Sustainable and Equitable Pensions with Means Testing

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Motivation: Population ageing

- Population ageing (projected to accelerate in developed countries over next several decades), with

  (i) Changing population age structure

  - Australia => support ratio ($\frac{20-64}{65+}$) to decline to **2.4** in 2050 from 4 in 2015 (United Nations, 2015)

  (ii) Mortality improvements and greater life expectancy

  - Life-expectancy

  (iii) Life expectancy gaps by socio-economic status (particularly by income)

  - Life-expectancy gaps

Motivation: Sustainability

- These demographic changes will have vast implications for public pensions (particularly PAYG pensions), causing

  (i) Increasing fiscal costs with spending on public pensions in

  - Australia => **4.9%** of GDP in 2050, compared to 3.6% in 2015 (OECD, 2013)
  - OECD28 countries (average) => **11.7%** of GDP in 2050, compared to 9.5% in 2015 (OECD, 2013)

  (ii) Equity concerns about targeting public pensions towards more-affluent, longer-lived individuals (Auerbach et al, 2017)

  - Driven by (widening) life-expectancy gaps between high and low skilled groups of individuals.

Motivation: Policy responses

- Parametric public pension reforms widespread across developed world over last decade (OECD, 2015), aming to improve

  (i) Fiscal sustainability

  - **Examples**: Reductions in benefit levels or pension formulae, lowering benefit indexation, increasing access ages, increasing payroll taxes

  (ii) Adequacy and equity of pensions

  - **Examples**: Increasing coverage and benefit levels, changes to pension entitlements and benefit formulae, means testing of benefits

THIS PAPER

- Focuses on means testing of public pensions as a response mechanism to population ageing, with objectives to examine
  - Implications of means-tested pensions for fiscal sustainability and equity of public pensions under *different ageing scenarios*
  - Long run effects of relaxing & tightening pension means test via altering the taper
- Employs a general equilibrium OLG model, with
  1) Private-heavy pension system => Australian case (This talk)
  2) PAYG social security DB pension system => OECD prototype

Preview of main results

- Our results show that means testing public pensions
  - improves fiscal sustainability with
    - reduced public pension expenditure & increased tax base
  - improves intra-cohort equity due to
    - directing pension payments to those in need
  - increases labour supply & savings due to
    - increased incentives => lower pensions to more affluent types & lower income tax rates
- These effects shown to be more pronounced under population ageing

OUTLINE

- Model description
- Calibration & data comparison
- Experiments & results
- Sensitivity & extensions
- Conclusions

Full model: Key features

- Type: Dynamic general equilibrium with overlapping generations
- Sectors: Household, firm, government and foreign sectors
- Markets: Labour, capital and goods markets
- Market structure: Small open economy

Household sector: Demographics

- Overlapping generations of heterogeneous households => cohorts aged 20 to 100 years of 5 skilled types
- Stationary demographic structure with size of i-type cohort at age j given by

$$pop_j^i = \frac{s_j^i}{(1+n)^{j-1}}$$

where, n : population growth rate, $s_j^i = \prod_{z=1}^{j} \pi_z^i$: skill-specific (unconditional) survival rates, π_j^i : conditional survival probabilities.

- Total population then given by

$$P = \sum_{i \in I} \omega^i \sum_{j \in J} pop_j^i$$

where ω^i : intra-generational shares (0.2 for each quintile).

- Households of each skill type i assumed to choose consumption, c, and leisure, l, at age j to maximize expected lifetime utility

$$U^i = E\left[\sum_{j=1}^{J}\left(\prod_{z=1}^{j}\pi_z^i\right)\beta^{j-1}\frac{\left[\left(c_j^i\right)^{\rho}\left(l_j^i\right)^{1-\rho}\right]^{\left(1-\frac{1}{\gamma}\right)}}{1-\frac{1}{\gamma}}\right], \qquad (1)$$

where

π_j^i : conditional survival probabilities with $\pi_{j=1}^i = 1$
β : subjective discount factor
γ : intertemporal elasticity of substitution
ρ : share parameter for leisure

Household sector: Budget constraint

- Expected lifetime utility in (1) to be maximized subject to per-period budget constraint

$$
\begin{aligned}
a_j^i - a_{j-1}^i &= r \cdot a_{j-1}^i + le_j^i + ap_{j\geq 65}^i + sp_{j\geq 60}^i \\
&\quad + st_{j<65}^i + \widehat{b}_{45<j<65}^i - c_j^i - tax_j^i, \qquad (2)
\end{aligned}
$$

where

a_j^i : private assets	$r \cdot a_{j-1}^i$: investment income
ap_j^i : age pension	sp_j^i : superannuation payouts
$\widehat{b}_j^i$: bequest payment	$le_j^i = we_j^i(1 - l_j^i)$: labour earnings
st_j^i : social transfers	$tax_j^i = t(y_j^i) + \tau^c c_j^i$: household taxes

- Aggregates: e.g., $C = \sum_{i\in I} \omega^i \sum_{j\in J} c_j^i \cdot pop_j^i$.

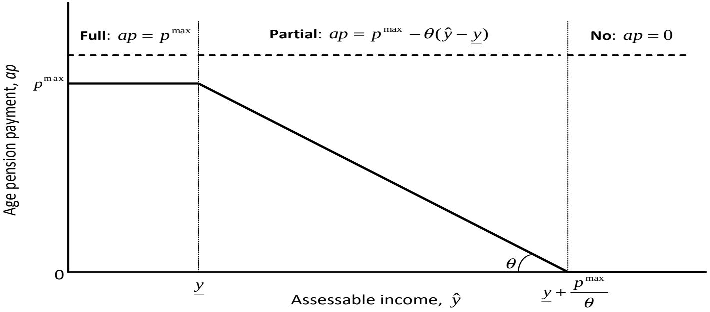
Modeling age pension

- Age pension paid to households $j \geq 65$ and subject to income test:

$$ap_j^i = \max\left\{\min\left\{p^{\max}, p^{\max} - \theta\left(\hat{y}_j^i - \underline{y}\right)\right\}, 0\right\},$$

where $\hat{y}_j^i$: assessable income; $p^{\max}$: maximum pension; θ : taper rate; $\underline{y}$: income threshold.

Association between age pension and assessable income

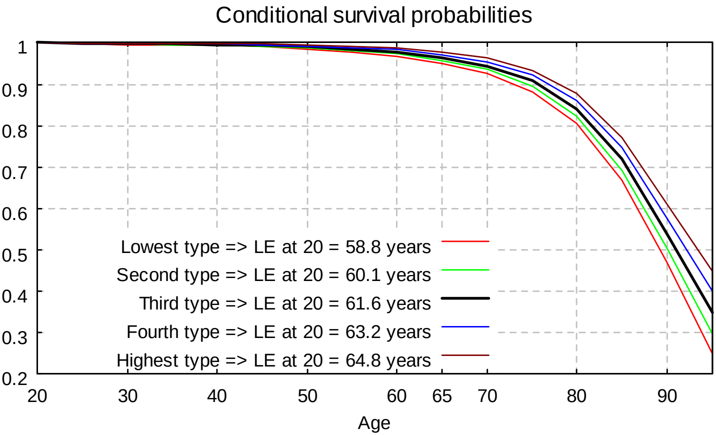


Calibration: Assumptions & parameter values

- Benchmark economy assumed to be in a steady state - calibrated to key macro & fiscal data in 2013-14
- Household utility & production technology of Cobb-Douglas forms
  - Some parameters taken from literature (e.g. $\gamma = 0.5$) and some calibrated to replicate observed macro data (e.g. $\beta = 0.982$)
- Policy settings & values of policy parameters (e.g. age pension & tax policy settings) as of 2013-14
- Demographic structure assumed to be stationary with
  - population growth rate ($n = 1.6\%$); survival rates for third quintile ($\pi_j^{i=3}$) derived from ABS 2012-14 life tables

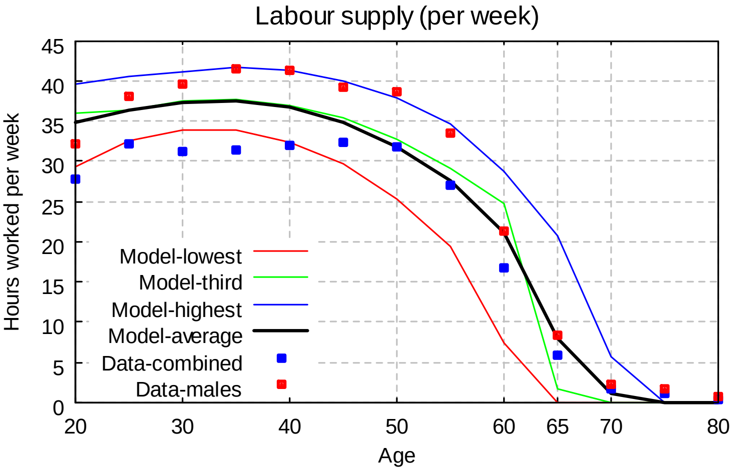
Calibration: Life expectancy gaps

- Life expectancy (*LE*) gaps at age 20 **in our model** between highest & lowest quintiles ≈ 6 years (Clarke & Leigh, 2011) and between fourth & second quintiles ≈ 3 years (assumed)



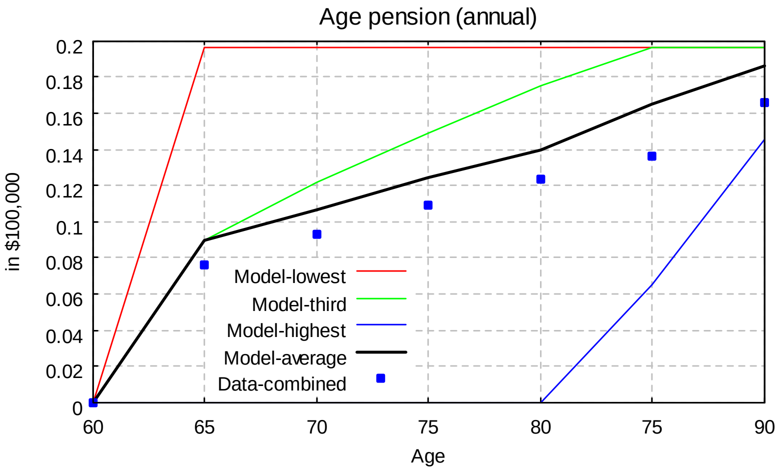
Model performance: Life cycle data

Hours worked per week



Model performance: Life cycle data

Annual public pension payments



Model performance: Macro & income data

Comparison of benchmark solution with Australian macro and income data		
Variable	Benchmark model	Australia 2013-14
Expenditures on GDP (% of GDP)		
Private consumption	55.50	54.61
Investment	15.08	17.95
Government consumption	27.90	27.60
Trade balance	1.51	-0.29
Calibration targets		
Capital-output ratio	3.10	3.10
Investment-capital ratio	0.09	0.09
Foreign assets-capital ratio	-0.18	-0.18
Average hours worked	0.33	0.33
Net income shares (%) (selected skilled types)		
Lowest quintile	6.1	7.5
Third quintile	17.9	16.9
Highest quintile	40.2	40.8
Gini coefficient (in net income)	0.36	0.33

Notes: Australian macro and income data taken from ABS data sets.

Experiments

- Examine the effects of public pension systems with different taper (θ)
  (In this talk, focus on two cases)

  (i) Universal pension system with $\boldsymbol{\theta = 0}$

  (ii) Strict means-tested system with $\boldsymbol{\theta = 1}$

- A range of demographic scenarios considered
  (In this talk, focus on two scenarios)

  (a) No population ageing (old-age dependency ratio of 0.25)

  - Same (existing) n & π_j^i as in benchmark model

  (b) Population ageing (old-age dependency ratio of 0.45)

  - Reduced n & increased π_j^i (for 2060 from ABS, 2013) & increased life expectancy gaps

Results: Macro & fiscal effects (no ageing)

- Macro & fiscal effects indexed to benchmark case with **Taper=0.5** (=100) under each demographic scenario

Taper scenario	Variable	Demographic scenario	
		No ageing	Ageing
Taper = 0	- Labour supply	96.9	
	- Domestic assets	88.0	
	- Age pension	167.3	
	- Income tax rate	122.5	
Taper = 1	- Labour supply	101.2	
	- Domestic assets	108.0	
	- Age pension	82.4	
	- Income tax rate	91.7	

Notes : For ageing scenario, benchmark with taper = 0.5 assumes government consumption (G) to balance the budget, with adjusted G kept constant to assess effects of taper = 0 or 1 with budget-equilibrating income taxes.

Results: Macro & fiscal effects (ageing)

- Macro & fiscal effects indexed to benchmark case with **Taper=0.5** (=100) under each demographic scenario

Taper scenario	Variable	Demographic scenario	
		No ageing	**Ageing**
Taper = 0	- Labour supply	96.9	93.0
	- Domestic assets	88.0	74.2
	- Age pension	167.3	176.3
	- Income tax rate	122.5	151.8
Taper = 1	- Labour supply	101.2	101.3
	- Domestic assets	108.0	123.0
	- Age pension	82.4	77.1
	- Income tax rate	91.7	80.8

Notes : For ageing scenario, benchmark with taper = 0.5 assumes government consumption (G) to balance the budget, with adjusted G kept constant to assess effects of taper = 0 or 1 with budget-equilibrating income taxes.

Results: Age pension shares (no ageing)

- Age pension shares by income types under **Taper=0 or 1** (in % and indexed to benchmark with **Taper=0.5** (=100))

Taper scenario	Income type	Demographic scenario			
		No ageing		Ageing	
		Share (%)	**Share (Index)**	Share (%)	Share (Index)
Taper = 0	- Low income	0.37	62		
	- Middle income	0.20	85		
	- High Income	0.43	246		
Taper = 1	- Low income	0.71	121		
	- Middle income	0.20	84		
	- High Income	0.09	52		

Notes : Low income = lowest & second quintiles, Middle income = third quintile, High income = fourth & highest quintiles.

Results: Age pension shares (ageing)

- Age pension shares by income types under **Taper=0 or 1** (in % and indexed to benchmark with **Taper=0.5** (=100))

Taper scenario	Income type	Demographic scenario: No ageing Share (%)	No ageing Share (Index)	**Ageing** **Share (%)**	**Ageing** **Share (Index)**
Taper = 0	- Low income	0.37	62	0.36	59
	- Middle income	0.20	85	0.20	85
	- High Income	0.43	246	0.44	270
Taper = 1	- Low income	0.71	121	0.79	130
	- Middle income	0.20	84	0.16	67
	- High Income	0.09	52	0.06	35

Notes: Low income = lowest & second quintiles, Middle income = third quintile, High income = fourth & highest quintiles.

Results: Welfare effects (no ageing)

- Equivalent variation - % change in consumption & leisure needed in benchmark with **Taper=0.5** to reproduce remaining utility with **Taper=0 or 1** under each scenario

Taper scenario	Income type	Demographic scenario	
		No ageing	Ageing
Taper = 0	- Low income	-0.46	
	- High Income	-1.75	
	- Average	-0.89	
Taper = 1	- Low income	0.12	
	- High Income	0.92	
	- Average	0.33	

Notes : Low income = average for lowest & second quintiles, High income = average for fourth & highest quintiles, average = average welfare across all five quintiles

Results: Welfare effects (ageing)

- Equivalent variation - % change in consumption & leisure needed in benchmark with **Taper=0.5** to reproduce remaining utility with **Taper=0 or 1** under each scenario

Taper scenario	Income type	Demographic scenario	
		No ageing	**Ageing**
Taper = 0	- Low income	-0.46	-1.31
	- High Income	-1.75	-5.24
	- Average	-0.89	-2.80
Taper = 1	- Low income	0.12	0.37
	- High Income	0.92	2.75
	- Average	0.33	1.21

Notes : Low income = average for lowest & second quintiles, High income = average for fourth & highest quintiles, average = average welfare across all five quintiles

Sensitivity & extensions

- Sensitivity checks
  1) Alternative budget-balancing consumption tax instrument
     - Lower consumption tax rate under higher taper => negative effects on the economy and equity (relative to lower income taxes)
  2) Endogenous interest rate framework
     - Lower interest rate under higher taper => positive effects on the economy but negative equity effects (relative to constant interest rate)
- Extensions
  - Uninsurable wages
  - Intended bequests
  - Transition path effects

Conclusions

- Long run results show that population ageing strengthens the case for means testing public pensions =>
  - significantly improving fiscal sustainability with
    - reduced public pension expenditure & increased tax base
  - increasing labour supply & savings due to
    - increased incentives => lower pensions to more affluent types & lower income tax rates
  - improving intra-cohort equity due to
    - directing pension payments to those in need
- Political challenges
  - How to means test (contributory) PAYG DB pensions?
  - Requiring pensioners to report their wealth => big issue in some countries

Thank you

Thank you for your attention!

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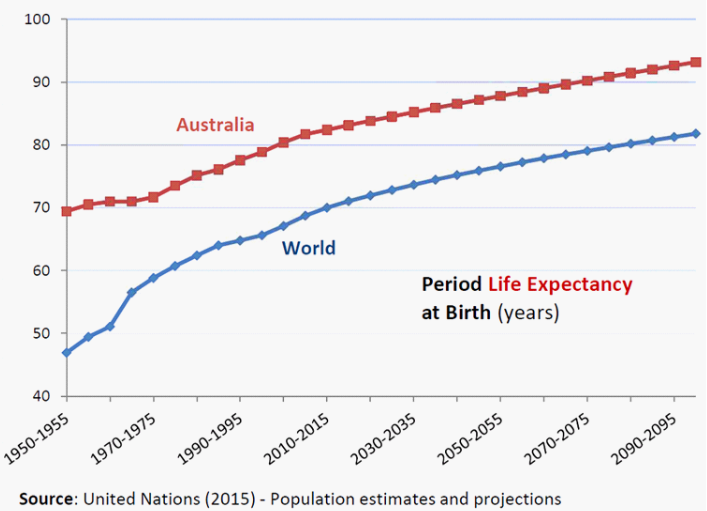
Higher life expectancy: Australia vs. World



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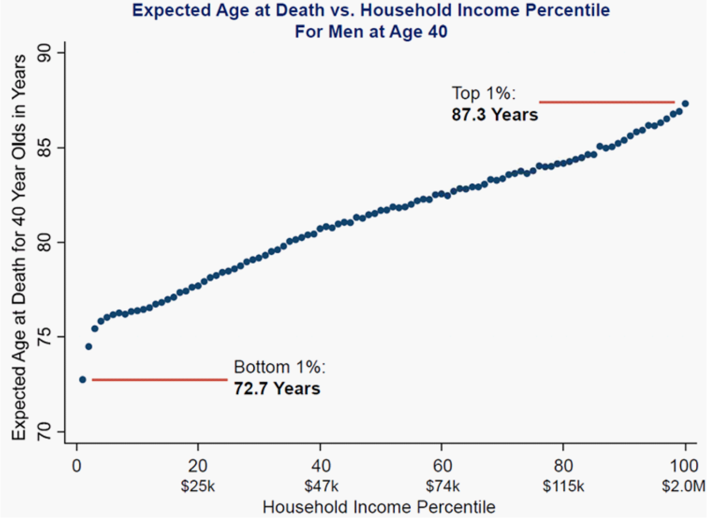
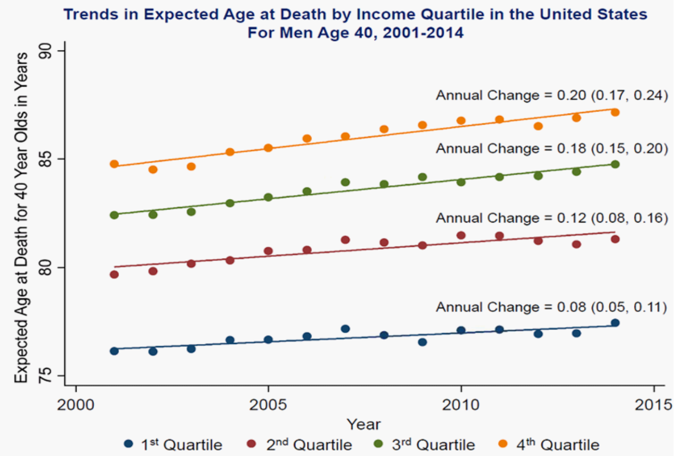
Life expectancy gaps by Income (US)

Chetty et al (2016), using US data



Increasing life expectancy gaps over time (US)

Chetty et al (2016), using US data



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