



# Optimal choice of health and retirement in a life-cycle model <sup>☆,☆☆</sup>

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## Abstract

We examine within a life-cycle model the simultaneous choice of health care and retirement (together with consumption). Health tends to have an impact on retirement through morbidity, determining earnings and the disutility of work, and through longevity, determining the need to accumulate retirement wealth. Conversely, the age of retirement drives the demand for health care through the value of survival and the value of morbidity reductions. We characterise the optimal relationship between health expenditure and retirement and apply our model to analyse the effects of moral hazard in the annuity market. While moral hazard always induces excessive health investments and an excessive duration of working life, it also triggers an excessive level of consumption if the impact of health on the disutility of work is sufficiently large.

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We examine a transfer scheme and mandatory retirement as policies towards curtailing moral hazard. Numerical analysis illustrates the role of moral hazard in shaping the life-cycle allocation.

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## 1. Introduction

In response to the demographic changes affecting most developed economies, policy-makers are increasingly seeking to safeguard the sustainability of social security programmes by enacting changes to the pension system that promote an expansion of the working lives of individuals. Such policy reforms bring into focus the nexus of retirement and health. On the one hand, if individuals are expected to work productively for a longer stretch of their life, they must be in adequate physical condition to do so. On the other hand, significant changes in the length of the working life may alter the individual's health related behaviours.

The health-retirement nexus is complex for three reasons. First, health and retirement are jointly determined, with one feeding back into the other. Second, health and retirement interact through both mortality and morbidity, the latter affecting both earnings and the disutility of labour. Third, the relationship between health care and retirement is governed by both substitution and income effects. A thorough understanding of the health-retirement nexus is a prerequisite for the design of both retirement policy and health policy. For instance, it is unclear whether incentives for a later retirement also generate the incentives for the kinds of health improvements that facilitate a longer working life. Conversely, it is not yet fully understood how the excessive consumption of health care due to moral hazard in the annuity market distorts consumption and retirement over the life-cycle and what policies could be used to mitigate this problem.

While the link between retirement and health has received considerable attention in the literature,<sup>1</sup> most of the theoretical work is focused on the relationship between exogenous measures of health, particularly survival, and the decision to retire. In contrast, little is known about the way in which the decision to retire is shaped by the individual's health care choices, and about the incentives that govern the demand for health (care) itself.

We therefore propose a life-cycle model in which individuals choose a stream of consumption and health care over their life-course, as well as the timing of their retirement from the labour market. The consumption of health care contributes to reductions in both mortality and morbidity, where lower morbidity is associated with higher earnings and a lower disutility from labour. This model allows us to analyse in a unified way the impact of health care on retirement, feeding through both mortality and morbidity, as well as the impact of retirement on the demand for health care. We also provide a generalisation of the statistical value of life, i.e., the individual's

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<sup>1</sup> Recent empirical studies include McGarry (2004), French (2005), Disney et al. (2006), Dave et al. (2008), Lindeboom and Kerkhofs (2009), Kuhn et al. (2010a), Jones et al. (2010), Coe and Zamarro (2011) and Behncke (2012). Theoretical approaches towards the relationship between health and/or survival and retirement include Wolfe (1985), Boucekkine et al. (2002), Bloom et al. (2007, 2014), Sheshinski (2008), Heijdra and Romp (2009), Kalemli-Ozcan and Weil (2010), d'Albis et al. (2012), Dalgaard and Strulik (2012), Galama et al. (2013) and Sanchez-Romero et al. (2014).

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