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30 Life expectancy and health investments

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- ▶ Life expectancy has a positive causal effect on health investments.
 - ▶ One reason that longer lives do not necessarily imply a longer time spent in poor health is individuals' investments in healthy behaviours.
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30.1 Introduction

During the last 15 years, life expectancy at age 65 in the European Union has increased by 2.2 years, reaching 18.2 years for males and 21.6 years for females in 2016 (source: Eurostat). The steady increase in life expectancy has not yet approached a maximum (Oeppen and Vaupel, 2002); consequently, in the next decades, population ageing is bound to decrease the proportion of individuals in their active life spans and increase the proportion of retirees. This imbalance threatens the sustainability of public health and long-term care programmes. Will population ageing be accompanied by an extended period of good health and a longer working life, or will it be associated with a longer period of morbidity?

Recent empirical evidence (see, e.g., Felder et al., 2010) has in fact shown that proximity to death is a more important determinant of health expenditures than ageing per se because morbidity is compressed at the end of life. However, little is known about the mechanisms behind such a result. An important role in answering this question is played by the adoption of individual health-promoting behaviours, which can be viewed as investments to improve future well-being (Grossman, 1972). How much individuals are willing to invest in health depends on their discount rates or – in other words – on the value of life.

According to standard economic models, expectations of a longer life span may generate an incentive to invest in health to increase the quality of life when old because a longer planning horizon increases returns on investment. However, such expectations might also provide a disincentive to invest in health because the marginal value of additional years of life is lower (Fang et al. 2007).

In this chapter, we investigate the effect of a longer life expectancy on health investments across SHARE countries to provide additional evidence on which of the two channels prevails. Life expectancy is measured as the

subjective probability of living past age 75. The health behaviours we consider are body weight, nutrition, exercise and smoking.

We find a positive bivariate association between life expectancy and health investment. Because healthier individuals are likely to live longer and to invest more in health, we assess the robustness of this result when controlling for health endowment. Additionally, health investments are likely to have a direct effect on life expectancy; therefore, we apply an instrumental variable strategy to provide a causal interpretation of the positive effect of life expectancy on health investments. The results show that life expectancy has indeed a causal positive effect on all measures of investments that we consider. The effect of an increase in the subjective survival probability is especially strong on the probability of not being overweight and of being a non-smoker. A longer life span increases the incentive to invest in health to improve the quality of life when older, with positive consequences for the sustainability of public health systems.

The next section presents data and descriptive evidence. The following section describes the empirical strategy and the last section reports the main findings and conclusions.

30.2 Data and descriptive statistics

We use data on individuals aged 50 to 65 who were interviewed in SHARE Wave 4, Wave 5 and refreshers of Wave 6 because nutrition questions were not asked of panel respondents in Wave 6. We end up with a sample of 16 European countries and 18,097 observations without missing values for the set of variables considered in the analyses. The average age is 58 years and 56 per cent of subjects are females. Life expectancy is given by the answer to the question ‘What are the chances that you will live to be age 75 or more?’ In our sample, the average subjective probability of living past age 75 shows large variability across countries, ranging from values lower than 70 per cent in the Czech Republic, Croatia and Estonia, and higher than 80 per cent in Denmark (see Figure 30.1).

We consider among health behaviours body weight, nutrition, physical activity and smoking. We define a binary variable that takes the value of one when the Body Mass Index is lower than 25, that is, when individuals are not classified as overweight. We measure eating habits using a binary variable that takes the value of one when the individual reports consuming fruits and vegetable daily, as recommended by the World Health Organization (WHO) for a healthy diet. According to the WHO (<http://www.who.int/nutrition/topics/ageing/en/index1.html>), older

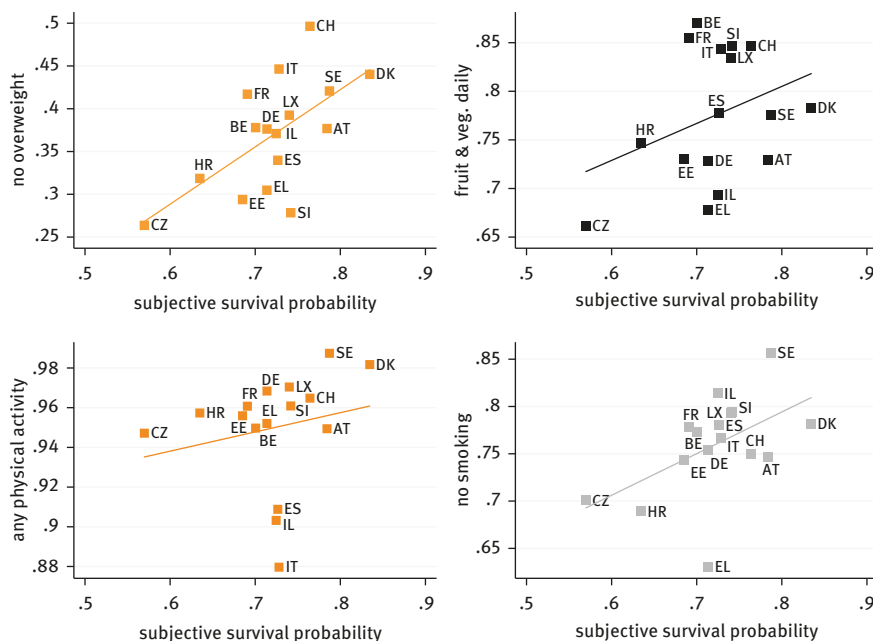


Figure 30.1: Correlation between subjective survival probability and health investments.

Source: SHARE Wave 4, 5 and 6 release 6.1.0.

individuals are vulnerable to malnutrition associated with a higher risk of bad health outcomes (e.g., premature mortality, coronary heart disease, hypertension and weight gain). Our measure of physical activity takes the value of one if the individual reports doing any physical activity, either vigorous or moderate, and zero otherwise. Not smoking takes the value of one if the respondent currently does not smoke and zero otherwise. On average, 37 per cent of our sample is not overweight, and the lowest percentage is found in the Czech Republic and Slovenia (approximately 27 per cent) and the highest in Switzerland (50 per cent). Approximately 78 per cent of the sample reports consuming fruits and vegetables every day; the percentage is lower for Czech Republic, Greece and Israel (approximately 68 per cent) and is higher than 85 per cent for France and Belgium. Approximately 95 per cent do some kind of physical activity, with little variability across countries. Finally, Greece and Croatia have the lowest percentages of non-smokers (slightly lower than 70 per cent) and Sweden and Israel the highest percentages (higher than 80 per cent).

As shown in Figure 30.1, an increase in the subjective probability of surviving to age 75 or older is positively associated with a higher probability of not

being overweight, eating fruits and vegetable daily, doing any physical activity and not smoking.

30.3 Empirical methods

To assess whether we can provide a causal interpretation of the positive bivariate associations between life expectancy and health investments, we estimate a linear probability model and account for the potential sources of endogeneity, i.e. omitted variable and reverse causality. The individual health endowment is likely to be correlated with both life expectancy and health investment. Therefore, we control for the current health of the respondent by including among the regressors a binary indicator for being in poor health, the number of limitations with Activities of Daily Living and Instrumental Activities of Daily Living, the number of diagnosed chronic conditions, the EURO-D score measuring depressive symptoms and the presence of reduced muscle strength. We further include in our model health during childhood (self-reported health evaluation and whether the individual missed school for a month or more because of a health condition) and parents' educational attainment to control for long-run health determinants. Finally, the model controls for cohort-by-country-by-gender fixed effects that implicitly also account for pension eligibility rules and for a set of individual characteristics, such as education, household composition and household income and wealth.

The other relevant source of endogeneity that we need to account for is reverse causality because investments in health have a positive effect on life expectancy. To address this concern, we rely on an instrumental variable strategy. Specifically, we need an instrument that affects health behaviours only by modifying individuals' subjective assessment of their life expectancy. Following Fang et al. (2007), we use as instruments two binary variables indicating whether the respondent's mother and father are alive at the time of the interview, conditional on mother and father cohort fixed effects (this information is derived from the current age if the parent is alive or from parental year of death – asked in Wave 7 – if deceased).

The correlation between the instruments and life expectancy is reported in Figure 30.2. It also reports on the x-axis the fraction of respondents having at least one parent alive by country and the countries' average subjective probability of surviving to age 75 or older on the y-axis. The results suggest that the instruments are informative.

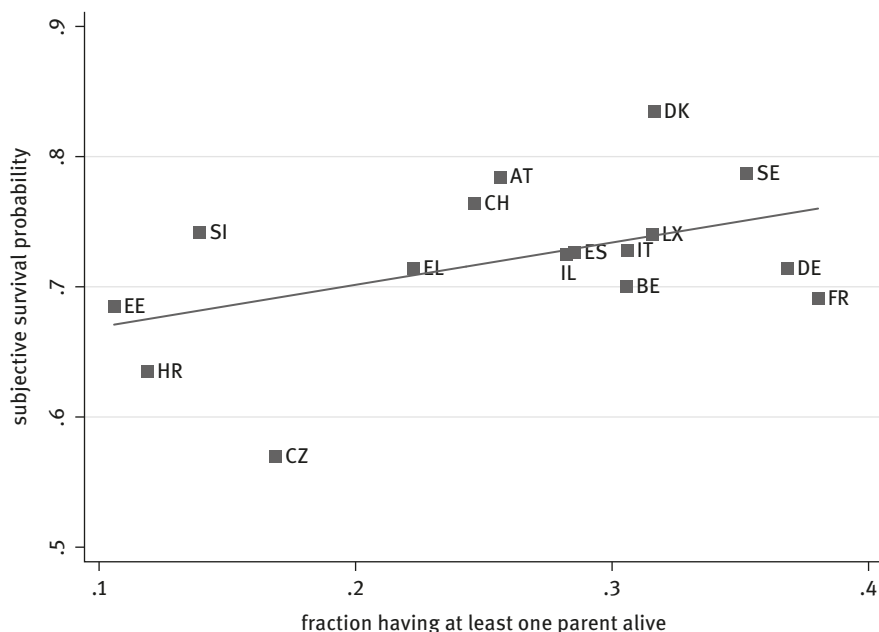


Figure 30.2: Correlation between subjective survival probability and fraction having at least one living parent.

Source: SHARE Wave 4, 5 and 6 release 6.1.0.

The validity of our identification strategy relies on the assumption that, conditional on our set of controls (including parents' year of birth fixed effects), investments in health are conditionally mean independent of the genetic health endowment. Additionally, we need to rule out the possible direct effect of parental death on health investments. We do so in a robustness test (not reported) through which we verify that our results are robust when we drop from our sample respondents whose parents died recently for whom there might be a stronger direct connection between parental bereavement and the adoption of health behaviours.

30.4 Results

Table 30.1 shows our main results. We report the parameter for the subjective probability of surviving past age 75 (which is standardised to have a mean of zero and a standard deviation equal to one) for each investment measure and for two different specifications. For each outcome, the first column provides the

Table 30.1: Linear probability model estimates.

Variables	No overweight		Fruit and veg. daily		Any physical activity		No smoking	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Subj. prob. of living to age 75+	-0.001 (0.004)	0.297*** (0.077)	0.025*** (0.004)	0.139** (0.058)	0.006*** (0.002)	0.054* (0.029)	0.030*** (0.004)	0.342*** (0.073)
Observations	18,097	18,097	18,097	18,097	18,097	18,097	18,097	18,097
Hansen p-value		0.875		0.713		0.932		0.515
Weak identification		29.973		29.973		29.973		29.973

Significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Note: The following controls are included in all models: household composition, education, household income and wealth, health indicators, health during childhood, parental education and year of birth-country-gender fixed effects. The Weak identification test statistic is the Kleibergen-Paap rank Wald F-statistic, with Stock and Yogo (2005) critical values for 10 per cent maximal IV size equal to 19.93. Standard errors are clustered at the individual level in parentheses.

Source: SHARE Wave 4, 5 and 6 release 6.1.0, Wave 7 release 0.

ordinary least squares (OLS) estimate of the association between expectations to live past age 75 and health investments, net of the effect of all covariates listed in the previous section. The subjective probability of living past age 75 is not significantly associated with not being overweight but is positively and significantly associated with consuming fruits and vegetables daily, doing any physical activity and refraining from smoking. In most cases, the coefficients related to the control variables (not reported for brevity but available from the authors) have the expected sign.

The OLS estimates reported in the odd-numbered columns of Table 30.1 do not necessarily identify a causal relationship because they suffer endogeneity attributable to reverse causality (see the discussion in the previous section). The estimation results from our instrumental variable (IV) approach, which uses two dummies for whether the respondent's mother and father are alive as instruments, are reported in the even-numbered columns of Table 30.1. For each specification, we report the p-value of the Hansen test, which shows that the over-identifying restrictions are not rejected, and the weak identification F statistic, which shows that the instruments are informative. Subjective life expectancy is highly significant for all outcomes, and the point estimates imply that OLS greatly understates the strength of the effect. In particular, a one standard deviation increase in the subjective probability of living to age 75 or older increases the probability of not being overweight by 29.8 per cent, the probability of consuming fruits and vegetable daily by 13.8 per cent, the probability of doing any physical activity by 5.4 per cent and the probability of not smoking by 34 per cent. We have also performed the same analysis using alcohol consumption, for which we can derive a consistent indicator only for Waves 4 and 5 (a binary variable that is equal to one if the respondent does not drink alcohol daily and zero otherwise), but both estimates are close to and not significantly different from zero.

30.5 Conclusions

This chapter investigated whether longer subjective life expectancy has a causal effect on investment in healthy behaviours. The theoretical predictions behind this relationship are ambiguous because expectations of a longer planning horizon increase returns to investment in health on the one hand, while a longer life-span reduces the marginal value of additional years of life on the other hand.

Our empirical analysis based on the instrumental variables suggests that the first channel prevails given that we observe positive effects of a longer life-span on most health behaviours that we have considered.

In summary, our results provide an economic mechanism behind the so-called ‘compression of morbidity’ hypothesis because they show that one reason longer lives do not necessarily imply a longer time spent in poor health is individuals’ investments in healthy behaviours.

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