	Never	87 years
Money left to heirs	Nothing	20% of pot at death	Nothing	Whatever left in pot at death
Calculation basis				
(Mortality, Investment returns), [allocation to tontine]	*(S1PMA-2, 2% p.a.), [100% allocation]*	*(S1PMA-2, 2% p.a.), [80% allocation]*	*(S1PMA-2, -0.3% p.a.)*	*(N/A, 2% p.a.)*

Life annuity contract

Life annuity contract

Life annuity contract

Life annuity contract



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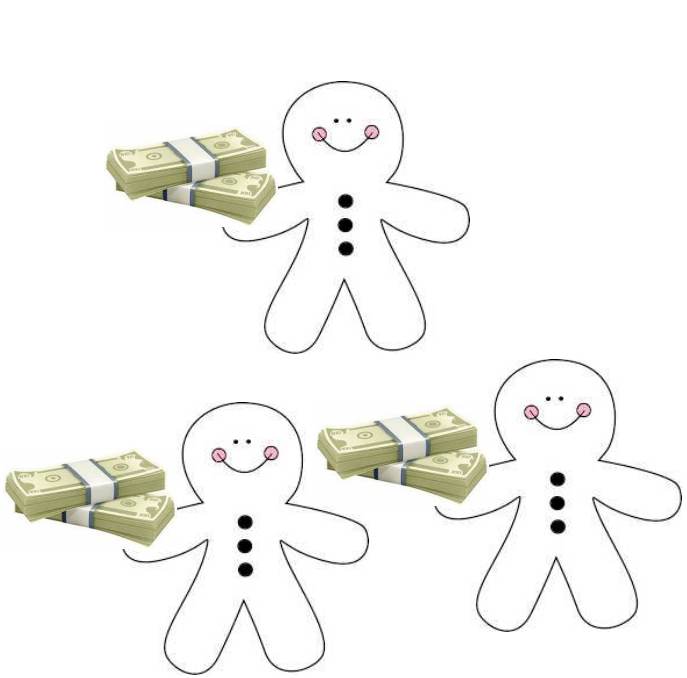
Life annuity contract



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Life annuity feature

- Life annuity gives higher income than income drawdown,
  - if follow same investment strategy, and
  - ignore fees, costs, taxes, etc.

- Why? Pool longevity risk.

- We can pool longevity risk without buying life annuities.

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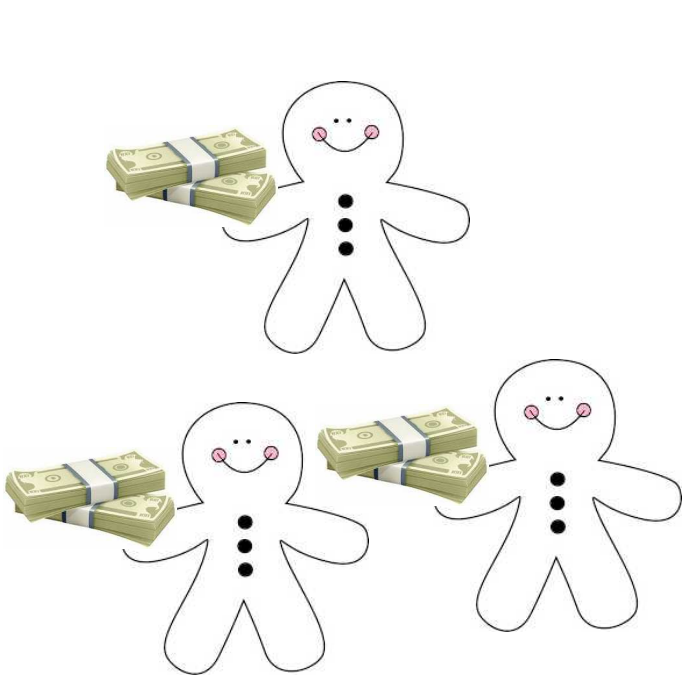
Life annuity contract



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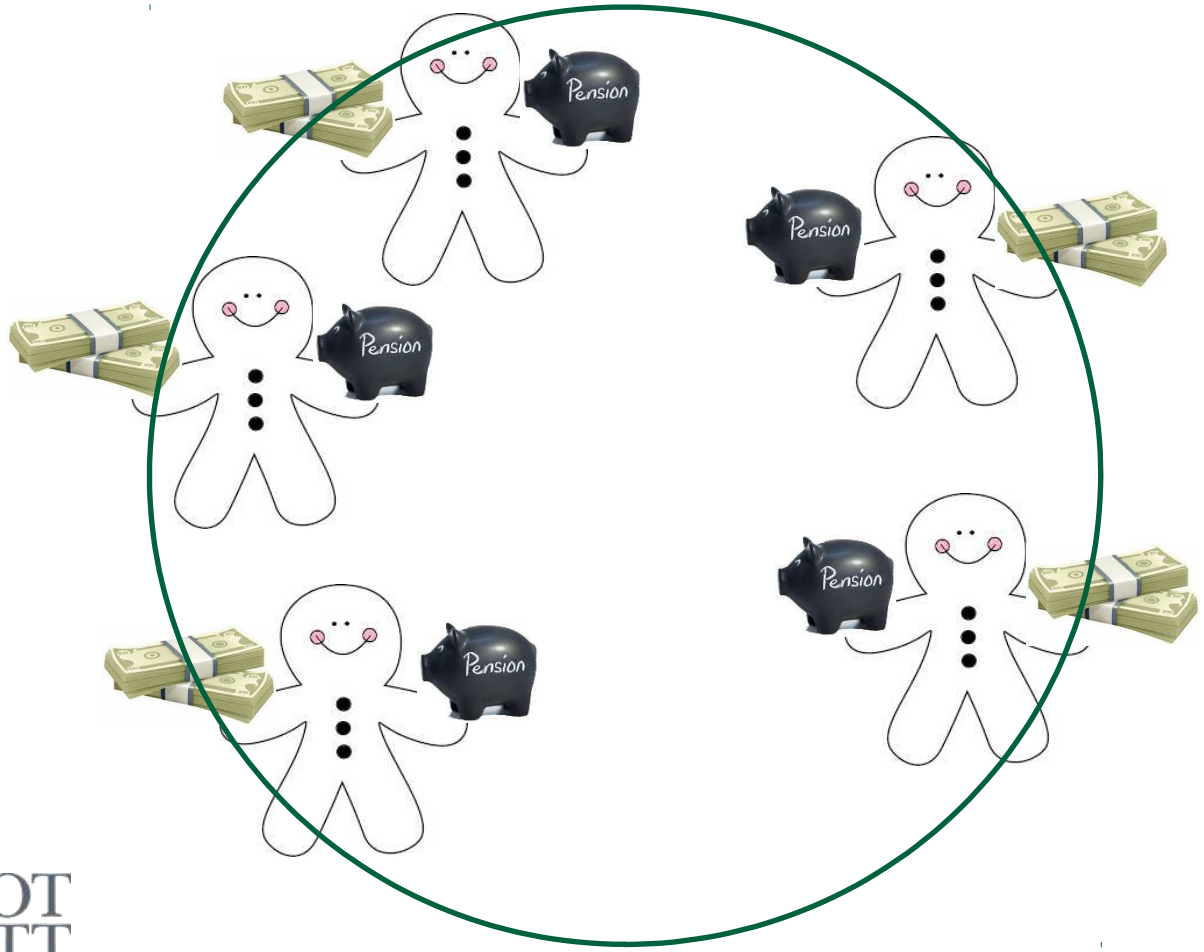
Tontine



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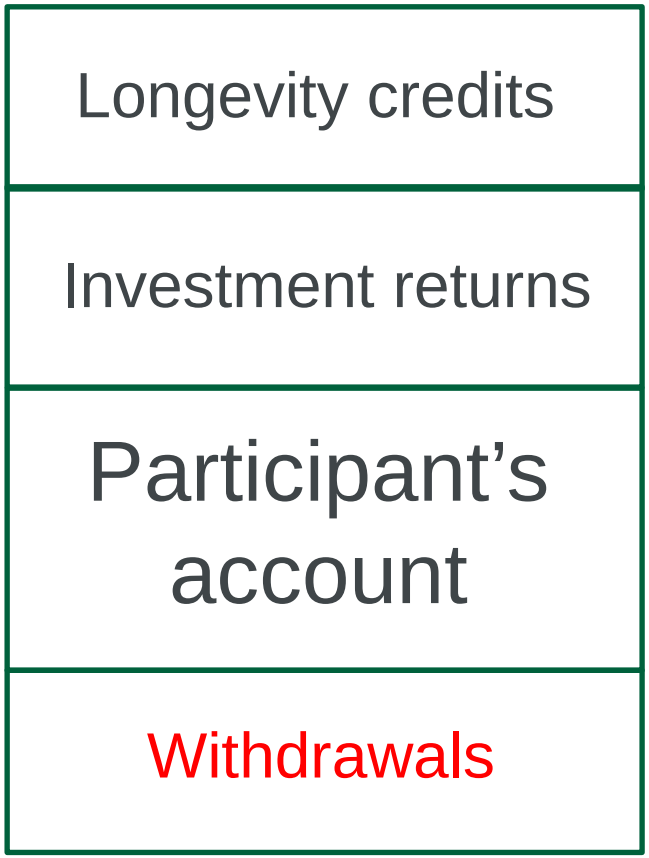
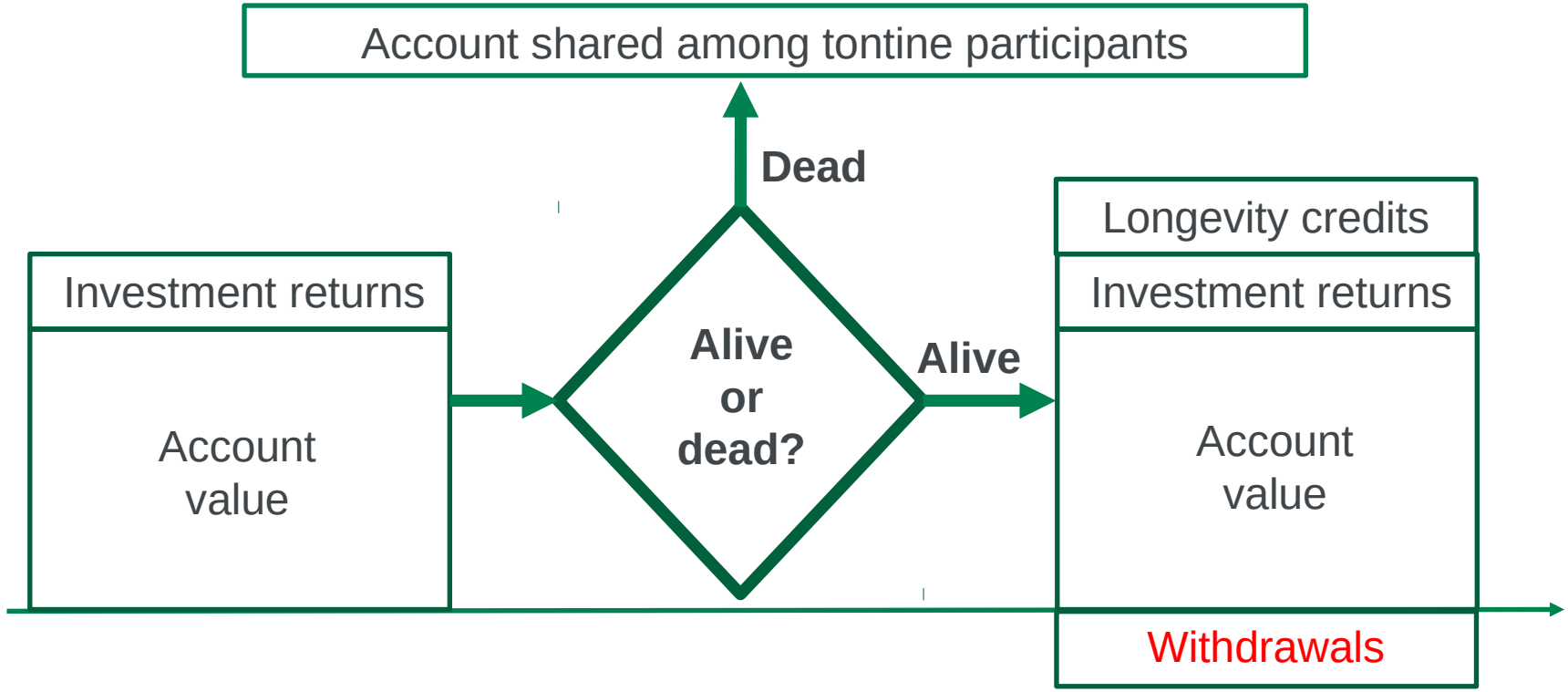
Modern tontines

- Aim: retirement income, not a life-death gamble.
- Various tontines structures have been proposed.
- Focus on [DGN] method of pooling longevity risk

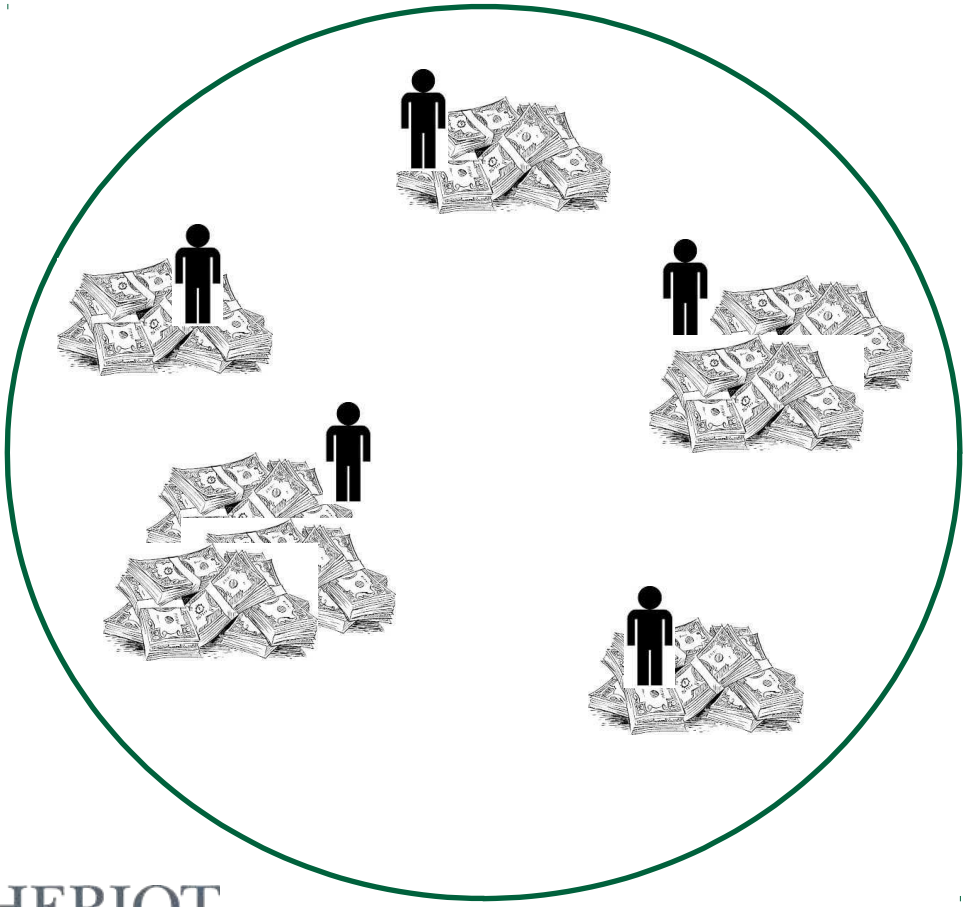
Pure modern tontine – individual account structure



Pure modern tontine



Calculating longevity credits [DGN]



Pool risk over lifetime

Individuals make their own investment decisions

Individuals withdraw income from their own accounts

However, when someone dies at time *T*…

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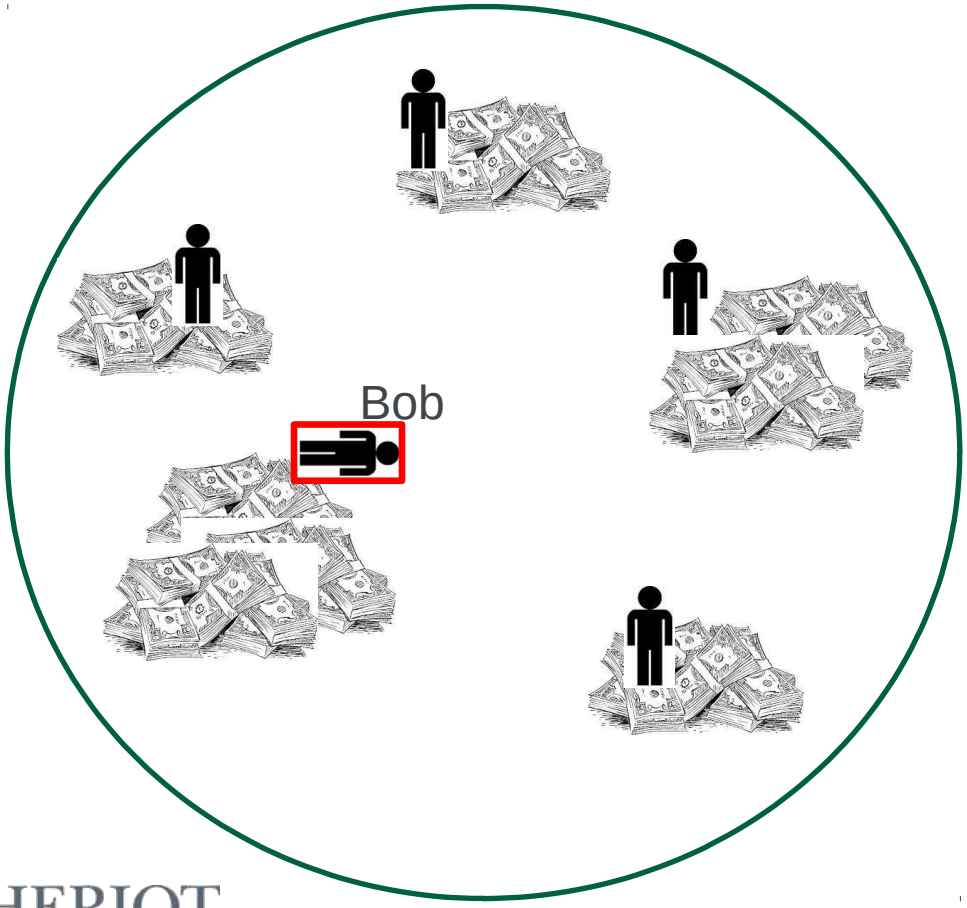
Calculating longevity credits [DGN]



Share out account value of Bob.

$\lambda^{(i)}$ = Instantaneous chance of dying of i^{th} member at time T

$W^{(i)}$ = Account value of i^{th} member at time T.

Longevity credit to i^{th} member

$$\frac{\lambda^{(i)} \times W^{(i)}}{\sum_{k \in Group} \lambda^{(k)} \times W^{(k)}} \times \{\text{Bob's account value}\}.$$

Calculating longevity credits [DGN]

- Total account value of group is unchanged by pooling.

- Expected actuarial gain = 0, for all members at all times.
  - i.e. the pool is actuarially fair at all times

- There will always be some volatility in the longevity credit:
  - But longevity credit ≥ 0, i.e. never negative.
  - Loss occurs only upon death.

Calculating longevity credits [DGN]

- Mitigates longevity risk, but does not eliminate it.
- Update chances of death to reflect new information on longevity.

- Anti-selection risk remains, as for life annuity. Waiting period?

- ``Cost'' is paid upon death, not upfront like life annuity.
  - Could consider, e.g. housing (Donnelly & Young 2017).

Other methods of longevity credits, for finite groups

- [DGN] rule works for any group:
  - Actuarial fairness holds for any group composition, but
  - Requires a (small) payment to estate of recently deceased.
- [Sabin] proposes a survivor-only, actuarially fair payment. However, it requires restrictions on membership.
- Implicit tontines pay an income rather than longevity credits
  - Group Self-Annuitization Scheme of [Piggott *et al*], enabled by Australian Government.
  - Milevsky and Salisbury (2015).

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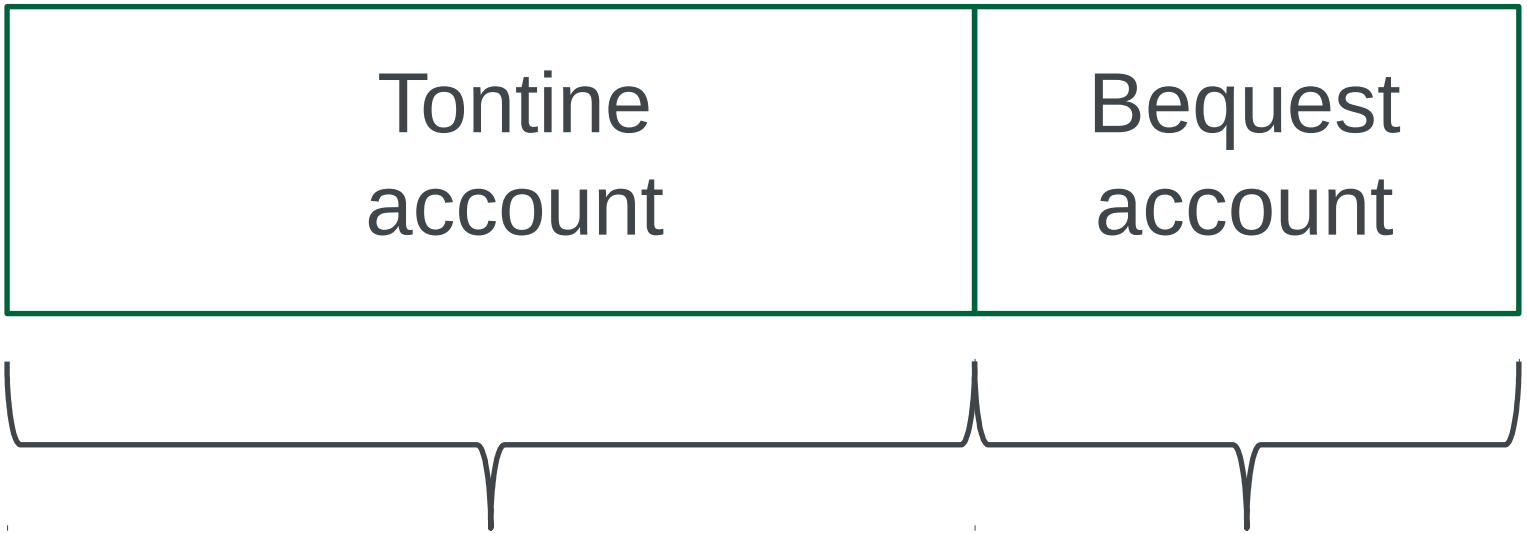
Modern tontine with bequest

- Here, present potential new product with bequest.
- Based on Bernhardt & Donnelly (2019).

Modern tontine with bequest

Split pension savings into two accounts, 80% in tontine account



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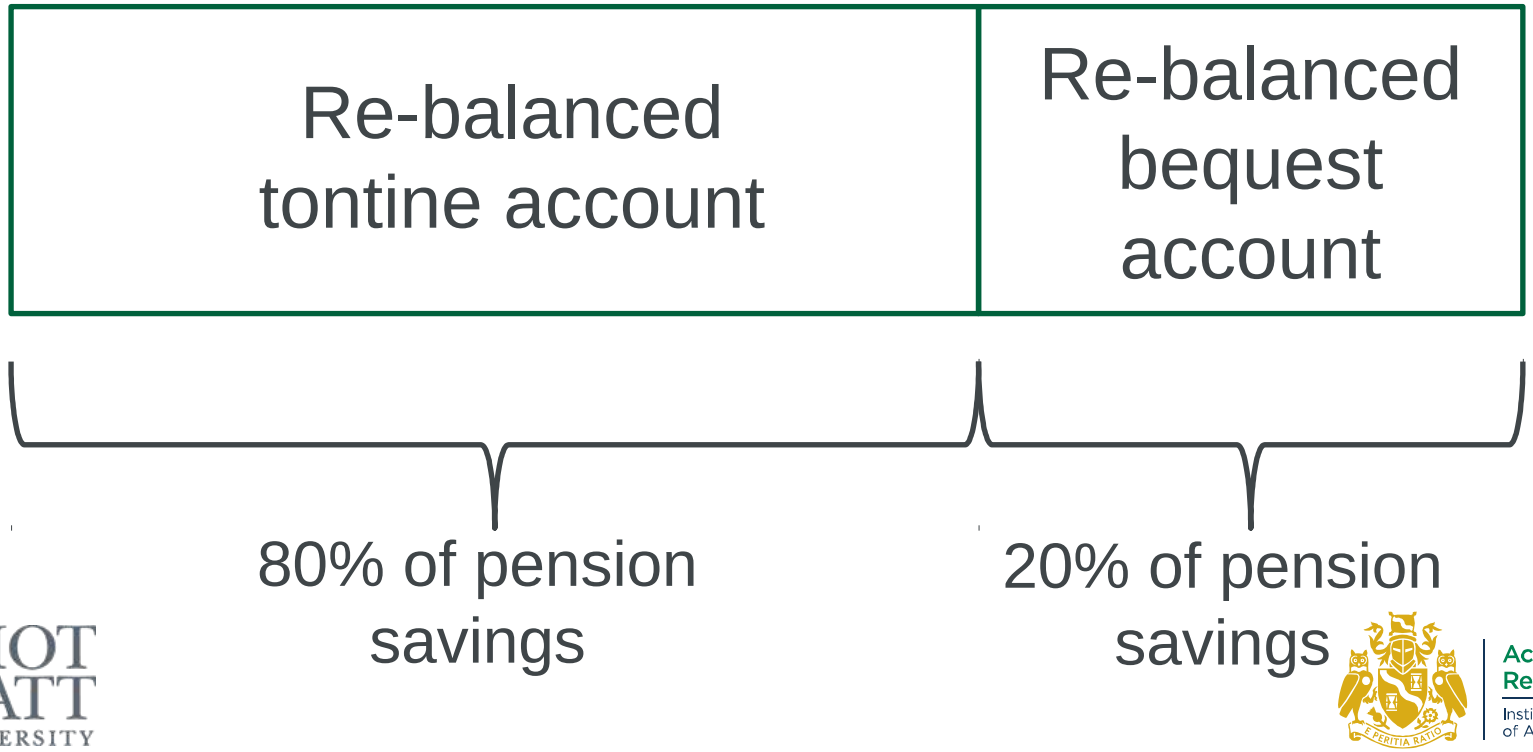
Modern tontine with bequest

Longevity credits	
Investment returns	Investment returns
Tontine account	Bequest account
Withdrawal	Withdrawal

Modern tontine with bequest

Re-balance accounts (re-distribute longevity credits)



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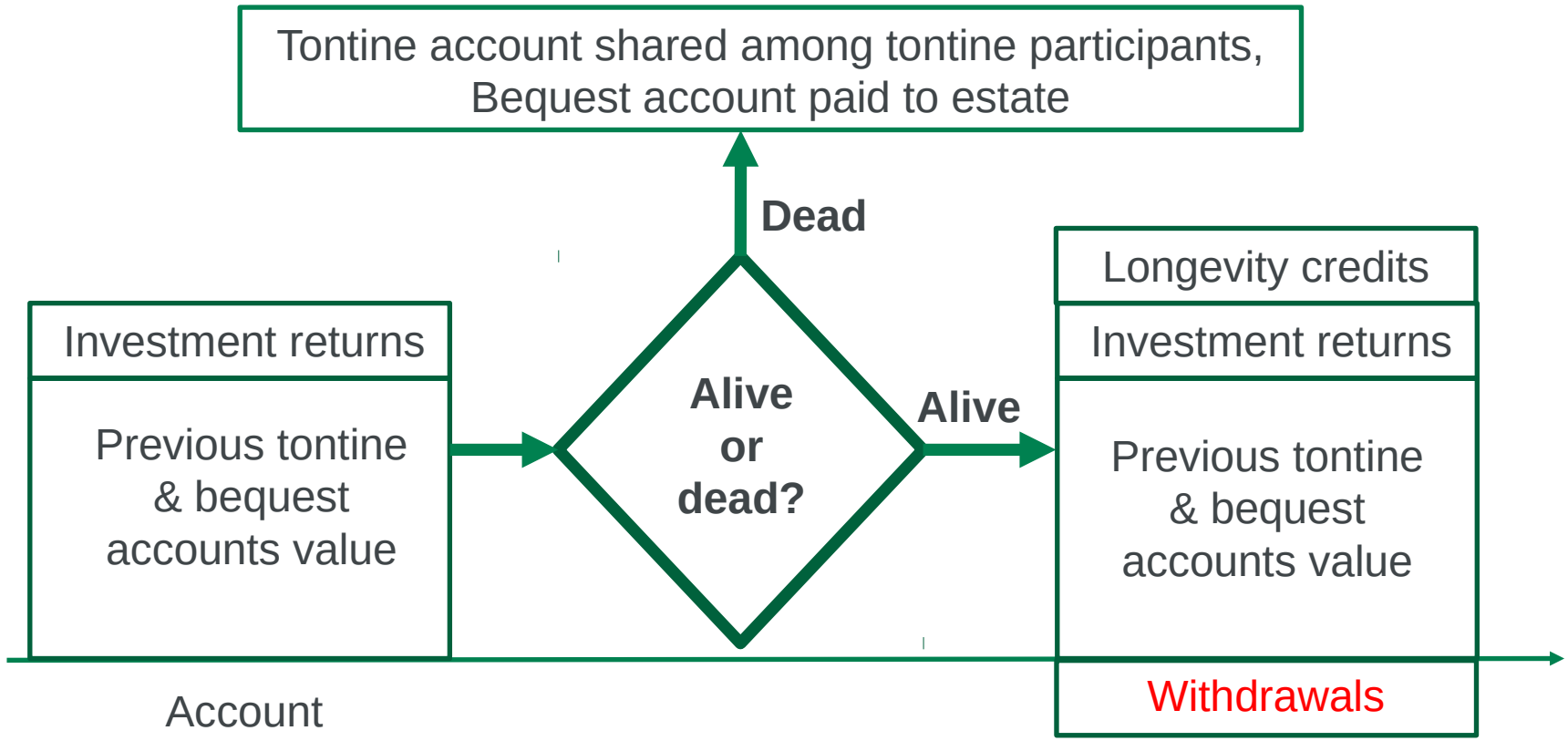
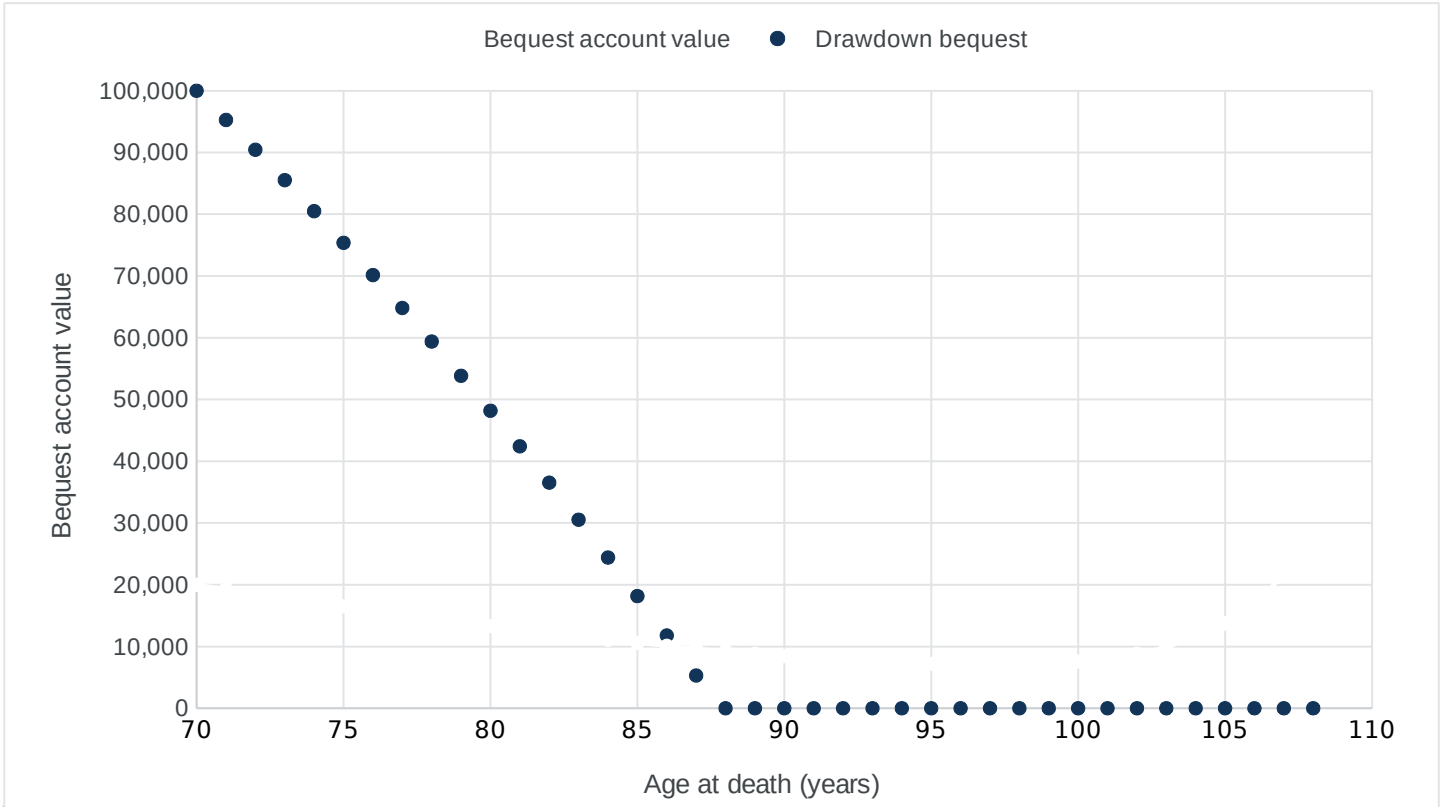
Modern tontine with bequest



Age 70 with £100K pot

		Modern tontine with bequest		Income drawdown
Annual income		£6,600		£6,600
Age at which out-live savings		120 years		87 years
Money left to heirs		20% of pot at death		Whatever left in pot at death
Calculation basis				
(Mortality, Investment returns), [allocation to tontine]		*(S1PMA-2, 2% p.a.), [80% allocation]*		*(N/A, 2% p.a.)*

Bequest account vs Drawdown bequest



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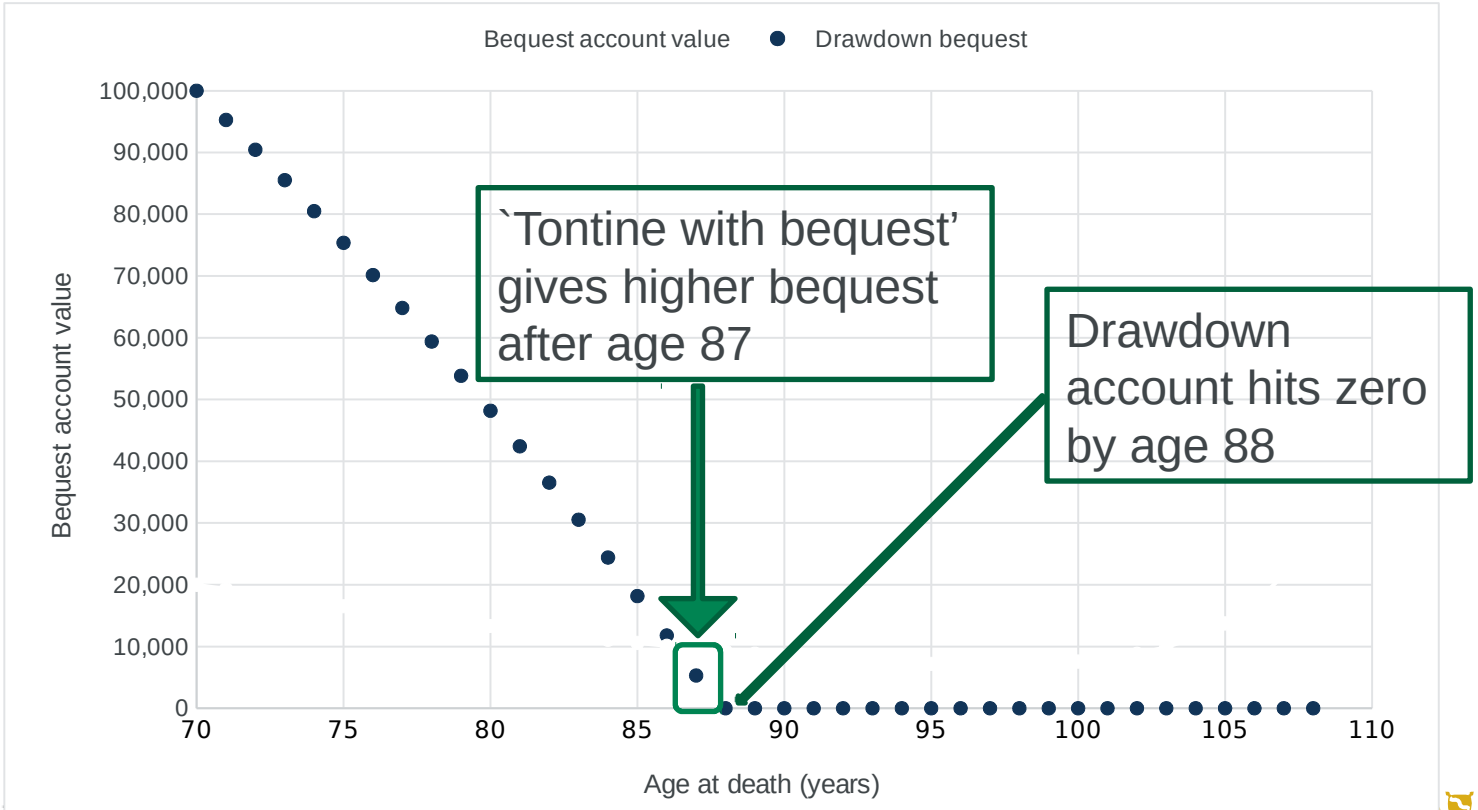
Bequest account vs Drawdown bequest



Research question

What percentage of pension savings should you put in the tontine account?

- Allow for desire for income, bequest motive and risk aversion.
- Found that, for (normal) risk aversion, percentage is fairly stable and high.
- Results are in theoretical model.
- Next step is to look at more realistic model.

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Modern tontines - summary

- Reduce risk of running out of money in retirement.
- Should be structured to provide a stable, fairly constant income (**not** increasing exponentially with the longevity credit!).
- Provide a higher income than living off investment returns alone.
- Can seek higher investment returns than life annuity, though implies more volatility.
- Can incorporate bequests.

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Modern tontines - applications

- Potential innovation in retirement products, e.g.
  - allow for bequest: ‘modern tontine with bequest’ – see Donnelly & Bernhardt (2019).
  - provide downside protection that too few deaths occur (minimum income) – see Donnelly & Young (2017).
  - allow less liquid assets such as pensioner’s house.
- Foundation for collective DC plans
  - Provides income without buying life annuities.
  - Could be integrated into DC plans as post-retirement option.

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Questions

Comments

The views expressed in this presentation are those of the presenter.

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