Long Term Care: the State, the Market and the Family[*]

Pierre Pestieau[‡] and Motohiro Sato[§]

September 22, 2006

Abstract

In this paper we study the optimal design of a long term care policy in a setting that includes three types of care to dependent parents: public nursing, private nursing and assistance in time by children. Private nursing can be financed either by financial aid from children or by private insurance. The social planner can use a number of instruments: public nursing, subsidy to aiding children, subsidy to private insurance premiums, all financed by a flat tax on earnings. The two sources of heterogeneity are children's productivity and parents' endowment. Parents can influence their children by leaving them gifts before they know whether or not they will need long term care. What they do know is the productivity of their children. We show that the quality of public nursing homes and the level of tax-transfer depend on their effect on gifts, the distribution of wages and the various inequalities in consumption. We also consider the possibility of private insurance.

Keywords: long term care, altruism, bequests.
JEL classification: D64, H55, I18.

---

[*]We started this project with Maurice Marchand who passed away suddenly in July of 2003. This paper was presented at the University of Ottawa, at the University of Montréal, at the annual meeting of CIRPEE, at PSE and at Columbia University. We thank seminar participants for helpful comments. We also thank Dario Maldonado for his remarks. We are grateful to two referees for their valuable questions and suggestions which substantially improved the paper.

[†]The first author is grateful for financial support of the Belgium Science Fondation (FNRS) and the second author is grateful for financial support of Center of Excellence Project of Ministry fo Education of Japan.

[‡]CREPP, University of Liège, CORE, PSE and CEPR, <p.pestieau@ulg.ac.be>.

[§]Hitotsubashi University, <satom@econ.hit-u.ac.jp>.

1 Introduction

The ongoing demographic ageing process represents a major challenge both from a social and an economic point of view. This is because ageing can be felt across the board. It touches all age groups from the very young to the oldest old. One often cited example is the provision of long-term care insurance to the oldest old, be it under the form of a private or a public system. Only a handful of countries have set up such long-term care insurance systems also sometimes called dependency insurance. The relative scarcity of such systems, and the difficulties of organizing them are pack and parcel intrinsically linked to some conceptual problems. This might explain why the theoretical literature on long term care policy is rather scanty and why it has to assume away a number of real life features.

This paper studies a society consisting of a number of parent-child pairs. In this model parents are not altruistic, while children are altruistic in that they are ready to help their parents as soon as they lose their autonomy. In the absence of a government policy and insurance market, dependent parents can be helped in two ways: either their children can give them some financial aid, or they can provide them with assistance in time. Children have different productivities, and parents have a uniform endowment (wealth, pension); this assumption is dropped later. While market productivity varies, productivity in terms of help to dependent parents is the same for all. As a consequence, children of dependent parents are divided into three groups: the low market productivity group who help their parents with time, middle income children who let their parents resort to private insurance and the high income children who provide financial assistance. Before knowing their own health status parents can give part of their endowment to their children so that in case of bad health they can get better assistance. Alternatively parents can purchase a private long term care insurance.

Following that we discuss public policy in terms of four instruments: a uniform payroll tax, a subsidy for children providing assistance (in kind or in cash), a subsidy on private insurance premium, and institutionalized nursing assistance. Parents who receive this latter benefit don't receive any help from their children. It appears thus that dependent parents whose children are at the middle wages level tend to either go to these nursing homes or to purchase private insurance.

Ultimately what we are interested in is the optimal policy chosen by a utilitarian government. Thus we analyze the comparative statics of our model. In particular, we study the effect of policy variables and exogenous variables on the segmentation of our society into three groups. When we introduce heterogeneity in parents' endowment, we show that the optimal policy may involve self-selecting them such that in the middle income range, rich parents purchase private insurance and poor parents resort to public nursing.

Quite clearly such a model does not include all the aspects of long term care, and it rests on a number of assumptions. Some are pretty realistic; others are made to keep the analysis within reasonable limits. The main heterogeneity comes from differences in market productivity. The other characteristics such as altruism and productivity in assistance to dependent parents are equal for all.[1] The instruments are a payroll tax, a lump-sum subsidy to aiding children, an *ad valorem* subsidy to private insurance, and public nursing home. These restrictive policies are adopted for the sake of simplicity. As it will appear the choice of private insurance and public nursing is dichotomous, and influenced by the relative efficiency of the two schemes.[2]

In an earlier paper [Pestieau and Sato, 2006] we only considered a tax-transfer policy. The present paper extends this work in two different directions, allowing for the possibility of public nursing homes and also for the existence of private insurance and introducing heterogeneous endowments of parents. We show that public nursing home and private insurance cater to parents with children of middle productivity while low wages children prefer to help their parents with time and high wages children prefer to assist them with financial transfers.

To avoid confusion, it is important to distinguish among the types of resources dependent parents can count on, and among the types of providers of long term care. Assistance in time implies that the dependent parent stays home and is taken care of by his child. Assistance in terms of cash or private insurance benefits allow the dependent parents to stay home and get some nursing service, or go to a private nursing home. The case of public nursing home is self-explanatory.

The scant evidence regarding upward intergenerational transfers from middle age children to their elderly parents includes the study by Sloan *et al.* (2002), who use data from HRS. They show that a child with a high wage tends to transfer money rather than time in contrast to a child with a low wage. On the basis of the same data, Zissimopoulos (2001) shows that, as children's wages increase, time tends to be substituted for money. Ioannides and Kan (2000) using data from PSID reach the same conclusion. It appears

[1] In Jousten *et al.* (2005) optimal long term care policy is analyed when the only source of heterogeneity is children's altruism.

[2] In a recent paper Finkelstein and McGarry (2004) underline two sources of heterogeneity in long term care insurance that are not observable: risk types and insurance preferences. They show that this double asymmetric information has negative efficiency consequences on the insurance market. We don't consider this issue here.

that children's transfers (both money and time) are determined by their parents' needs and their own resources. High income children and children living far away tend to make transfers in money and not in time.[3]

As mentionned above, there is little theoretical work devoted to optimal long term care policy. Jousten *et al.* (2005) focus on the moral hazard problem arising when children's altruism is not observable. There is naturally the seminal paper by Pauly (1990), who argues that the demand for long-term care insurance suffers from a particular moral hazard in that children may decide to diminish their caregiving in favor of low-cost care provided by third parties, such as a public long-term care program. More recently, Zweifel and Struwe (1998) have shown in a principal-agent setting that the existence of long-term care insurance coverage diminishes the amount of care provided by the major "natural" caregivers. The rational for this result is rather straightforward: in the face of long-term care coverage, children earning low wages are less constrained to spare wealth by providing care themselves. Anticipating this moral hazard, parents demand low levels of long-term care insurance. Pauly (1996) puts forward a provocative argument: long-term care insurance would largely protects bequests for non poor, non needy heirs. This is an interesting point that cannot be addressed to here as we assume away bequest motive.

The rest of the paper is organized as follows. The next section presents the basic model along with the *laissez-faire* solution with private insurance. Section 3 introduces the public policy tools and some comparative statics results. Section 4 discusses the design of optimal tax transfer and nursing homes policy. It deals with the choice between providing public nursing and subsidizing a private long term care insurance. This choice is shown to depend on the relative efficiency of the two schemes, as well as on the parent's wealth. A final section concludes.

2 The *laissez-faire*

2.1 The basic setting

We consider a society consisting of two-person families: a parent who may become dependent and then need some sort of long term care and his child. Families differ in terms of the health of parents and the market productivity of children denoted w; the latter has a density $f(w)$, a distribution $F(w)$ and support (w_-, w_+). They may also be different with respect to the resources

[3] See also Prouteau and Wolff (2003) for a study on French data reaching the same conclusion.

of the parent I. The basic model assumes just one value of I. In section 4.3, we consider that I takes two values I_H and I_L with $I_H > I_L$. *Ex ante*, parents face a uniform probability, π of losing their autonomy. If it occurs, children may help their parents either in time or in cash, depending on the comparison between their market productivity and their nursing productivity. The latter is assumed to be the same for all and denoted w_0. Children have a limited altruism, that is triggered by the dependence of their parents and that is restricted to long term care as modeled below. Parents are not altruistic. Before their health status is revealed, they can either leave some gift, G, to their children or purchase a private long term care insurance. We assume that parents who purchase a private insurance *ex ante* do not expect assistance from their children in case of loss of autonomy. In other words, familiy solidarity and market insurance are mutually exclusive.

We can now write the parent's expected utility:

$$V = v(d) - \pi(D - H) = v(d) + \pi H$$

where d is consumption, D the utility loss of autonomy and H the help he gets from his child or the compensation he receives from the private insurance company. For reasons of simplicity, D is normalized to 0. Denoting m the help received from children and a the private insurance compensation, we have that in case of assistance from children: $d = I - G$ and $H(m)$ and in case of private insurance $d = I - \pi a\theta$ and $H(a)$ where $H' > 0$ and $H" < 0$, where $\theta > 1$ expresses the fact that the private insurance is not actuarially fair. Market price of long term care is normalized to 1. One can expect that when long term care private insurance is very inefficient (large θ) no parent will ever buy private insurance.

Turning to the children, their altruism is limited to helping their parent in case of dependency and this help is restricted to long term care either in time hw_0 or in cash s. Using the superscripts D and N for dependency and autonomy and denoting their consumption by c, we write their utility as:

$$U^D = u\left(c^D\right) + \beta H$$

and

$$U^N = u\left(c^N\right)$$

where $c^D = w(1-h) + G - s$, $c^N = w + G$ and $\beta \leqslant 1$ is a factor of altruism. Total labor endowment is 1, market labor supply is $(1-h)$ and h is the time provided to dependent parents; s is the amount of financial aid that allows children to purchase nursing services on behalf of their dependent parents. We assume perfect substitutability between these two forms of assistance. In other words:

$$H(m) = H(w_0 h + s).$$

With this assumption, h and s become mutually exclusive with h chosen by children whose $w < w_0$ and s by those with $w > w_0$.

2.2 Parent and child's choices

It is time to look at the sequence of choices within the family. In our setting, the parent is the first to move before knowing about whether or not he needs long term care (LTC). He knows his child's productivity w and how much he can expect from him in case of need. On that basis the parent chooses to leave G or to buy a private LTC insurance. Note that if I is too low he can be unable to do either one. The next stage is the loss of autonomy with probability π, which is followed by a move from either the child or the insurance company.

Given the complexity of the problem at hand, we will adopt logarithmic functions, which clearly restricts the scope of our analysis, but can yield intuitive and manageable results.[4]

2.2.1 Children's problem

We consider a child who may have received a gift G. If his parent is healthy, he does not help him regardless of their respective consumption. If his parent needs LTC, he will help him given that he does not fall back on a private insurance. A child with productivity w then maximizes the following expression:

$$U^D = \ln(w(1-h) + G - s) + \beta \ln(w_0 h + s)$$

where $G \geqslant 0$. We have the following optimal levels of either h or s:

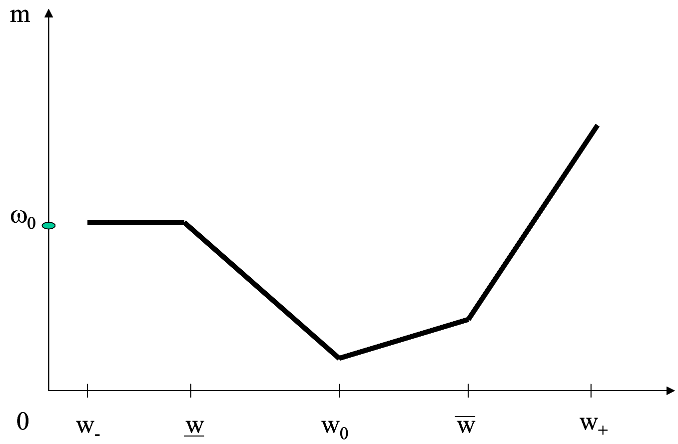
$$\begin{aligned}
\text{For } w < w_0: \quad & h^* = \frac{\beta}{1+\beta}\frac{w+G_1}{w} && \text{if } G \leqslant \frac{w}{\beta} \\
& h^* = 1 && \text{if } G > \frac{w}{\beta} \\
& s^* = 0 \\
\text{For } w > w_0: \quad & s^* = \frac{\beta}{1+\beta}(w+G). \\
& h^* = 0.
\end{aligned}$$

Throughout this paper we will assume that $w_- < w_0 < w_+$ to cover the two types of assistance. We see that G has a stimulating effect on either h or s.

[4] With isoelastic functions we obtain the same results, but they don't yield simple demand and supply functions. In any case, even with the logarithmic specification, we end up with ambiguous results.

When $G = 0$, $h^* < 1$ which is intuitive. Given G the profile of $m = w_0 h$ or s is represented on Figure 1 below. For the time being, private insurance is assumed away. In the following we use the subscript 1 and 2 to refer to the range of values for which $h^* > 0$, $s^* = 0$ and $h^* = 0$, $s^* > 0$.

Figure 1 - Child's assistance



2.2.2 Parent's problem without private insurance

Given the expected behavior of his child, each parent can decide to leave him a certain fraction of his endowment I. To be precise, the parent aims at maximizing:

$$V = \ln (I - G) + \pi \ln m^*$$

where $m^* = w_0 h^*$ for $w \leqslant w_0$ and $m^* = s^*$ for $w > w_0$. When making their choice, he takes into account the effect of G on m^*. There is no parental altruism. With $\pi = 0$ there would be no such a gift. This gift is not strategic; it acts as an insurance premium for LTC within the family. The first-order condition for G is given by:

$$G_1^* = Max \left[0, Min \left(\frac{\pi I - w}{1 + \pi}, \frac{w}{\beta} \right) \right]$$

and

$$G_2^* = Max \left[0, \frac{\pi I - w}{1 + \pi} \right].$$

There are three reasons for not having such an *inter vivos* gift. First, a private LTC insurance is more attractive as we will see below. Second, the parent may be too poor: $I < \dfrac{w}{\pi}$. Third, the child can be very productive. It indeed appears that $G^* > 0$ implies $I > w$; in other words the parent is wealthier than his child. The inequality $I > w$ is plausible if we interpret I as accumulated wealth. Up to 4.3 we make this assumption.[5]

Child with $w \in [w_-, \underline{w}]$ devotes all his available time to his dependent parent where $\underline{w} = \dfrac{\pi\beta I}{1+\pi+\beta}$. Child with $w \in [\underline{w}, w_0]$ chooses $h^* < 1$ and still receives positive gift. For $w \in [w_0, \bar{w}]$, $s^* > 0$ and $G_2^* > 0$ where $\bar{w} = \pi I$. Finally, for $w \in [\bar{w}, w_+]$, $s^* > 0$ and $G_2^* = 0$; children have so high earnings that a gift has no effect on the level of s^*.

We represent both the profile of G_i^* and that of V_i, the utility of the parent in Figures 2 and 3 respectively.

Figure 2: Parent's gift

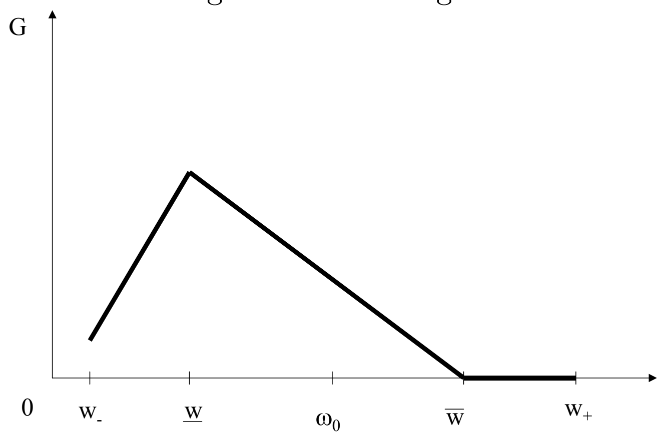
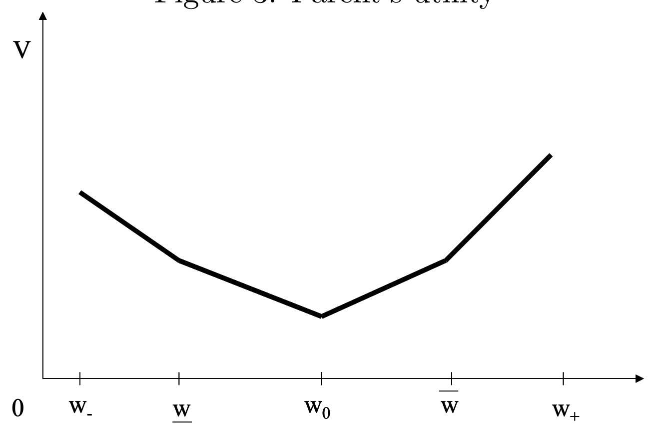


Figure 3: Parent's utility



[5] In Pestieau and Sato (2004), we represent the solutions to this problem for $w \in [w_-, w_+]$ and $I = I_H$ or I_L. For parents with I_L, $G^* = 0$ for all w. For parents with I_H we partition the interval $[w_-, w_+]$ in different regimes.

Given I, by substituting the optimal value of G_i^* in the parent utility function, we have:

$$\begin{array}{ll} V_1 = \ln(I - w/\beta) + \pi \ln w & \text{for } w \in [w_-, \underline{w}] \\ V_1 = (1+\pi)\ln(w+I) - \pi \ln w - B + \pi \ln \dfrac{\beta \pi w_0}{1+\beta} & \text{for } w \in [\underline{w}, w_0] \\ V_2 = (1+\pi)\ln(w+I) - B + \pi \ln \dfrac{\beta\pi}{1+\beta} & \text{for } w \in [w_0, \bar{w}] \\ V_2 = \pi \ln w + \ln I + \pi \ln \dfrac{\beta}{1+\beta} & \text{for } w \in [\bar{w}, w_+] \end{array}$$

where $B = (1+\pi)\ln(1+\pi)$.

2.2.3 Parent's problem with private insurance

Up to now we have distinguished two regimes depending on $w \lesseqgtr w_0$. We now consider the possibility of a third and intermediate regime in which parents purchase a private LTC insurance. This regime is denoted by the subscript 3. Why intermediate? It is clear from Figures 1 and 3 that child's assistance is relatively low for productivity close to w_0 and it is possible that the parent finds it more attractive to purchase a private insurance. This intermediate regime 3 concerns parents of children with $w \in [\hat{w}_1, \hat{w}_2]$ where $\hat{w}_1 < w_0 < \hat{w}_2$.

If a parent purchase a private insurance policy, he chooses the value of a that maximizes:

$$V_3 = \ln(I - \pi a \theta) + \pi \ln a.$$

This yields an optimal compensation $a^* = \dfrac{I}{\theta(1+\pi)}$ and the parent utility becomes:

$$V_3 = (1+\pi)\ln I - \pi \ln \theta - B.$$

We assume that private insurance and filial assistance are mutually exclusive. In other words, by purchasing a private insurance, parent free their children from the moral obligation of helping them in case of loss of autonomy.

To obtain the values of $\hat{w}_1$ and $\hat{w}_2$ (assumed to exist), one respectively solves the following equations:

$$V_3 = V_1(\hat{w}_1) \quad \text{and} \quad V_3 = V_2(\hat{w}_2).$$

Explicitly this gives

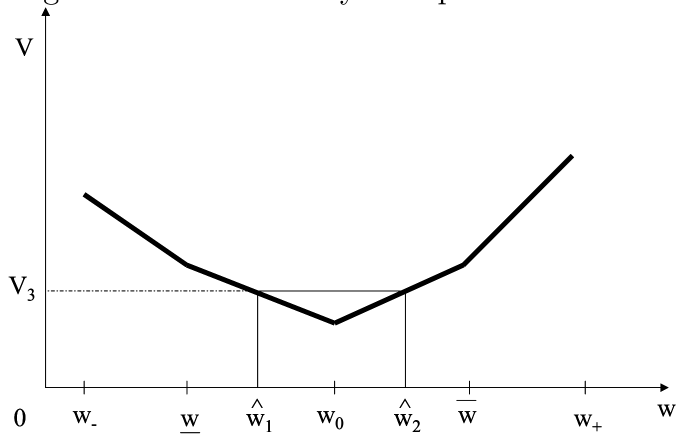
$$V_3 - V_1(\hat{w}_1) = (1+\pi)[\ln I - \ln(\hat{w}_1 + I)] + \pi \ln \frac{\hat{w}_1}{w_0} - \pi \ln \theta - \pi \ln \frac{\beta\pi}{1+\beta} = 0$$

and

$$V_3 - V_2(\hat{w}_2) = (1+\pi)\left[\ln I - \ln(\hat{w}_2 + I)\right] - \pi \ln \theta - \pi \ln \frac{\beta\pi}{1+\beta} = 0.$$

In Figure 4 we represent the value of V along the w-axis that is divided into three regimes: assistance in time, private insurance, assistance in cash. It is clear that for high values of θ (namely for very inefficient markets), the horizontal line V_3 could be below the minimum of V_1 and V_2.

Figure 4: Parent's utility with private insurance



We can summarize the content of this section in a proposition.

Proposition 1 *If there is no LTC insurance market or if parents have few resources, the assistance of low wage children to their dependent parents takes the form of service and decline with earning capacity up to the point where this capacity is equal to children's nursing productivity assumed to the same for all. From that threshold point, children's assistance becomes financial and increases with their earning capacity. Not only the level of assistance, but also the expected utility of parents takes a U-shape along the axis of market wages. If there is a LTC market insurance and parents have enough resources, there is an intermediate range of children's wages for which the parents prefer to purchase a LTC insurance rather than rely on their children's assistance. Outside of this range, parents may make some gift to their children to make sure that in case they need LTC they will benefit from generous assistance.*

In our model, we have assumed that private insurance and family solidarity are mutually exclusive, i.e., the parent who has purchased a private insurance and left no gift *ex ante* does not count on his child's help when he becomes dependent. One might consider that the child if he is altruistic enough could anyway provide some assistance. We now give the condition under which the child has indeed no motive to do so. Focusing on the child with productivity $\hat{w}_2$, his utility is:

$$u^D = u\left(\hat{w}_2 - s\right) + \beta\left[v\left(d\right) + H\left(a^* + s\right)\right].$$

One obtains that:

$$\left.\frac{du^D}{ds}\right|_{s=0} = -\frac{1}{\hat{w}_2} + \beta\frac{\theta\left(1+\pi\right)}{I} \leqslant 0$$

if $\hat{w}_2 \leqslant \dfrac{I}{\beta\theta\left(1+\pi\right)}$. This is a sufficient condition for not having m and a silmutaneously.

3 Public policy. Comparative statics

We now introduce four public policy instruments: an income tax of rate t levied on children's earnings, a flat subsidy σ for children assisting their dependent parents, a public nursing home of quality g and an *ad valorem* subsidy, τ, on private insurance premium. Introducing the government adds an additional stage to the sequence of decisions.

Stage 1. The social planner chooses t, σ, g and τ that maximize the sum of utilities of both parents and children.

Stage 2. Each parent chooses whether or not to leave some G and if so, how much. If he anticipates that, given t, σ, g and τ, he would be better off in case of bad health in a public nursing home or with a private insurance, he does not leave anything to his child. Otherwise, he expects to receive either h or s from his child and *ex ante* he may leave him part of his wealth.

Stage 3. The child helps his unhealthy parent by comparing the alternatives, assistance in time or in cash, except if the parent has chosen a private LTC insurance or has decided to go to a public nursing home.

We now proceed backwardly by looking first at the child's choice, then at the parent's decision and finally (in section 4) at the determination of optimal public policy. Throughout this section we keep using the Cobb-Douglas specification and we consider a single value of I.

3.1 Child's choice

A child with productivity w and with a dependent parent expecting his assistance chooses s or h in order to maximize:

$$U^D = \ln(\omega(1-h) + G + \sigma - s) + \beta \ln(w_0 h + s)$$

where $\omega = w(1-t)$. For further use, $\omega_0 = w_0(1-t)$. As shown above, we have to distinguish two regimes. For $\omega \leqslant \omega_0$, $s = 0$ and

$$\begin{aligned} h^* &= \frac{\beta}{1+\beta}\left(1 + \frac{G+\sigma}{\omega}\right) && \text{if } G + \sigma \leqslant \omega/\beta \\ h^* &= 1 && \text{if } G + \sigma > \omega/\beta. \end{aligned}$$

For $\omega > \omega_0$, $h = 0$ and

$$s^* = \frac{\beta}{1+\beta}(\omega + G + \sigma).$$

It is interesting to note that the child can end up spending all his available time (here equal to 1) taking care of his dependent parent if both parental gift and subsidy exceed his net of tax wage divided by the factor of altruism.

We can also write the consumption of the child with a dependent parent:

$$c^D = \frac{1}{1+\beta}(\omega + G + \sigma).$$

It is the same for the two regimes. The consumption of the child when his parent is healthy is trivial as it involves no choice:

$$c^N = \omega + G.$$

3.2 Parent's choice without nursing home and private insurance

Given the above supply function $h^*(w, \sigma + G)$ and $s^*(\omega + \sigma + G)$ the parent of a child with productivity w maximizes

$$V_1 = (I - G) + \pi \ln(w_0 h^*)$$

or

$$V_2 = \ln(I - G) + \pi \ln s^*.$$

This yields two supply functions G_1^* and G_2^*, depending on whether $\omega \lesseqgtr \omega_0$:

$$G_1^* = Max\left[0, Min\left(\frac{\pi I - \omega - \sigma}{1+\pi}, \frac{\omega}{\beta} - \sigma\right)\right]$$

and

$$G_2^* = Max\left[0, \frac{\pi I - \omega - \sigma}{1+\pi}\right].$$

We also have two indirect utility functions:

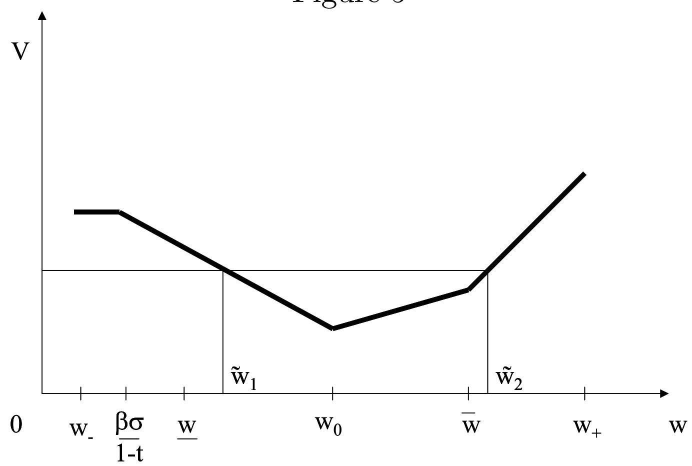
$$V_1^* = V_1^*\left(\underset{-}{\omega}, \underset{+}{\sigma}\right)$$

and

$$V_2^* = V_2^*\left(\underset{+}{\omega}, \underset{+}{\sigma}\right).$$

The values of $m\,(= \omega_0 h$ or $s)$, G and V can be represented as seen above along the w-axis. With the logarithmic functions and assuming away private insurance and public nursing, the utility of the parent first declines and than increases as in Figure 5.

Figure 5



When $G^* > 0$, $c < d$. For $\underline{w} < w < \bar{w}$, $G^* = G_1^* = G_2^* = \dfrac{\pi I - w - G}{1+\pi}$ yielding

$$c_1^D = c_2^D = \frac{\pi}{1+\beta}\frac{w+\sigma+I}{1+\pi} < d = I - G^* = \frac{w+\sigma+I}{1+\pi}.$$

We also have $d > c^N = w + G = \dfrac{\pi\left(I+w\right)-\sigma}{1+\pi}$. This result is useful in order to understand the equity implications of intergenerational transfers.

We have adopted a value of I sufficiently high to lead to some exchange-based gift G or to buy some private insurance. We also consider below the case where I is rather low, so low that there is no gift nor LTC private insurance.

3.3 Parent's choice with private insurance and public nursing home

As seen above, the parent can opt for a public nursing home or for a private insurance in case of bad health instead of relying on family assistance. This choice concerns parents with children having a productivity around w_0. Depending on the available instruments the parents will choose either one or the other. In other terms, the choice is dichotomous.

We have seen that private insurance is chosen when children have a productivity belonging to interval $(\hat{w}_1, \hat{w}_2)$. With a subsidy equal to τ, the optimal value of a is given by

$$a^* = \frac{I}{\theta (1+\pi)(1-\tau)}$$

and the parent's utility in regime 3 is:

$$V_3 = (1+\pi)\ln I - \pi \ln \theta (1-\tau) - B.$$

The threshold values $\hat{w}_1$ and $\hat{w}_2$ are given by $V_3 = V_1^*(\hat{w}_1, \sigma)$ and $V_3 = V_2^*(\hat{w}_2, \sigma)$. For low value of θ or low value of I, the interval $(\hat{w}_1, \hat{w}_2)$ can be empty.

By equation

$$V_3(\tau) = V_i((1-t)\hat{w}, \sigma) \qquad i = 1, 2$$

we have

$$\hat{w}_1 = \frac{1}{1-t}\varphi_1(\underset{+}{\sigma}, \underset{-}{\tau}) \text{ and } \hat{w}_2 = \frac{1}{1-t}\varphi_2(\underset{-}{\sigma}, \underset{+}{\tau}),$$

which yields:

$$n_3 = F(\hat{w}_2) - F(\hat{w}_1) = n_3(\underset{?}{t}, \underset{-}{\sigma}, \underset{+}{\tau}).$$

The effect of t on n_3 is ambiguous. Indeed $(1-t)^2 \dfrac{\partial n_3}{\partial t} = F'(\hat{w}_2)\varphi_2 - F(\hat{w}_1)\varphi_1$. With a uniform density, given that $\varphi_2 > \varphi_1$, the number of parents purchasing the private insurance increases with the tax rate, namely $\partial n_3/\partial t > 0$.

We now denote by the number 4 the regime wherein children don't help their dependent parents when they choose public nursing. It is bounded by

$\tilde{w}_1$ and $\tilde{w}_2$ which we now define. These threshold values are given by the two equalities:

$$V_1^* (\tilde{w}_1, \sigma) = V_4 (g) = \ln I + \pi \ln g$$

and

$$V_2^* (\tilde{w}_2, \sigma) = V_4 (g) .$$

Again there are values for g that are so low that the parent would never choose to go to the public nursing home. This is clear in Figure 5.

From the equalities $V_1 = V_4 (g)$ and $V_2 = V_4 (g)$, we can write:

$$\tilde{w}_1 = \frac{1}{1-t} \psi_1(\underset{+}{\sigma}, \underset{+}{g}) \quad \text{and} \quad \tilde{w}_2 = \frac{1}{1-t} \psi_2(\underset{-}{\sigma}, \underset{+}{g}) > \tilde{w}_1.$$

We denote by n_4 the fraction of parents opting for the public nursing home.

$$n_4 = F (\tilde{w}_2) - F (\tilde{w}_1) = n_4(\underset{?}{t}, \underset{-}{\sigma}, \underset{+}{g}).$$

As for n_3 the effect of t on n_4 is ambiguous in general but $\partial n_4/\partial t > 0$ if w is uniformly distributed. With a uniform density, given that $\psi_2 > \psi_1$, the number of dependent parents going to nursing homes increases with the tax rate.

The choice between g and a, public nursing and private insurance, is dichotomous. Public nursing is preferred over private insurance if:

$$V_4(\underset{+}{g}) = \ln I + \pi \ln g > V_3(\underset{+}{\tau}) = (1 + \pi) \ln I - \pi \ln \theta (1 - \tau) - B$$

or

$$g > \hat{g}(\underset{+}{\tau}) \equiv \frac{I}{\theta (1 - \tau) (1 + \pi)^{\frac{1+\pi}{\pi}}}.$$

Note the difference between the two ways of financing long term care: g is paid by the young generation whereas a is paid by the parent himself. Note also that when $g > \hat{g} (\tau)$, $\tilde{w}_1 < \hat{w}_1$ and $\tilde{w}_2 > \hat{w}_1$.

3.4 The revenue constraint

The government collects a proportional tax on children's earnings, and uses it to finance both subsidies as well as nursing homes. As seen above, with only one value of I, τ and g are mutually exclusive. Also, it is not impossible that τ or σ turn to be negative. The subsidy is then a tax.

To keep the presentation simple, we keep the assumption of a unique value of I and distinguish the two regimes: private insurance and public nursing.

We start with private LTC insurance. Then the revenue constraint becomes

$$\varphi(t,\sigma,\tau) = t\bar{y} - \pi(1-n_3)\sigma - n_3\tau\theta a^*$$

where

$$\bar{y}(1-\pi)\bar{w} + \pi\int_{w_-}^{\hat{w}_1} w(1-h^*)\,dF(w) + \pi\int_{\hat{w}_2}^{w_+} w dF(w).$$

In this expression $\bar{y}$ and $\bar{w}$ are respectively average income and average wage; h^*, $\hat{w}_1$, and $\hat{w}_2$ are n_4 functions of policy tools. The labor supply of workers with productivity higher than $\hat{w}_2$ is 1. That of workers with productivity lower than $\hat{w}_1$ is $1-h^*$ or 1, depending on whether or not their parents are dependent.

Turning to public nursing ($g > \hat{g}$), let us introduce the parameter q that reflects the cost of providing nursing home services. We expect that $q > 1$, which implies some inefficiency. The revenue constraint can be written as

$$\varphi(t,\sigma,\tau) = t\bar{y} - \pi(1-n_4)\sigma - n_4 qg$$

where $\bar{y}$ is defined as above replacing $\hat{w}_i$ by $\tilde{w}_i$.

4 Optimal policy

4.1 Unconstrained first-best

As a benchmark, we first consider the resource allocation that a social planner would implement if he had perfect information and full control of the economy. The objective that we find appropriate is the sum of individual utilities, after removing the altruistic component from the children's utility. In other words we consider the following social welfare function:

$$\begin{aligned} SW &= \int_{w_-}^{w_+} \left\{\pi\left[u\left(c^D\right) + v\left(d^D\right) + H(m)\right]\right. \\ &\quad \left. + (1-\pi)\left[u\left(c^N\right) + v\left(d^N\right)\right]\right\} d\ F(w). \end{aligned}$$

This view is not properly utilitarist. Yet if we were adding individual utilities, this would amount to weighting the welfare of the elderly people by $(1+\beta)$ and not by 1.[6]

Long term care can be supplied using the most efficient technology. First, the least productive workers would devote all their available time to long

[6] See on this Hammond (1997), Cremer and Pestieau (2001).

term care not only of their own parents, but also of those of others. If it is not enough, additional resources, denoted by T, would be devoted to long term care in the same way as s, namely, with a unitary productivity. In other words, the resource constraint is equal to:

$$\pi m = \int_{w_-}^{w_0} w \; dF(w) + T$$

and

$$c + d = \int_{w_0}^{w_+} w \; dF(w) - T$$

or

$$\pi m = \int_{w_-}^{\breve{w}} w \; dF(w)$$

and

$$c + d = \int_{\breve{w}}^{w_+} w \; dF(w)$$

where either T or $\breve{w}$ depends on m.

Maximizing SW subject to these constraints implies the equality $u'\left(c^D\right) = v'\left(d^D\right) = u'\left(c^N\right) = v'\left(d^N\right) = H'(m)$.

Decentralizing such a first-best optimum calls for a much richer assortment of tools than those used here. On the production side, one would need a market for long term care services that would be open to workers with productivity below w_0. One would also need individualized transfers allowing for redistribution across individuals, between the two generations and between the two states of nature.

4.2 Second-best optimality

We now turn to a second-best setting with imperfect information and restricted policy tools: namely linear taxation, lump-sum, but conditional subsidies and public nursing homes. We keep in mind that public nursing homes and private insurance are mutually exclusive. The former dominates the latter if $g \geqslant \hat{g}$. In other words, we can have a partition of the interval (w_-, w_+) either in the three subintervals $(w_-, \tilde{w}_1)$, $(\tilde{w}_1, \tilde{w}_2)$, $(\tilde{w}_2, w_+)$ if public nursing prevails or the three subintervals $(w_-, \hat{w}_1)$, $(\hat{w}_1, \hat{w}_2)$, $(\hat{w}_2, w_+)$ if private insurance happens to be more attractive $(g < \hat{g})$.

To discuss second-best policies, we focus on alternative pairs of instruments. For example, we start by looking at the optimal values of t and σ with private insurance (thus $\tau = g = 0$).

4.2.1 Combination t and σ

When the only available instruments are σ and t, we write the problem of the government with the following Lagrangean expression.

$$\begin{aligned}\mathcal{L} &= \int_{w_-}^{\hat{w}_1} (\bar{u}_1 + V_1)\, dF(w) + \int_{\hat{w}_1}^{\hat{w}_2} (u_3 + V_3)\, dF(w) + \int_{\hat{w}_2}^{w_-} (\bar{u}_2 + V_2)\, dF(w) \\ &\quad -\mu\left[(1-n_3)\,\pi\sigma - t\bar{y}\right]. \qquad (1)\end{aligned}$$

where the $\bar{u}_i$ denotes the child's utility net of the altruistic component:

$$\bar{u}_1(w) = \pi u\left(w(1-t)(1-h^*(w(1-t), G_1^*+\sigma) + G_1^*+\sigma\right) + (1-\pi)\, u\left(w(1-t)+G_1^*\right))$$

$$\bar{u}_2(w) = \pi u\left(w(1-t)+G_2^*+\sigma - s\left(w(1-t), G_2^*+\sigma\right)\right) + (1-\pi)\, u\left(w(1-t)+G_2^*\right)$$

$$u_3 = u\left(w(1-t)\right).$$

The FOC for the social optimum can be expressed in compensated terms as:

$$\frac{\partial \mathcal{L}^c}{\partial t} = \frac{\partial \mathcal{L}}{\partial t} + \frac{\bar{y}}{\pi(1-n_3)}\frac{\partial \mathcal{L}_1}{\partial \sigma},$$

where the superscript c denotes the fact that the change in both t and σ must respect the budget constraint. After a few manipulations we obtain the following formula for t:

$$\begin{aligned}-\mu\frac{\partial \bar{y}^c}{\partial t}t &= \left(\int_{w_-}^{\hat{w}_1} + \int_{\hat{w}_2}^{w_+}\right)\left[\pi(1-\beta)\,H'\frac{\partial m^c}{\partial t} + (\bar{u}'-v')\frac{\partial G^c}{\partial t}\right] dF \\ &\quad -\{cov\left(Eu'(c), y\right) + \sum_{j=D,N}\pi_j cov\left(u'\left(c^j\right), y^j\right)\} \\ &\quad +\left\{\hat{\Delta}_1\frac{d\hat{w}_1^c}{dt} - \hat{\Delta}_2\frac{d\hat{w}_2^c}{dt}\right\} \\ &\quad +\left\{Eu'(c^D/w \leqslant \hat{w}_1, w \geqslant \hat{w}_2) - Eu'(c)\right\}\bar{y} + \mu\pi\sigma\frac{\partial n_3^c}{\partial t}. \qquad (2)\end{aligned}$$

To interpret (2) we consider each of its components. On the LHS, besides the tax rate, we have $\mu\,(>0)$ the shadow price of public funds and $\frac{\partial \bar{y}^c}{\partial t}$ which represents the traditional efficiency terms. It is negative as both the tax on earnings and the subsidy tend to foster h and thus to discourage market labor supply. On the RHS we first have the two effects of our tax-transfer on child's assistance and parental gift, if any. It is indeed important to realize that even when parents don't have enough resources to buy a family or a market insurance, formula (2) remains valid. The role of β is important. When $\beta = 1$, both social planner and children have the same view of parents' utility and thus there is no reason to use tax-transfer to modify the level of assistance.

Using the logarithmic example, we see that $\frac{\partial m^c}{\partial t} > 0$ for $w < Max\left[w_0, \bar{y}/\pi\right]$, whereas $\frac{\partial G^c}{\partial t} < 0$ for $w < \bar{y}/\pi\left(1-n_3\right)$. If the majority of children have a low productivity, below w_0 and $\bar{y}/n$, the term $\frac{\partial m^c}{\partial t}$ is positive and will push for a positive tax if $\beta < 1$. Under the same circumstances (a majority of children with low productivity) the effect of the tax-transfer on gifts that are narrowing the gap between the marginal utilities of children and parents ($\bar{u}' - v' > 0$ when $G > 0$) is negative and this rather pushes for a negative or at least a lower tax.

We now turn to the covariance terms. They concern the consumption of children and their income. The first one is the covariance between groups of children with and without dependent parents and the second ones are the within group covariances. They are all expected to be negative and clearly push for a higher tax-transfer.

The third term of the RHS gives the effect that the tax transfer (t, σ) combination has on the bounds $\hat{w}_1$ and $\hat{w}_2$, each being weighted by the change in utility the child incurs going from one regime to another:

$$\hat{\Delta}_1 = \bar{u}_1\left(\hat{w}_1\right) - u_3\left(\hat{w}_1\right) \quad \text{and} \quad \hat{\Delta}_2 = \bar{u}_1\left(\hat{w}_1\right) - u_3\left(\hat{w}_2\right).$$

It can be shown that $\hat{w}_1^c$ is increasing in t whereas the sign of $d\hat{w}_2^c/dt$ is ambiguous. Note that *ceteris paribus*, increasing the tax rate raises $\hat{w}_2$, but compensated increase in the subsidy σ works in opposite direction. With our log functions, we can also see that $\hat{\Delta}_1$ decreases with w and $\hat{\Delta}_2$ increases with it. In the following, we assume $d\hat{w}_2^c/dt < 0$, $\hat{\Delta}_1 > 0$ and $\hat{\Delta}_2 < 0$, which seems to be plausible. Then the third term of the RHS of (2) is positive and thus pushes for a higher tax and subsidy.

The fourth term of the RHS concerns the difference between the conditional expected utility of children assisting their parents and the expected utility of all children. We normally expects this term to be positive as children helping their parents have a lower disposable income than those having the same productivity but healthy parents. Finally, there is the fifth term pertaining to the cost of financing the subsidy to $\pi\left(1-n_3\right)$ parents. If as assumed $\frac{\partial n_3^c}{\partial t} > 0$, this term is positive and induces a higher tax and subsidy.

To conclude, with our assumption on $\hat{\Delta}_i$ and $\hat{w}_i$, the last four terms are positive. The first term sign depends on the distribution of w. It is interesting to see what formula (2) would become if we assume that I is so low that G and n_3 vanishes. In that case the third and fifth term of the RHS of (2) disappear as well as $\dfrac{\partial G^c}{\partial t}$. The case for a positive tax-transfer increases particularly if most children have a productivity below w_0. We summarize the message of this subsection with a proposition.

Proposition 2 *When the instruments are restricted to a flat tax on earnings and a subsidy on children's assistance, the level of both the tax and the subsidy is likely to be high when parents have a low endowment and when the majority of children have a productivity below w_0.*

We are now going to analyze the incidence of additional instruments. We will see that formula (2) will not basically change, but for the last two terms of the RHS. The fourth term represents the effect of the additional instrument on the individuals' welfare and the fifth term the cost that it implies.

4.2.2 Combination t and τ

We now consider the idea of subsidizing private LTC insurance with an earning tax. Note that all the compensated terms of the tax formula so modified must be adjusted:

$$\frac{\partial \mathcal{L}^c}{\partial t} = \frac{\partial \mathcal{L}}{\partial t} + \frac{\bar{y}}{n_3 a^*}\frac{\partial \mathcal{L}}{\partial \tau}.$$

The optimal formula is equal to (2) in which the last two terms of the RHS are replaced by:

$$+\left[v_3' - Eu'(c)\right]\bar{y} - \mu\left[\frac{\bar{y}}{a^*}\frac{\partial a^*}{\partial \tau} + \pi\left(\tau\theta a^* - \sigma\right)\frac{\partial n_3^c}{\partial t}\right].$$

The first term reflects the redistributive effect of the tax-transfer which transfer resources from the workers to the parents benefiting from an LTC insurance. One may reasonably expect that this term is negative: parents with enough resources to make gifts and buy a LTC insurance tend to have a higher disposable income than their children. The second term represents the budgetary cost of the subsidy. If a^* increases as one might expect we have a depressive effect on both instruments. In the same line, if the tax-subsidy increases the number of insurees and if the per unit insurance subsidy cost more than the subsidy granted to children, one has another depressive effect on both instruments.

4.2.3 Combination t and g

We now look at the case when public nursing prevails over private insurance ($g > \hat{g}$). Compared to the two previous cases, we now have threshold values of w equal to $\tilde{w}_1$ and $\tilde{w}_2$ and $n_4 = F(\tilde{w}_2) - F(\tilde{w}_1)$. The optimal tax formula is given by (2) in which the last two terms of the RHS are replaced by:

$$+\left[H'(g)/q - Eu'(c)\right]\bar{y} - \mu\pi(qg - \sigma)\frac{dn_4^c}{dt}.$$

In this case the revenue constraint implies that the compensated change in g becomes $dg/dt = \bar{y}/n_4\pi q$. As above, the first term pertains to some intergenerational redistribution from children to parents using public nursing. The second term pushes for less taxes and less public nursing if these instruments increase n_4 and if per unit public nursing costs more than assistance subsidy.

In the second best optimum, either private insurance subsidy or nursing home is chosen. The two policy instruments are mutually exclusive. To see this, define the value $\bar{\tau}$ that equates the government spending between the two policies:

$$E_3 \equiv \pi(1 - n_3)\sigma + n_3\bar{\tau}\theta a^* = E_4 \equiv \pi(1 - n_4)\sigma + n_4\pi q g(\bar{\tau})$$

where $g = \hat{g}(\tau)$ yields $V_3(\tau) = V_4(g)$. Note that we have $n_3 = n_4$ when the parents are indifferent between the private insurance and the public nursing home. After substitution we obtain:

$$\bar{\tau} = \frac{q}{\theta}\left[\frac{1}{1+\pi}\right]^{1/\pi}. \tag{3}$$

Consider the private insurance subsidy that is optimized at τ^* alongside with other policy instruments t and σ given $g = 0$. If τ^* is larger than $\bar{\tau}$, switching from the optimal insurance subsidy to public nursing at $g = \hat{g}(\tau^*)$ implies less public spending and thus raises social welfare. Social welfare will be further enhanced by optimizing g so that g^*. Consequently g^* dominates τ^* when $\tau^* > \bar{\tau}$. The opposite is verified if τ' is such that $g^* = \hat{g}(\tau')$ is less desirable than $\bar{\tau}$.

4.3 Parents with different endowments

Up to now we have assumed that parents have some resources I, the same for all, that were high enough for some of them to *ex ante* "buy" the assistance of their children in case of dependence and for others to purchase a private

LTC insurance. It was acknowledged that if I were low enough, parents would not make any transfer to their children and some of them, those who receive little family assistance, would use public nursing facilities.

We now consider the case where there are two levels of parental endowment, I_H and I_L with $I_H > I_L$. In the present context, the insurance subsidy and the public nursing home may not be mutually exclusive but can be used as a device to separate the two types of family.

Using the logarithmic utility, we define $\hat{g}^j$, $(j = H, L)$, such that

$$V_3^j(\tau) = V_4^j\left(\hat{g}^j\right)$$

or

$$(1+\pi)\ln I^j + \pi \ln \frac{1}{1-\tau} + \pi \ln \frac{1}{\theta} + B = \ln I^j + \pi \ln \hat{g}^j.$$

From this equality we derive the function $\hat{g}^j(\tau)$:

$$\hat{g}^j = I^j \left[\frac{1}{1-\tau}\frac{1}{\theta}\right]\left(\frac{1}{1-\pi}\right)^{\dfrac{1+\pi}{\pi}}.$$

When $V_3 = V_4$, total spending by the government with τ or g is generally not equivalent. In other words, subsidizing private insurance can be cheaper or more expensive than providing nursing. The value of τ for which such equivalence would hold is given by (3).

On Figure 6 the dotted vertical line represents the value of $\bar{\tau}$: to the right of $\bar{\tau}$ public spending is higher with a subsidy on private insurance and to the left of $\bar{\tau}$, this is other way around.

The two functions defining $\bar{\tau}$ and $\hat{g}^j$ $(j = L, H)$ partition the (g, τ) plane in four areas. Note that $\bar{\tau}$ is independent of I. This partitioning can be useful to compare the desirability of g^* and τ^*, the optimal values of those two parameters obtained through separate optimization.

If we have just one value for I, we can consider the value of τ^* and for this value we derive the value of g that makes $V_3 = V_4$: $g = g(\tau^*)$. If τ^* is larger that $\bar{\tau}$, switching from the optimal insurance subsidy to public nursing at $\hat{g} = g(\tau^*)$ implies less public spending and thus raises social welfare. Social welfare will be further enhanced by optimizing g so that $g = g^*$. Consequently g^* dominates τ^* when $\tau^* > \bar{\tau}$. The opposite is verified if τ^* is smaller than $\bar{\tau}$.

We now introduce explicitly our two levels of I. Note that if I_L is low enough it is possible that parents cannot afford leaving any gift G to their children. This implies a simple way to express both V_1^L and V_2^L.

Figure 6

Public care versus private insurance with I_L and I_M

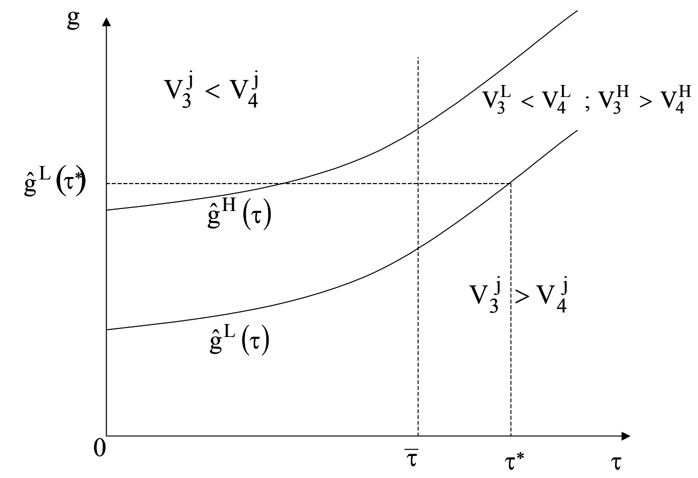


Figure 6 can be used to show when it might be desirable to have a subsidy τ for the rich parents and public nursing g for the poor parents. Consider that there is only the insurance subsidy which is optimized at τ^*; τ^* is granted for both the rich and the poor parents *ex ante*. Suppose that the optimal subsidy τ^* is to the right of $\bar{\tau}$ where $\bar{\tau}$ is as defined in 4.2 and is applied to each type of the parents. It is straightforward to see that $\bar{\tau}$ is independent of I and in figure 6, it is represented by the dotted vertical line. Then, choose the value of g given by $\hat{g}^L(\tau^*)$. If we give this amount of public care to the $n_3^L \left(= n_4^L\right)$ poor parents, nothing changes except that there are some available resources, which increase social welfare. It is of course important to make sure that the rich parents are not going to be tempted to use public nursing as well. For that, it suffices that they are better off with τ^* than with $\hat{g}^L(\tau^*)$. This is the case given that $\hat{g}^L(\tau^*) < \hat{g}^H(\tau^*)$. The welfare is further enhanced by optimizing g and τ subject to the self selection constraints such that the poor prefers g and the rich chooses the subsidy.

We have thus shown that self-selecting the two types of parents can be part of the optimal policy of the social planner. To be complete, we should look for the optimal values of t, σ, τ and g with and without self-selection. This problem is rather complex and outside the scope of the present paper. We conclude this section by a proposition.

Proposition 3 *When parents have different endowments, it might be socially desirable to choose the policy instruments in a way that induces rich* *parents to buy private insurance and poor parents to resort to public nursing. This separating solution is more likely when there is a wide difference in parental endowment.*

5 Concluding remarks

The purpose of this paper was to design an optimal tax transfer policy for long term care. The setting is relatively simple. Each elderly person has an altruistic child who will help him in case of loss of autonomy. Help can be of two types: time for low productivity children, cash for high productivity children. To foster help from their children parents can *ex ante* make a gift to their children. The government can subsidize children's assistance. But it can also directly provide the services of nursing homes. Parents of middle productivity children tend to rely on nursing homes, but in that case they don't give anything to their children. Private insurance appears to be a substitute for public nursing homes, but not for children's assistance.

The case of public nursing is quite strong, particularly when private long term care insurance is inefficient. The case of subsidy for either type of assistance is not clear. For redistributive reason, a scheme of tax-subsidy is desirable as it narrows down some differences in consumption. At the same time, it can have undesirable effects on some type of assistance and on the level of *inter vivos* gifts. To clear this ambiguity one has to know more about the distribution of w, the level of I and the concavity of the utility function.

Two questions can be raised in conclusion. Is it realistic? Is it not too simplistic? The two questions are naturally related. The issue of LTC is a complex one; it involves three institutions, the family, the market and the government and it comprises several informational difficulties. In this paper, we have introduced a number of assumptions and simplifications that we now discuss.

First, we adopt a very restrictive view of intergenerational transfers within the family: children help their dependent parents and parents make *inter vivos* gifts to foster such a help. We are aware that the bulk of parental transfers are of a different kind. *Inter vivos* gifts and notably education are motivated by altruism. Some bequests are also altruistic even though for most people they seem to be rather unplanned.[7] To keep the analysis simple, we just consider *inter vivos* gifts based on an insurance motive: they foster transfers that will be made in case of dependency when parents find them more attractive than public nursing or private insurance. In that respect,

[7] Cremer and Pestieau (2006) for a survey of theoretical motives of bequests and Arrondel *et al.* (1998) for a survey of the empirical evidence. See also Gale *et al.* (2000).

they differ from gifts made by parents to shape their children's preferences.[8] To conclude on this point, most of our analysis would be valid if we were assuming away such transfers.

In the literature on LTC, the psychological dimension is important.[9] In this paper we take the view that contingent subsidies of rate σ foster altruistic assistance to dependent parents. This is at odds with the view held by psychologists and sociologists for whom such subsidies (*extrinsic motivation*) can be counterproductive because they undermine the *intrinsic motivation.* This alternative view that implies a crowding-out of altruistic behavior by extrinsic incentive would lead to different results, particularly regarding the desirability of a subsidy on child's assistance. If, for example, there is full crowding out, the government should not use any subsidy and focus on the provision of public nursing and on subsidizing private insurance. Note that not only public subsidy, but also parental gifts could put off children to provide altruistic care. Clearly, this question though important is outside the scope of this paper.

The gender issue is also important. Daughters and daughters-in-law seem to be more involved in assisting dependent parents than sons. Also long term care has a huge impact on aiding persons who most often have a costly and painful aftermath. These dimensions are assumed away even though we aknowledge their importance.

Another crucial assumption is that the different types of care are mutually exclusive and that the two types of assistance by children are additive. These assumptions were made for reasons of simplicity. For example, if assistance in time and in money were not additive but complementary, we would not get a U-curve for both m and V as sharp as the one presented in this paper. It remains that the idea that less productive children provide more time and less financial assistance than more productive children seems quite realistic.

In this paper we assume that each parent has a child and that the child is ready to help him in case of dependency. This is questionable for various reasons. Some parents don't have children; all children are not altruistic; in many cases the aiding person is the spouse and not the child and among children, daughters appear to be more aiding than sons. Again we made this assumption to keep the model as simple as possible. Introducig non altruistic children would not be too complicated; it would extend the range of parents purchasing private insurance or using public nursing. In this case we are faced with a moral hazard problem if altruism cannot be observed (see Jousten *et al.* (2005)). Another difficulty that we have assumed away

[8] Cox and Stark (2005).

[9] See on this Benabou and Tirole (2003, 2005).

is that loss of autonomy may not be observable. This leads to another moral hazard problem as it is tempting for healthy parents to mimick unhealthy parents. Again this would add an additional constraint to the design of an optimal tax-transfer scheme.

References

[1] Arrondel, L., A. Masson and P. Pestieau, (1997), Bequests and inheritance: empirical issues and French-US comparison, in G. Erreygers and T. Vandevelde (eds), *Is Inheritance Legitimate?*, Springer-Verlag, Berlin, 89-127.

[2] Benabou, R. and J. Tirole, (2005), Incentives and prosocial behavior, IZA DP n° 1695.

[3] Benabou, R. and J. Tirole, (2003), Intrinsic and extrinsic motivation, *Review of Economic Studies*, 70, 480-520.

[4] Cox, D. and O. Stark, (2005), On the demande for grandchildren: tied transfers and the demonstrations effect, *Journal of Public Economics*, 89, 1665-97.

[5] Cremer, H. and P. Pestieau, (2001), Non linear taxation of bequests, equal sharing rules and the trade-off between intra- and inter-family inequalities, *Journal of Public Economics*, 79, 35-54.

[6] Finkelstein, A. and K. McGarry, (2004), Multiple dimensions of private information: evidence from the long-term care insurance market, unpublished.

[7] Gale, W., J. Hines and J. Slemrod, eds, (2000), *Rethinking Estate and Gift Taxation*, Brookings Institution, Washington D.C.

[8] Hammond, P., (1987), Altruism, in *The New Palgrave: a Dictionary of Economics*, J. Eatwell, M. Milgate and P. Newman (eds), Macmillan, 85-86.

[9] Ioannides, Y. and K. Kan, (2000), The nature of two directional intergenerational transfers of money and time. An empirical analysis, in Gérard-Varet, L-A., S.Ch. Kolm and J. Mercier-Ythier (eds), *The Economics of Reciprocity, Giving and Altruism*, Mac Millan, London, International Economic Association, ch. 18.

[10] Jousten, A., B. Lipszyc, M. Marchand and P. Pestieau, (2005), Long term care insurance and optimal taxation for altruistic children, *FinanzArchiv, 61, 1-18.*

[11] Pauly, M.V., (1996), Almost optimal social insurance of long-term care, in *Long-Term Care: Economic Issues and Policy Solutions*, R. Eisen and F. Sloan (eds), Kluwer Academic Publishers, 307-329.

[12] Pauly, M.V., (1990), The rational non-purchase of long term care insurance, Journal of Political Economy, 98, 153-168.

[13] Pestieau, P. and M. Sato, (2006), Long term care: the State and the family, *Annales d'Economie et de Statistique*, (forthcoming).

[14] Pestieau, P. and M. Sato, (2004), Long term care: the State, the market and the family, CORE DP 2004/82.

[15] Prouteau, L. and F-Ch. Wolff, (2003), Les services informels entre ménages: une dimension méconnue de bénévolat, *Economie et Statistiques*, 336, 3-31.

[16] Sloan, F., H. Zhuang and J. Wang, (2002), Upstream intergenerational transfers, *Southern Economic Journal*, 60, 363-380.

[17] Zissimopoulos, J., (2001), Resource transfer to the elderly: do adult children substitute financial transfer for time transfer?, Labor and Population Program, WP 01-05, Rand.

[18] Zweifel, P. and W. Struwe, (1998), Long-term care insurance in a two-generation model, *The Journal of Risk and Insurance*, 65, 13-32.