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To cite this version:

Edouard Augustin Ribes. How does education influence individuals' use of bequests as a long-term care insurance?. [Research Report] PLPSOFT; Mines Paristech. 2021. hal-03498481

HAL Id: hal-03498481

https://hal.science/hal-03498481v1

Submitted on 21 Dec 2021

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How does education influence individuals' use of bequests as a long-term care insurance?

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December 21, 2021

This paper proposes a simple economic model describing retirees' use of bequests. The model assumes that retirees need long term care and have preferences regarding the source of this support. Support can either be bought from the market (at a fixed rate) or sourced from within their family and compensated through bequests.
When calibrated, the model shows that for individuals to get at least 1h of daily care, they must, independently of their education level, save about 20% of their pension in the early years of their retirement. However, differences in the source of support appear between non educated and educated households. It is indeed much easier to get support from family members in non-educated households compared to educated ones.
Those results suggest that non educated households are also less likely to contract financial insurance products for long term care as they can easily leverage informal arrangements (i.e. their family).
Keywords. Bequests; Inheritances; Intergenerational transfers; Wealth inequalities; Wealth management

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1 Introduction

Mature societies are currently experiencing a rapid and drastic shift in their demographic structure. For instance, the U.N department of economic and social affairs forecasts that across Europe and North America, there will be almost as many "retired" individuals (i.e. aged 65+) than "active" ones (i.e. aged 20 - 64) by 2050.

While this raises macro/society level concerns, for instance around public as well as private pensions (Ribes, 2021) and healthcare systems funding, the academic community found out two decades ago that, at an individual (i.e. micro-economic) level, ageing also triggers some interesting and unexpected shifts. Retirees indeed display consumption and savings patterns which, not only differ from the ones of active workers, but also from the classical theory around wealth decumulation (Ando and Modigliani, 1963; Yaari, 1965) which is assumed to structure the latter part of the human lifecycle. Those effects have been dubbed as the retirement consumption (Hurd and Rohwedder, 2003) and savings puzzles (Banks et al., 1998).

Since then, questions of changes in retirees' consumption patterns have already been thoroughly investigated (Aguila et al., 2011; Velarde and Herrmann, 2014; Olafsson and Pagel, 2018). The community has found that if consumption drops at retirement by about 10 to 20% compared to the consumption of active individuals, this drop is actually mainly explained by changes in food consumption (i.e. retirees tend to prepare their meals at home compared to active workers) given that consumption of durable goods remains unchanged (Browning et al., 2016).

Retirees' savings and investments patterns are yet still the subject of questions. The classical view is that retirees should simply decumulate wealth (Ando and Modigliani, 1963; Yaari, 1965). But recent empirical findings show that retirees keep on saving up to 40% of their annual income (Cheng et al., 2016). Recent findings on that front have highlighted that a significant portion of those savings (about 30% to 50%) could be explained by retirees provisioning behavior towards out of the pocket medical expenses (De Nardi et al., 2010, 2016) . The usage of additional savings is yet still subject to debate.

On this front, a recent avenue of research consists in explaining retirees' savings behavior as an informal insurance mechanism against long term care dependencies (Dobrescu, 2015; Mommaerts, 2015; Dobrescu et al., 2018; Suari-Andreu et al., 2019). Instead of relying on traditional financial and insurance products to ensure that they can buy personal long-term services on the market, 85%+ of retired individuals tend to hoard wealth to incentivize their family members to take care of them (Coe et al., 2015). This wealth is then redistributed as bequests (Ameriks et al., 2020). Note that this recoups this long-standing idea in the academic community that bequests are used as strategic instruments (Bernheim et al., 1986).

However, the use of bequests as a long-term care insurance mechanism is still subject to investigations as recent reviews have shown that it could vary, at an individual level, based on socio economic determinants (Dobrescu et al., 2018; Eling and Ghavibazoo, 2019). This note therefore offers a possible explanation in the form of a model where individuals' human capital (i.e. their education) drives their decision around the use

of bequests. The model is depicted in two sequential steps. First a simple equilibrium model on the strategic use of bequest is proposed and exemplified. Then the model gets built upon and discussed via the introduction of heterogeneity with respect human capital.

2 Bequests as incentives behind informal long term care arrangements:

Individuals generally retire in mature countries around 65 years old. The beginning of their retirement is relatively healthy. But after 10 years (i.e. when they start to reach 75), the accumulation of co-morbidities and the natural decline in physical abilities call for long term support (Himes et al., 2000). This support can come from two sources: it can be bought/contracted on the market (at an hourly cost c_m), via for instance nursing homes, or it can be sourced informally from within the individual's family (whose member earn a wage c_f based on their contribution to the society). Let us assume that when sourcing support from the family the individual must compensate them at their hourly rate for the support provided and that this compensation will come under the form of a bequest.
Similarly to Pauly (1990), assume individuals have preferences when it comes to the source support they benefit from when old. This inclination can be represented through a utility function $u(h_m, h_f)$ which accounts for the benefits individuals get from getting $h_m \geq 0$ hours of support from the market and $h_f \geq 0$ hours of support from their family. Assume that this utility function $u(.)$ has the following form:

$$u(h_m, h_f) = u_0.h_m^{\alpha}.h_f^{\beta} = u_0.(H - h_f)^{\alpha}.h_f^{\beta} \tag{1}$$

Now, rational individuals will have two options to plan for their support needs. In the first case, individuals will have an idea of the level of support they require (i.e. $H \geq 0$ hours) when old and will create a savings plan to meet this need. This will be referred to as "Option 1" throughout this note. On the other hand, if individuals do not really know how much support they need, they can dedicate a portion of their earnings while retired as a contingency and then leverage those savings to get a certain level of support during the latter part of their life. This will be referred to as "Option 2".

2.1 What is happening when individuals have an idea of the long-term care level they need?

When rational individuals have a set support requirement of H hours, the maximization of their utility $u = u_0.(H - h_f)^{\alpha}.h_f^{\beta}$ will entail that they will get a portion $\frac{h_f}{H} = \frac{\beta}{\alpha+\beta}$ of their support needs covered by family members. To fund this, individuals must therefore accumulate an amount of $s = c_m.h_m + c_f.h_f$ savings, where $c_m.h_m = c_m.H.\frac{\alpha}{\alpha+\beta}$ is used to purchase personal support services on the market, whilst $c_f.h_f = c_f.H.\frac{\beta}{\alpha+\beta}$ is used to provision for bequests towards family members.

Example. Let us consider an individual who is now 75 years old and who will live up to 82. The individual has children who earn c_f=75k\$/year (which is equivalent to an hourly rate of c_m=42\$/h). Assume that the individual will need about 1h of support per day for the rest of his/her life (i.e. $H = 2.5$kh). Support can be provided on the market at an hourly cost of c_m=15\$/h. Now, assume that the individual would prefer 50% of his/her care to come from family members (i.e. $\frac{\beta}{\alpha+\beta} = 50\%$). The total savings needed to fund long term care in this instance would then be of s=71k\$ and 52k\$ (73%) of it will be spent on bequests. Assuming the individual retires at age 65 and can save about 10k\$ per year, this could be easily provisioned for.

2.2 What is happening when individuals have no idea of the long-term care level they need?

When individuals have no idea of the support they will need, they can set budget of $s = c_m.h_m + c_f.h_f$ to fund long term care. The maximization of their utility $u = u_0.(\frac{s}{c_m} - \frac{c_f}{c_m}.h_f)^{\alpha}.h_f^{\beta}$ will then entail getting $h_f = \frac{s}{c_f}.\frac{\beta}{\alpha+\beta}$ (resp. $h_m = \frac{s}{c_m}.\frac{\alpha}{\alpha+\beta}$) hours of support covered by family members (resp. by external resources). The total amount of support received $H = \frac{s}{\alpha+\beta}.(\frac{\beta}{c_f} + \frac{\alpha}{c_m})$ is then directly proportional to individuals' savings and negatively influenced by the costs of resources available to provide a level of care. It also depends in individuals' preferences.

Example. Assume that an individual has a budget of $s = 100k\$$ to dedicate to his/her support needs. As in the previous example, children are assumed to earn an hourly rate of $c_m = 42\$$/h while resources outside of the family come at a costs of $c_m = 15\$$/h. Now let's normalize α to 1 and assume individuals want to receive 30% of support from their family, then β=1.5 ($\frac{h_f}{H} = \frac{1}{(1)+\frac{\alpha}{\beta}.(\frac{c_f}{c_m})} \leftrightarrow (\frac{H}{h_f} - 1).\frac{c_f}{c_m} = \frac{\alpha}{\beta}$) . The individual will then get a total of $H = 4.1$kh of support through the rest of his/her life and will have to allocate 52k\$ (or 52% of his/her savings) towards bequest. Assuming that the individual is 75 old and will live up to 82, this represents about 1.6h of support of day.

3 Differences in informal long term care arrangements between educational levels:

The capital stocked by individuals is traditionally assessed in the economic literature around three dimensions: wealth, health & education. Those three dimensions are however heavily interlinked as education plays a notable role in the generation of wealth as well as the preservation of individuals' health stock. The literature has indeed provided ample evidence that more educated individuals not only yield better salaries and accumulate more wealth, but also invest more in their health and benefit from an increased life expectancy as well as an improved quality of life (Grossman, 1999). Given those dependencies it seems logical to extend the previous model to explore the impact of human capital on long term care arrangements.

Assume that individuals can have two levels of human capital: a high level (indexed with the superscript U) if they have gone through university and have benefited from an advanced education or a low level if they have stopped their studies before college (resp. N). Human capital differences then yield differences in terms of:

- Wage: the labor of educated (resp. non) individuals come at a cost c_U (resp. c_N), such that $c_U \geq c_L$
- Life expectancy: educated (resp. non) individuals live E_U years (resp. E_L), such that $E_U \geq E_L$.
- Intergenerational human capital transmission: children are more likely to be educated when their parents are also educated. Calling p_{UU} (resp. p_{UN}) the probability of children to be educated when their parents are educated too (resp. not educated), the following pattern holds true: $p_{UU} \geq p_{UN}$.

When accounting for education related differences, two adjustments to the previous model are required. First, since caring for an individual does not require high educational achievements, the cost of long-term care arrangements on the market can be assumed to follow $c_m = c_N$. Second, the cost of getting care from family members varies depending on the education level of the individual. Highly educated individuals' family members indeed come at an average cost of $c_f = c_N + p_{UU}.(c_U - c_N)$, whilst the family of non-educated ones have an average cost footprint of $c_f = c_N + p_{UN}.(c_U - c_N)$.

3.1 How do individuals react when they know the amount of support they require?

Proposition 1: *An individual of education level $l \in \{N; U\}$ who is aware that he/she will require H hours of support will save an average of:*

$$\forall l \in \{N; U\}; \qquad s_l = H.(c_N + p_{Ul}.(c_U - c_N).\frac{\beta}{\alpha + \beta}) \tag{2}$$

Lemma 1: *To receive the same level of care and with the same level of preferences, educated individuals have to save more than non-educated ones (i.e. $s_N \leq s_U$) since their children have on average a higher cost footprint.*

Example. Assume individuals requires $h = 1$h of support per day as soon as they are above 75 years old and that they have preferences in terms of sources of care which are similar to the example described earlier (i.e. 40% of the support comes through family - $\frac{\beta}{\alpha} = 1.5$). Now, focusing on an U.S example and looking at national statistics provided by the US bureau of labor, educated resources come at an average cost $c_U = 40\$/\text{h}$, while non educated ones have a footprint of $c_f = 20\$/\text{h}$. Additionally, educated individuals tend to live longer than non-educated ones. Assume that non educated individuals live on average up to 82 years, while educated ones up to 87 (as seen on the O.E.C.D databases). Finally, when it comes to family, educated individuals are more likely to have

educated children: $p_{UU} = 0.75$ while $p_{UN} = 0.25$ (Teachman, 1987). As a result, savings related to long term care are worth: $s_U = 4380*(20+0.75*20*0.4) = 4380*26 = 114$k\$, $s_N = 2555 * (20 + 0.25 * 20 * 0.4) = 2555 * 22 = 56$k\$.
Now, assuming a replacement rate of 60% and a 10 year savings horizon corresponding to the period between 65 and 75 years old, educated [resp. non educated] retirees (who then earn 40.3k\$ a year [resp. 20.2k\$/year]) will have to save 28% [resp 27%] of their earnings to get 1 h of daily long term care, 40% of which will come from family members. To assess the robustness of those findings a sensitivity analysis was performed regarding individual preferences regarding the source of long-term care. Associated results, displayed in Figure 1, show that the level of savings required from non-educated individuals displays little variation based on the level of care stemming from family members. However, the same does not hold true for educated individuals. This would suggest that it is much easier for non-educated individuals to secure informal family support than for educated ones. The model also suggests that to get 80% of support from family members (which seems to be the norm across the U.S. (Hendricks, 2001)), average bequests are in the 40 to 50k\$ for non-educated individuals which seems to recoup previous empirical studies of the size of bequests in the U.S. (Gale and Scholz, 1994).

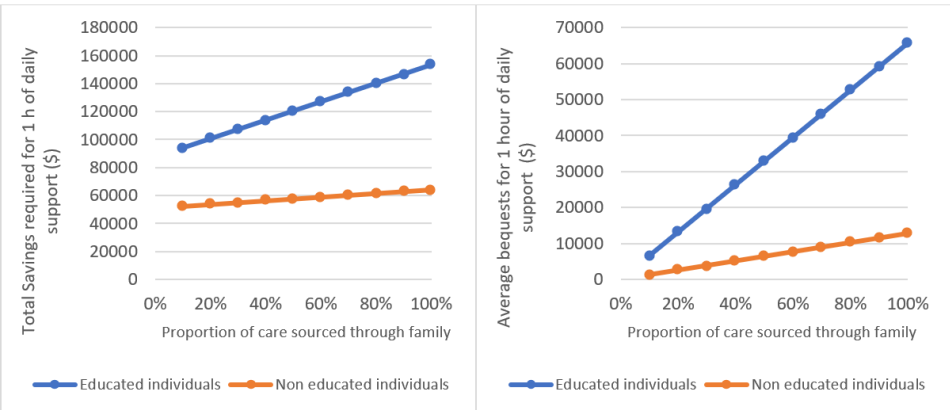

Figure 1: Savings and bequests across educational levels and individuals' preferences

3.2 How do individuals plan format when they think purely in terms of savings?

Proposition 2: *A retiree of education level $l \in \{N; U\}$ who does not know how much support he/she will require but save a portion s of its earnings will receive, on average, a support of:*

$$\forall l \in \{N; U\}; \qquad H_l = \frac{s}{\alpha + \beta}.(\frac{\beta}{c_N + p_{Ul}.(c_U - c_N)} + \frac{\alpha}{c_N}) \tag{3}$$

Lemma 2: *A retiree of education level level $l \in \{N;U\}$ saving an amount s and who whishes to get a portion of support $\frac{h}{H_f}$ from his/her family will have to provision for the following amount in bequests:*

$$\forall l \in \{N;U\}; \qquad B_l = \frac{s}{(\frac{(\frac{H}{h_f}-1).c_N}{c_N+p_{Ul}.(c_U-c_N)}+1} \tag{4}$$

Lemma 3: *With the same amount of savings, educated individuals receive less support from their family than non-educated ones (i.e. $H_N \geq H_U$) since their children have on average a higher cost footprint.*

Lemma 4: *Assuming both educated and non-educated retirees can dedicate the same proportion of their earnings to the preparation of the latter part of their lifecycle, educated retirees only receive more care than non-educated ones if their preferences for family support are such that $H_U \geq H_N$ which translates into the following condition:*

$$\frac{(1+p_{UU}.(\frac{c_U}{c_N}-1)).(1+p_{UN}.(\frac{c_U}{c_N}-1))}{(p_{UN}.\frac{c_U}{c_N}+(1-p_{UU}))} \geq \frac{\beta}{\alpha} \tag{5}$$

Example. Assume individuals can save up to θ=20% of their pension between age 65 and 75, which recoups the original order of magnitude around retirees' savings level empirically witnessed by Modigliani (1988). Also assume that they have preferences in terms of sources of care, costs (i.e. c_U = 40\$/h, c_N=20\$/h), life expectancy (E_U=87;E_N=82) and human capital transmission (p_{UU} = 75%,p_{UN} = 25%) which reflect national U.S statistics described in the previous example. The volume of care individuals can benefit from is then given by H_U = 3.53kh and H_N = 2.45 kh. This means that non-educated (resp. educated) individuals get a total of 1h (resp. 0.8h) of daily care between 75 years old and the rest of their life.
To assess the robustness of the findings associated to this case, a sensitivity analysis was also performed regarding individual preferences in the source of long-term care. Associated results, displayed in Figure 2, first show that, for the same proportion of saving (i.e. 20% of their earnings during the early phase of retirement), educated individuals receive less daily care than their non-educated counterpart as soon as they want to have more than 40% of their support coming from family members. Results also show that the amount of care received by non-educated individuals is relatively stable independently of its source and that the size of bequests from educated individuals planning through savings is 3 to 4 times bigger than bequests from non-educated individuals.

4 Conclusion

Individuals can self-insure their long-term support needs via two methods. On one hand, they can estimate the level of savings needed to receive a certain level of daily support. On the other, they can save a fixed portion of their income in the early stages of retirement and transform it in support when needed. Support can be sourced from

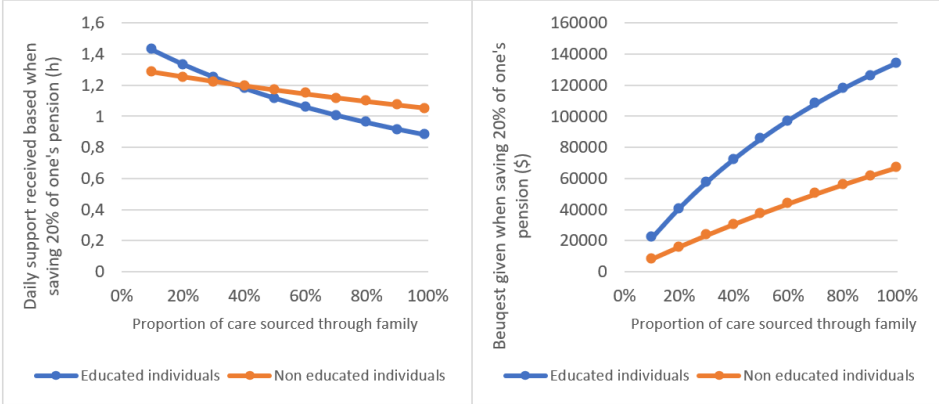

Figure 2: Long care term support bequests across educational backgrounds.

either the market or from the family.
When modeled, both mechanisms indicate that for individuals to get at least 1h of daily care, they must, independently of their education level, save about 20% of their pension in the early years of their retirement. The model also highlights that it is much easier to get support from family members in non-educated households as associated bequests are in the 40-50k$ range compared to educated households where bequests required to get 1h of daily support by family members are closer to 100-120k$. Those results suggest that non educated households are also less likely to contract financial insurance products for long term care as they can easily leverage informal arrangements (i.e. their family).

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