The Link between Parental Longevity and the Human Capital of Their Offspring

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ABSTRACT

We develop an overlapping generations model where adult agents finance the education of their offspring and also undertake certain health expenditures aimed at improving their own longevity. We show that for agents with incomes exceeding a certain threshold value, health expenditure is a necessity, while it is a luxury for others. Another threshold value of income exists such that, for agents with incomes below this value, longevity enhancing health expenditures and the education of offspring are gross substitutes, but are gross complements for agents with incomes above this value. We show that as long as the intertemporal elasticity of substitution is below a particular threshold, a positive association between parental longevity and offspring's human capital is present for all agents in the economy. However, if the intertemporal elasticity of substitution is above this value, there may be a negative association between parental longevity and offspring's human capital for the poorer agents in the economy, with incomes below a certain value. This could translate into a negative link between the expected longevity of parents and their offspring, thereby resulting in intergenerational inequalities in longevity.

Keywords: health expenditures, longevity, education expenditures, human capital

JEL codes: I13, I22, E24, J24

EXTENDED ABSTRACT

Interdisciplinary literature provides evidence of a positive link between parental longevity and the socio-economic status of their children, and attributes this relationship to the possibility that educated offspring can impact the health of their aged parents both directly and indirectly. Direct influence takes the form of expenditures on medication and specialized care undertaken by educated children with the intention of ameliorating the health conditions their elderly parents. Furthermore, educated children are likely to display healthy behaviours, which their parents too may adopt, resulting in an indirect improvement in their potential longevity.

However, in this paper, we propose a different mechanism that could create a link between parental longevity and the human capital of their offspring Firstly, we recognize that investments undertaken by parents on their children's education is a key determinant of children's human capital. We also note that a person's expected lifetime could be affected by certain longevity enhancing health expenditures undertaken by her in adult age. Such expenditures could include regular diagnostic testing, which can help detect certain diseases early, thereby allowing timely treatment to be obtained, and other activities such as nutritional supplementation, regular exercise and healthy eating that can potentially prevent or delay the onset of various diseases.

Hence, we suggest that a link between the human capital of offspring and the longevity of their parents could emerge as a *result* of the decisions make by parents relating to expenditures on educating their children and improving their own longevity. As expenditures on educating offspring and those aimed at enhancing longevity need to be financed out of household income, they can be viewed as elements of spending that compete for a given household budget. This leads to the possibility that higher education expenditure on children may come at the expense of lower longevity enhancing health expenditure by parents, thereby resulting in a possible negative association between the human capital of offspring and the longevity of their parents.

In order to explore this perspective on the link between parental longevity and the human capital of offspring, we develop an overlapping generations model where agents potentially live for three periods: childhood, adulthood and old age. Childhood is spent studying. At the beginning of adult age, the agent gives birth to a single offspring whose education has to be funded by the parent. In addition to educating her child, the adult agent spends her wage income on household consumption, savings to finance old age consumption, and health expenditures aimed at improving her probability of survival into old age. We abstract from physical capital, and assume that the agent's wage is equal to her stock of human capital in adult age, which depends on her parent's human capital and the education she acquired in childhood according to a Cobb Douglas specification with increasing returns to scale. While agents survive during childhood and adulthood for certain, the probability of survival into old age is a strictly concave function in health expenditure. The agent derives utility from consumption and educating her child during adulthood. She also derives utility from her expected consumption in old age, which is the product of her old age survival probability and old age consumption.

Our key results show that for individuals with incomes below a certain threshold value, the income elasticity of demand for health expenditure is above 1, and health expenditure is therefore a luxury good for these agents. On the other hand, agents with incomes exceeding this threshold value consider it to be a necessity. Hence, a given increase in income causes a proportionately higher increase in health expenditure among the poorer agents with health expenditures falling below the threshold value. On the other hand, the health expenditure of the richer agents with incomes exceeding this threshold is less responsive to a rise in income.

We also show that longevity enhancing health expenditure and expenditure on educating offspring are gross substitutes for agents whose incomes fall below a particular threshold value, but for the remaining agents with incomes above this threshold, the two expenditures are complementary. Although we mentioned earlier that longevity enhancing health expenditures and education expenditure compete for a given household budget, this result shows that only the poorer agents in the economy, with income below the threshold value we derive, actually face a trade-off between educating their children and improving their likelihood of living longer. Conversely, with regard to the richer agents with income levels

above this threshold value, as they increase spending on the education of their offspring, they simultaneously undertake more expenditure to enhance their own longevity as well.

We show that as long as the intertemporal elasticity of substitution is below a certain threshold, there is a positive association between expected parental longevity and the human capital of offspring for all agents in the economy. In our model, the utility associated with educating their offspring is realized by adult agents immediately, while expenditures on longevity enhancing health care contribute towards expected utility in old age, which is realized only in the following period. A lower intertemporal elasticity of substitution is associated with greater complementarity between these two types of expenditure and this is captured by an increase in the curvature of the intertemporal utility function. Increased curvature of the intertemporal utility function would cause health care and education expenditures to move in the same direction. However, if the intertemporal elasticity of substitution is above the threshold value mentioned above, for some agents with incomes below a certain value, a negative association between expected parental longevity and the human capital of their offspring may be present. A higher intertemporal elasticity of substitution improves agents' ability to shift expenditures between periods. Hence, this result suggest that, driven by their altruism, the poorer agents in the economy may make use of the greater flexibility created by a higher intertemporal elasticity of substitution to increase expenditures on their children's education whilst foregoing their own expected longevity. As longevity enhancing health expenditures yield them utility in old age, while educating their children provides them with immediate utility, this result suggests that a higher intertemporal elasticity of substitution may encourage the poorer agents in the economy agents to forego future utility in order to improve present utility.

In our model, agents with higher stocks of human capital are able to undertake higher longevity enhancing health expenditures. Consequently, they are able to achieve a higher probability of survival into old age. Hence, this possible negative link between parental longevity and the human capital of their offspring that the poorer agents in the economy experience when the intertemporal elasticity of substitution is high could lead to a negative link between parental and offspring longevity for these agents. The possible emergence of such a negative link between parental and offspring longevity for agents at the lower end of the income

distribution is in contrast to empirical findings which reveal a positive association between parental and offspring longevity arising genetic and behavioural factors. However, in our model, this possible negative association between parental and offspring longevity among the poorer agents in the economy is solely the result of parental decisions relating to expenditures on their children's education and their own health.

A main caveat in our model is that we abstract from behavioural and genetic impacts on longevity. Hence, an obvious extension to our model includes incorporating genetic and behavioural influences into the survival probability. Another extension is considering a reciprocal arrangement where, in return for educating them in childhood, children look after their parents in old age, and thereby influence their health and longevity. The possible non-monotonicity of the relationship between parental longevity and offspring's education revealed in the study can also be investigated using suitable econometric techniques.