Individual saving behaviour and the welfare consequences of alternative means-testing policies

Dr. Gareth.D.Myles and Pei Sun

University of Exeter

September, 2016

Overview

- We analyze a life-cycle model of individual saving behaviour under two different long-term care means-testing policies.
  One of the policies allows a private top-up, and the other does not allow a top-up.
- Total social walfare functions are produced seperately to test which policy can bring higher social welfare.
- The results provide insight into the consequeces of alternative government policies on long-term care issues (funding, insuring, etc).

Introduction

Definitions

Long term care

- Non-medical care, including nursing, personal and social care, supervision and domestic help
- Care provided in institutions, by community services, in supported housing and by informal carers

Fact

Long term care costs have become a big concern as well as a major motivation for young people to save.

Literature Review

- $U = U(c_y) + p\alpha\beta U(c_0) + (1-p)\beta U(c_0)$ (Kotlikoff,1989).

Literature Review

- $U = U(c_y) + p\alpha\beta U(c_0) + (1-p)\beta U(c_0)$ (Kotlikoff,1989).
- In 2007, Hemmi, Tabata and Futagami made a refining study on *decision about paying for LTC*, *precautionary saving behaviour* and *economic development*
  concumption can be replaced by savings, $c_t = w_t - s_t$, and $c_{t+1} = (1 + r_{t+1})s_t$.
  θ is the disutility broungt by after-retirement health shocks
  h is expenditure on long-term care.
  $U(c_{t+1}) - \theta$ and $U(c_{t+1} - h)$
  Thus, the model is.
  $U = U(c_t) + (1-p)U(c_{t+1}) + p\{\max(U(c_{t+1}) - \theta, U(c_{t+1} - h))\}$
  However, this model fails to test the changes between variables, and it assumes once the payment is made, the bad utility will be totally removed.

Model

$$U = \ln(C_1) + \beta p \ln\left((\delta + \frac{h}{c})C_2^h\right) + \beta(1-p)\ln\left(C_2^g\right)$$

As, $C_1 = w - s$, $C_2^h = (1+r)s - h$, $C_2^g = (1+r)s$, the model is,

$$U = \ln(w-s) + \beta p \ln\left((\delta + \frac{h}{c})\left[(1+r)s - h\right]\right) + \beta(1-p)\ln\left((1+r)s\right)$$

h	Future long-term expenditures
s	Savings in the 1st period or young period
w	Wages that individuals get in the first period
δ	The bad effects from a health shock, $0 < \delta < 1$
c	A constant. It needs to be large enough to make $\left(\delta + \frac{h}{c}\right) < 1$
β	Discount factor for the second period

Basic Model

$$U = \ln(w-s) + p\ln\left(\left(\delta + \frac{h}{c}\right)\left[(1+r)s - h\right]\right) + (1-p)\ln\left((1+r)s\right)$$

The uility function in the second period for the individuals with p to get health shocks is...

- When $h = 0$, $p\ln\left((\delta + \frac{h}{c})C_2^h\right) = p\ln(\delta C_2^h)$. Worst health condition individuals can have in the second period.
- When$h > 0$, the consumption function $p\ln\left((\delta + \frac{h}{c})\left[(1+r)s - h\right]\right)$will increase, as the quality of life increases.
- $\delta + \frac{h}{c} < 1$. It means the disutility that the health shocks bring will not be removed completely.

Means-testing Policy

Life-cycle model in this research is adjusted to study the interactions of precautionary savings and future long-term care expenditures under **means-testing policy**.

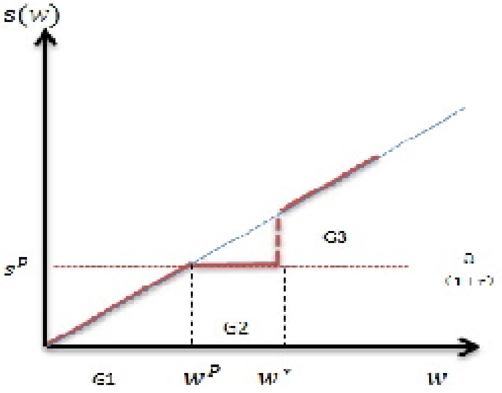
- The policy that is made by the government is policy $\{\Omega, h^p\}$
- Individuals with a wealth level under Ω, are provided with long-term care h^p.
- Define s^p by $\Omega = (1 + r)s^p$.
- s^p is the savings of the first period on the government threshold.

Regime 1

Two means-testing regimes are examined.
Regime 1. When government provides h^p for an individual's long-term care subsidy, the individual must choose to consume h^p(No top-up allowed)
Regime 2 The individual can choose to top-up on their government subsidy using their own finance when they are qualified to receive h^p.
When government provides h^p, individuals can choose to pay $h^p + h^t$ (Top-up allowed)

Saving behaviour affected by government threshold (Regime 1)

A plot has been invented to describe an individual's saving behaviour.



In this economy, the individuals are made up of three groups,

Group 1 Group 1 refers to the individuals whose saving level is from the lowest wage to the wage level w^p.

Their long-term care spending is totally financed by the government

Group 2

When w reaches and exceeds w^p, and before it hits w^*, individuals are motivated to save no more than s^p and consume more to maintain its saving level equal to the government threshold to stay qualified for the government subsidy.

Group 3

Instead of consuming more irrationally now but save less for the future, at some point, individuals will finally choose to go back to the saving line and save more.In this group, individuals will pay for the long-term care by themsevles.

Individual's choice of the three groups

$$
\begin{aligned}
U_1 &= \ln\left(C_1\right) + \beta p \ln\left((\delta + \frac{h^p}{c}) C_2^h \right) + \beta(1-p) \ln(C_2^g) \\
&= \ln\left(w - s\right) + \beta p \ln\left(\delta + \frac{h^p}{c} \right) + \beta \ln((1+r)s) \\
U_2 &= \ln(w - s^p) + \beta p \ln\left(\delta + \frac{h^p}{c} \right) + \beta \ln\left((1+r)s^p\right) \\
U_3 &= \ln(C_1) + \beta p \ln\left((\delta + \frac{h}{c}) C_2^h \right) + (1-p) \ln(C_2^g) \\
&= \ln(w - s) + \beta p \ln\left((\delta + \frac{h}{c})((1+r)s - h) \right) + \beta p \ln((1+r)s)
\end{aligned}
$$

Social Welfare (Regime 1)

$$SW = \int_{\underline{w}}^{w^P} U_1(w) f(w)\, dw + \int_{w^p}^{w^*} U_2(w) f(w)\, dw + \int_{w^*}^{\overline{w}} U_3(w) f(w)\, dw. \tag{1}$$

Assume that the individuals are distributed uniformly along the wage line, then

$$f(w) = \frac{1}{\overline{w} - \underline{w}}$$

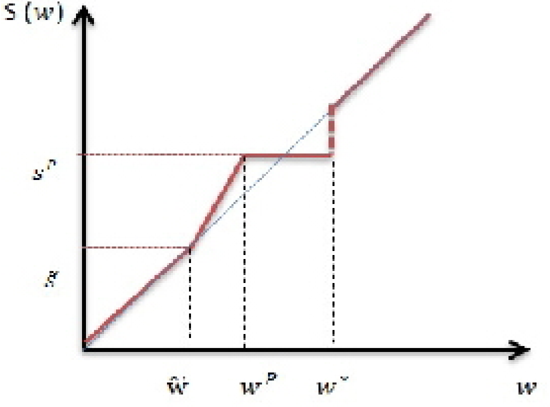
$\overline{w}$	Highest wage in the population
$\underline{w}$	Lowest wage in the population

Social Welfare (Regime 1)

Using the indirect utility functions

$$SW = \frac{1}{\overline{w}-\underline{w}}\int_{\underline{w}}^{w^P} \left(\ln\left(w-s\right)+\beta p \ln\left(\delta+\frac{h^p}{c}\right)+\beta \ln((1+r)s)\right) dw +$$
$$\frac{1}{\overline{w}-\underline{w}}\int_{w^p}^{w^*} \left(\ln(w-\frac{\Omega}{1+r})+\beta p \ln\left(\delta+\frac{h^p}{c}\right)+\beta \ln\left(\Omega\right)\right) dw +$$
$$\frac{1}{\overline{w}-\underline{w}}\int_{w^*}^{\overline{w}} \left(\ln(w-s)+\beta p \ln(\delta+\frac{h}{c})+\beta p \ln((1+r)s-h)+\beta(1-p)\ln((1+\right.$$

Saving behaviour affected by government threshold (Regime 2)



Four groups (Regime 2)

Under the means testing policy, individuals are allowed to pay for more long-term care using their own finance.

Group 1The individuals who are not capable to provide themselves more long-term care rather than totally relying on government subsidy.

Group 2 The individuals who have and will choose to use extra money to get more long-term care on top of the government subsidy

Group 3 The individuals who hit the government threshold but consume more and save less to stay qualified for the government subsidy

Group 4 The individuals who pay for their long-term care by themselves.

Individual's choice of the four groups

$$
\begin{aligned}
U_1 &= \ln(w-s)+\beta p\ln\left((\delta+\frac{h^p}{c})C_2^h\right)+\beta\ln\left((1+r)\,s\right) \\
U_2 &= \ln(w-s)+\beta p\ln\left((\delta+\frac{h^p+h^t}{c})((1+r)s-h^t)\right)+\beta(1-p)\ln((1 \\
U_3 &= \ln(w-s^p)+\beta p\ln\left(\delta+\frac{h^p}{c}\right)+\beta\ln\left((1+r)s^p\right) \\
U_4 &= \ln(w-s)+\beta p\ln(\delta+\frac{h}{c})+\beta p\ln((1+r)s-h)+\beta(1-p)\ln((1+
\end{aligned}
$$

Social Welfare (Regime 2)

$$SW = \frac{1}{\overline{w}-\underline{w}}\int_{\underline{w}}^{w^P} \left(\ln(w-s) + \beta p \ln\left(\delta + \frac{h^p}{c}\right) + \beta \ln((1+r)s)\right) dw +$$
$$\frac{1}{\overline{w}-\underline{w}}\int_{w^{\tilde{}}}^{w^p} \left(\ln(w-s) + \beta p \ln\left(\left(\delta + \frac{h^p+h^t}{c}\right) C_2^h\right) + \beta(1-p)\ln((1+r)s) - h^t\right.$$
$$\frac{1}{\overline{w}-\underline{w}}\int_{w^p}^{w^*} \left(\ln\left(w - \frac{\Omega}{1+r}\right) + \beta p \ln\left(\delta + \frac{h^p}{c}\right) + \beta \ln(\Omega)\right) dw +$$
$$\frac{1}{\overline{w}-\underline{w}}\int_{w^*}^{\overline{w}} \left(\ln(w-s) + \beta p \ln(\delta + \frac{h}{c}) + \beta p \ln((1+r)s-h) + \beta(1-p)\ln((1+\right.$$

Social cost of long-term care

Social cost is the same in both regimes, it is,

$$k = \left(\frac{w^* - \underline{w}}{\overline{w} - \underline{w}}\right) h^p$$

Results

Regime 1

Table 1

	$\mathbf{h}^p$	$\mathbf{s}^p$	$\mathbf{w}^p$	$\mathbf{w}^*$	**k**	**sw**
3.6	5.0	3.0	10.5	13.6024	0.6801	4.1015
—	6.0	—	—	14.5822	0.8749	4.1023
—	7.0	—	—	15.3590	1.0751	4.1032
—	8.0	—	—	16.0281	1.2823	4.1040
—	9.0	—	—	16.6263	1.4964	4.1048

$(/p = 0.25, r = 0.2, \delta = 0.25, \beta = 0.4, c = 45, w^0 = 0, \overline{w} = 100)$

- When the government improves the government subsidy under the same threshold, the individuals in Group 1 is unchanged. But Group 2 keeps increasing which means more individuals choose to save less on purpose to stay under the threshold.The social welfare increases in this case.

Results

Regime 1

Table 2

	$\mathbf{h}^p$	$\mathbf{s}^p$	$\mathbf{w}^p$	$\mathbf{w}^*$	**k**	**sw**
1.8	5.0	1.5	5.25	6.7650	0.3382	4.1409
2.4	–	2.0	7.00	10.4694	0.5235	4.1319
3.0	–	2.5	8.75	13.7703	0.6885	4.1232
3.6	–	3.0	10.50	16.8931	0.8447	4.1147
4.2	–	3.5	12.25	19.8773	0.9939	4.1063

$(p = 0.25, r = 0.2, \delta = 0.25, \beta = 0.4, c = 30, w^0 = 0, \overline{w} = 100)$

- When the government threshold is raised, but keeping the subsidy unchanged, the government subsidy becomes more accessible to more individuals, which makes dividers (which are w^p and w^*) of the three groups increase. This means more people with higher income and more savings will join the first two groups. Observing the results, the size of Group 2 expands faster than Group 1.The social welfare decreases in this case.

Results

Regime 1 and Regime 2

.	h^p	$\mathbf{s}^p$	w^p	w^*	k	**sw**	**sw**(top-up
3.0000	5.0	2.5000	8.7500	13.7703	**0.6885**	4.1232	4.1706
1.4593	10.0	1.2161	4.2563	6.8853	**0.6885**	4.1483	4.1289
0.9748	15.0	0.8123	2.84317	4.5904	**0.6886**	4.1565	4.1112
0.7725	19.0	0.6438	2.2531	3.6237	**0.6885**	4.1600	4.1000
0.7003	21.0	0.5836	2.0425	3.2789	**0.6886**	4.1612	4.0939

$(p = 0.25, r = 0.2, \delta = 0.25, \beta = 0.4, c = 45, w^0 = 0, \overline{w} = 100)$

- The research finds out that under a limited (constant) budget, government policy with a lower government threshold and a higher government subsidy can generate a higher social welfare level.
- Keeping all the values of variables unchanged, the second means-testing regime (top-up) generates higher social welfare level
- In the Regime 2, when the government cost on long-term care is kept unchanged, it is also a lower government threshold and a higher government subsidy which can generate a higher social welfare level. This welfare level is also higher than that of regime 1.

Results

Regime 1 and Regime 2

.	h^p	$\mathbf{s}^p$	w^p	w^*	k	**sw**	**sw**(top-up
3.0000	5.0	2.5000	8.7500	13.7703	**0.6885**	4.1232	4.1706
1.4593	10.0	1.2161	4.2563	6.8853	**0.6885**	4.1483	4.1289
0.9748	15.0	0.8123	2.84317	4.5904	**0.6886**	4.1565	4.1112
0.7725	19.0	0.6438	2.2531	3.6237	**0.6885**	4.1600	4.1000
0.7003	21.0	0.5836	2.0425	3.2789	**0.6886**	4.1612	4.0939

$(p = 0.25, r = 0.2, \delta = 0.25, \beta = 0.4, c = 45, w^0 = 0, \overline{w} = 100)$

- The three dividers of the four groups increase during this process.
- However, when the government threshold level is too low, the individuals in Group 1,2 and,3 shrink, and individuals who are able to top-up are no longer qualified for the government subsidy. In this case, the social welfare of Regime 1 is higher than that of Regime 2.

Conclusion

This research improves life-cyle model to include the long-term care cost under means-testing policy regime. Comparing the social welfare function, the means-testing policy allowing a top-up will bring a higher social welfare.

Future research will focus on modifying the model to study and compare another means-testing regime where individuals can consume a cost when they are young to get public long-term care. .