Nursing Home Choice, Family Bargaining and Optimal Policy in a Hotelling Economy

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Introduction (1)

- **Long Term Care:** the care needed by people who are unable to perform alone activities of daily living or instrumental activities of daily living.
- Provision of LTC has become a major challenge for advanced economies.
  → The number of dependent persons in the Euro Area is expected to grow from $27M$ in 2013 to $35M$ by 2060.
- Provision and funding of LTC is carried out by 3 channels: *the family, the market and the state*.
  Norton (2000): about 2/3 of the supply of LTC is provided informally by the family, whereas the remaining consists of formal care (either at home or in nursing homes).
- Private LTC insurance market is under-developed → *LTC insurance puzzle*.
- Intervention of the government is limited (but growing).

Introduction (2)

Rising demand for institutionalized LTC services

- New societal constraints.
- Increase in severity of pathologies.

... but still the role of the family is crucial

- The family is a *collective* agent composed of different agents with different goals (bc of different preferences, different constraints) and different bargaining powers.
- We model decisions inside the family as a *cooperative* decision-making process *between a parent and a child.*
  $\rightarrow$ the *distribution of bargaining power* within the family is crucial.
- *Sloan et al. (1997)*: the bargaining power of the parent depends on 3 features: his degree of cognitive awareness, his number of children, his wealth.

Introduction (3)

Our objective:

- To explore the consequences of the distribution of bargaining power within the family on LTC outcomes, by considering its impact on the *prices* and *location* of nursing homes.

- *Schmitz and Stroka (2014)*: Those two dimensions - distance and price - are the most important determinants of nursing home choices, and matters more than nursing home (reported) quality.

Introduction (4)

- **Our baseline static model:**
  - Model of family bargaining where a family, composed of a dependent parent and a child, chooses between two nursing homes located along a geographical line.
  - The parent is interested in minimizing the distance between the nursing home and the location of his child (to have more visits), whereas the child, although caring also about the distance, wants to avoid too large LTC expenditure.
  - The design of the optimal public policy for nursing home access.
- **Extension to an OLG model** to examine how the distribution of bargaining power affects the accumulation of wealth and the dynamics of nursing home prices over time.

Introduction (5)

Our results with the static model:

- *At the laissez-faire*, *principle of maximum differentiation* holds.
- The mark up level in the nursing sector depends strongly on how the bargaining power is distributed within the family.
- *At the utilitarian social optimum*, nursing homes should locate in the middle of each half of the line; prices should be set to marginal cost. The implementation depends on whether the government can or cannot force nursing homes location.
- Robust to the increase in the number of children within a family.

Introduction (6)

Our results with the OLG model:

- It could be the case, if the motive for transmitting wealth to the children is sufficiently strong, that the mark up rate is decreasing with the bargaining power of the dependent parent.
- The mark up rate is decreasing with the interest rate, since a higher interest rate raises the opportunity cost of LTC expenditures and fosters wealth accumulation.
- A higher capital stock raises the price of nursing homes through higher mark up rates
- Multiple stationary equilibria (some being unstable), with a positive correlation between capital and nursing homes prices.

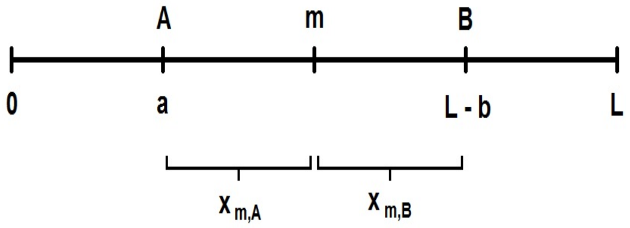
Litterature

- Modelling of family bargaining: Hoerger et al (1996) and Sloan et al (1997).
- Literature on location games in the context of LTC; Konrad et al (2002) and Kureishi et Wakabayashi (2007)
- Complement papers in IO applying Hotelling's model : Brekke et al, 2014 (competition btw hospitals), Bester, 1989 (bargaining game btw a consumer and a firm).
- Literature on optimal private and public LTC policies: Cremer et al. (2016), Jousten et al (2005) and Pestieau and Sato (2008), Canta et al. (2016).

The (baseline static) model (1)

- Continuum of families composed of a child and of a dependent parent. Families are uniformly distributed on a geographical line $[0, L]$.
- Each dependent parent needs to enter a nursing home.
  $\rightarrow$ 2 nursing homes in the economy, which are denoted by $\{A, B\}$, and located on the same $[0, L]$ line.
- Same nursing home *quality* and / or agents do not take into account that dimension.
- Imperfect competition on the NH market: fixed number of licences, equal to 2.

The (baseline static) model (2)



The (baseline static) model (3)

Within each family, preferences among members are not perfectly aligned.

- *Utility of the child*:

$$U_c = w - p_i - \gamma x_i^2$$

- *Utility of the dependent parent*:

$$U_d = -\delta x_i^2$$

$\Rightarrow$ The utility of the family is:

$$\begin{aligned} U_f &= \theta U_c + (1-\theta) U_d \\ &= \theta (w - p_i) - (\theta\gamma + (1-\theta)\delta) x_i^2 \end{aligned}$$

where $\theta \in [0, 1]$ is the bargaining power of the child within the family.

The Laissez-Faire (1)

- Standard Hotelling model except for the modelling of family bargaining.
- **Timing:**
  1- NH choose their location and the price they charge, anticipating on the demand from families and taking as given the price and the location of the other facility.
  2- families choose between $\{A, B\}$ taking prices and location as given.

The Laissez-Faire (2)

Proposition

At the laissez-faire, the two nursing homes A and B locate at the far extremes of the line $[0, L]$:

$$a^{LF} = b^{LF} = 0$$

Prices in the two nursing homes are equal to:

$$p_A^{LF} = p_B^{LF} = c + \frac{(\gamma\theta + (1-\theta)\,\delta)}{\theta} L^2$$

and the demands are $D_A^{LF} = D_B^{LF} = L/2$.

The Laissez-Faire (3)

Mark up rate:

$$MarkUp = \frac{\gamma\theta + (1-\theta)\,\delta}{\theta} L^2$$

- If agents prefer to be closer to each other (γ, δ high), the mark up level increases.
- Variation with the bargaining power:

Corollary

The mark up of nursing homes A and B is decreasing with the bargaining power of the child:

$$\frac{dMarkUp}{d\theta} = -\frac{\delta}{\theta^2} L^2.$$

Social Optimum (1)

- Government's problem:

$$\max_{a,b,c_A,c_B} \quad W = \int_{j=0}^{m} \left[\frac{1}{2}(c_A) - \frac{1}{2}(\gamma+\delta)(j-a)^2\right]\frac{1}{L}dj$$
$$+ \int_{m}^{L} \left[\frac{1}{2}(c_B) - \frac{1}{2}(\gamma+\delta)(L-b-j)^2\right]\frac{1}{L}dj$$
$$\text{s.t.} \int_{j=0}^{L} w\frac{1}{L}dj \geq \int_{j=0}^{m} c_A\frac{1}{L}dj + \int_{m}^{L} c_B\frac{1}{L}dj + \int_{0}^{L} c\frac{1}{L}dj$$

where $m = m(a, b, c_A, c_B)$, the location of the median family, satisfies the condition:

$$\theta c_A - (\gamma\theta + (1-\theta)\delta)(m-a)^2 = \theta c_B - (\gamma\theta + (1-\theta)\delta)(L-b-m)^2.$$

Social Optimum (2)

Proposition

At the symmetric utilitarian optimum, all young agents enjoy the same consumption, independently from the nursing home of their parents:

$$c_A^* = c_B^* = w - c$$

At the symmetric utilitarian optimum, nursing homes locate closer on the line $[0, L]$ *than at the laissez-faire :*

$$a^* = \frac{1}{4}L \text{ and } L - b^* = \frac{3}{4}L$$

and the two nursing homes A *and* B *equally share the demands:* $D_A = D_B = m^* = L/2$.

⇒ Welfare gains due 1) to nursing homes being closer to families, 2) increase in consumption: $w - c > w - p_i$ with $p_i \geq c$.

Implementation

- **If location can be forced in $(a^*, L - b^*)$:**
  - The government subsidizes nursing homes so that they price optimally:

$$S_A(a^*, b^*) = S_B^*(a^*, b^*) = (\gamma\theta + (1-\theta)\,\delta)\frac{L^2}{2\theta}$$

- **If location cannot be forced, 4 instruments are needed:**
  - $S_A(a,b)$ and $S_B(a,b)$ so that prices are equalized to marginal costs, $p_A^d = p_B^d = c \rightarrow$ same form as before.
  - *non-linear tax function* for each nursing home: $t_A = t\,(a - a^*)$ and $t_B = t\,(b - b^*)$ such that $t_i'(x) > 0 \forall x \in [0, L]$, if they deviate from their optimal location:

$$t_A'(0,b) = \frac{(\gamma\theta + (1-\theta)\,\delta)}{2\theta}(3a^* + b - L)(-a^* + b - L).$$

$$t_B'(a,0) = \frac{(\gamma\theta + (1-\theta)\,\delta)}{2\theta}(a - b^* - L)(a + 3b^* - L).$$

Discussion: Increasing the size of family

- The size of the mark up depends on *the average preference for the distance* ($\nearrow$) and on the sharing rule of the LTC spending between children ($\searrow$).
- *Distribution of the bargaining power within the family*: if an increase in the number of children raises the bargaining power of the parent, $\nearrow$ higher mark up.
  ...but if decisions are democratic (one person / one vote), mark up rates $\searrow$.
- *The sharing rule of LTC payment* among children may increase or decrease the mark up rate.
- The increase in the number of children may increase *the risk of coordination failures*:
  each child relies on his brother to go visit the parent and thus only cares about the price : $\gamma_i \to 0 \Rightarrow \searrow$ mark up rate.

Wealth accumulation and LTC price dynamics (1)

The OLG economy:

- Each cohort is a continuum of agents of size L. Fertility is at the replacement level (one child per young agent).

- *Period 1* (of length 1) is childhood.
  In *period 2* (of length 1), the agent is a young adult. He works in the production of goods, has one child, and saves a fraction $s \in]0,1[$ of his resources, while he consumes a fraction $1-s$ of his resources.
  In *period 3* of duration $\lambda \in]0,1[$, the individual is old and dependent. When the parent dies, the saved resources that are not spent in a nursing home are transmitted to his child.

Wealth accumulation and LTC price dynamics (2)

2 Production sectors: LTC services and goods.

- LTC services are produced over a period of length λ. It requires a quantity of good equal to c for each dependent person. Duopoly sector as in the baseline scenario.
- Production of goods is made over a period of length 1. The sector is perfectly competitive. The production function is:

  $$Y_t = \phi K_t^{\alpha} L^{1-\alpha}$$

  In intensive terms, we have:

  $$y_t = \phi k_t^{\alpha}$$

  We suppose a full depreciation of capital after one period of use.
- Factors are paid at their marginal productivity.

Wealth accumulation and LTC price dynamics (3)

Budget constraints:

- The available resources of the young are:

$$w_t + g_t - \lambda p_{it}$$

- The young saves a constant fraction of his resources so that consumption at the young age is:

$$(1 - s)(w_t + g_t - \lambda p_{it})$$

  and the intergenerational transfer g_t coming from the parent is:

$$g_t = R_t s \left[w_{t-1} + g_{t-1} - \lambda p_{it-1}\right]$$

  $\rightarrow$ dynamic of wealth accumulation, but LTC expenditures limit accumulation across generations.

Wealth accumulation and LTC price dynamics (4)

Individual preferences:

- *The lifetime utility of a young adult at time* t is given by:

$$\begin{aligned}&(1-s)\left(w_t+g_t-\lambda p_{it}\right)-\gamma\lambda x_{it}^2\\&+\mu\left(R_{t+1}^e s\left(w_t+g_t-\lambda p_{it}\right)-\lambda p_{it+1}^e\right)-\delta\lambda x_{it+1}^{e2}\end{aligned}$$

where the preference parameter $\mu\in[0,1]$ reflects the parent's interest in giving some wealth to his child net of the price that this one will pay for the nursing home of his parent.

Wealth accumulation and LTC price dynamics (5)

- If $\mu = s = 0$, we are back to the baseline model. Opportunity cost of LTC is only related to the child's consumption.

- Here, the opportunity cost of LTC is 3fold:
  - $\searrow$ consumption of the young to an extent $1 - s$.
  - $\searrow$ the amount of wealth that can be transmitted from the child of the dependent to his own child, proportionally to s
  - $\searrow$ the net wealth transfer that the old gave to his child, which matters for the utility of the elderly.

Wealth accumulation and LTC price dynamics (6)

Individual preferences:

- *The lifetime utility of the family* is:

$$\theta \left[\begin{array}{l} (1-s)\left(w_t + g_t - \lambda p_{it}\right) - \gamma \lambda x_{it}^2 \\ +\mu \left(R_{t+1}^e s \left(w_t + g_t - \lambda p_{it}\right) - \lambda p_{lt+1}^e \right) - \delta \lambda x_{lt+1}^{e2} \end{array} \right]$$
$$+ (1-\theta) \left[\begin{array}{l} (1-s)\left(w_{t-1} + g_{t-1} - \lambda p_{jt-1}\right) - \gamma \lambda x_{jt-1}^2 \\ +\mu \left(R_t s \left(w_{t-1} + g_{t-1} - \lambda p_{jt-1}\right) - \lambda p_{it} \right) - \delta \lambda x_{it}^2 \end{array} \right]$$

Wealth accumulation and LTC price dynamics (7)

TEMPORARY EQUILIBRIUM:

- The timing of the model is identical to that of the baseline model.
- The problem is identical except that *all decisions are conditional on the available resources and production factor prices, and also conditional on expectations regarding future prices.*

Wealth accumulation and LTC price dynamics (8)

Proposition

At the temporary equilibrium under myopic anticipations, the two nursing homes locate at the far extreme of the line $[0, L]$*, independently of the distribution of bargaining power within the family.*
Prices in the two nursing homes are equal to:

$$p_{At} = p_{Bt} = c + \frac{(\gamma\theta + \delta(1-\theta))}{[\theta(1-s) + \theta\mu R_t s + (1-\theta)\mu]} L^2$$

The demand for each nursing home is $D_{At} = D_{Bt} = L/2$.

Wealth accumulation and LTC price dynamics (9)

- NH prices depend on (s, μ, R_t) because *individuals care about wealth accumulation and transmission but LTC spending limits it.*

- Prices depend on the propensity to save, s : $\nearrow$ or $\searrow$ depending on whether $\mu R_t \gtrless 1$,
  ... on how much parents care about transmitting wealth (i.e. the level of μ): $\searrow$
  ... and on the interest factor R_t: $\searrow$.

Wealth accumulation and LTC price dynamics (10)

- The impact of bargaining powers on the mark up rates are modified:

Corollary

At the temporary equilibrium with myopic anticipations, the mark up of nursing homes varies non-monotonically with the bargaining power of the child in the family:

$$\frac{dMarkup}{d\theta} = \frac{-\delta\left(1-s\right) - s\delta\mu R_t + \gamma\mu}{\left[\theta(1-s) + \theta\mu R_t s + (1-\theta)\mu\right]^2} L^2$$

We have

$$\frac{dMarkup}{d\theta} < 0 \iff -\delta\left(1-s\right) - s\delta\mu R_t + \gamma\mu < 0$$

Wealth accumulation and LTC price dynamics (11)

- *First effect* is similar to baseline scenario : $\nearrow$ increasing prices, $\searrow$ consumption of the young (up to their propensity to consume $(1-s)$). $+ \searrow$ resources to be transmitted to their own child (*second effect*) $\Rightarrow$ **when $\theta \nearrow$, mark up rate $\searrow$.**
- *Third effect*: if prices increase, the parent obtains lower utility from transmitting wealth...but he has less weight ($(1-\theta)$ decreases) $\Rightarrow$ **when $\theta \nearrow$, mark up rates $\nearrow$.**

$\Rightarrow$ The overall impact depends on the magnitude of these 3 effects as well as on the level of R_t.

Wealth accumulation and LTC price dynamics (12)

INTERTEMPORAL EQUILIBRIUM

- The economy can be described by the following system:

$$
\begin{aligned}
k_{t+1} &= s\left(w_t + g_t - \lambda p_t\right) \\
g_{t+1} &= R_{t+1} s\left[w_t + g_t - \lambda p_t\right] \\
p_{t+1} &= c + \frac{(\gamma\theta + \delta(1-\theta))}{[\theta(1-s) + \theta\mu s R_{t+1} + (1-\theta)\mu]} L^2
\end{aligned}
$$

- High nursing homes prices prevent capital accumulation given the fixed propensity to save.
- We also have that $R_t = \phi\alpha k_t^{\alpha-1}$: higher capital accumulation decreases the interest rate so that LTC prices increase.

Wealth accumulation and LTC price dynamics (13)

Existence and uniqueness of stationary equilibrium:

- Under some conditions (see **Proposition 6**), there exist at least two stationary equilibria (k_1, p_1) and (k_2, p_2) with:

$$\begin{aligned} 0 < k_1 &< k_2 \\ p_1 &< p_2 \end{aligned}$$

$\Rightarrow$ *Richer stationary economies are characterized by higher NH prices.*

- **Proposition 7**: stability of these equilibria.
  It depends on the level of parameters as well as on the distribution of bargaining powers.

Conclusion

- This paper studies interactions between the distribution of bargaining power within the family and the prices and location of nursing homes.
- The mark up rate of nursing homes is increasing with the bargaining power of the dependent parent in the static model...
  but not in the OLG model where parents care about transmitting wealth.
- LF is not optimal. We derived the Utilitarian optimum and show how to decentralize it.
- The extension to an OLG economy allowed us to emphasize the dynamics of wealth and of LTC prices.
  $\rightarrow$ *positive correlation between capital and prices.*
- Stability is not guaranteed. It depends on the level of parameters and on the level of θ.
  $\rightarrow$ *The distribution of bargaining power can drive the whole long run dynamics of capital accumulation and nursing home prices.*