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Ageing, cognitive abilities and retirement

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ABSTRACT

We investigate the relationship between ageing, cognitive abilities and retirement using the Survey on Health, Ageing and Retirement in Europe (SHARE), a household panel that offers the possibility of comparing several European countries using nationally representative samples of the population aged 50+. The human capital framework suggests that retirement may cause an increase in cognitive decline, since after retirement individuals lose the market incentive to invest in cognitive repair activities. Our empirical results, based on an instrumental variable strategy to deal with the potential endogeneity of retirement, confirm this key prediction. They also indicate that education plays a fundamental role in explaining heterogeneity in the level of cognitive abilities.

1. Introduction

For many countries, ageing is one of the great social and economic challenges of the 21st century. In Europe, for example, the ratio of people aged 65 and over as a percentage of the population aged 18–65 is expected to increase from its current levels of 25 percent to about 50 percent in 2060 (Eurostat, 2008).

A fundamental aspect of the ageing process is the decline of cognitive abilities. Schaie (1989) shows that cognitive functioning is relatively stable until the fifth decade of life. After this period, the decline becomes apparent and the incidence of cognitive impairments increases sharply with age. At all ages, however, there is large variation across individuals in the level of cognitive performance.

The process of cognitive ageing is complex and not yet well understood. One conceptual framework, due to Horn and Cattell (1967) and Salthouse (1985), distinguishes between two types of abilities. The first type, 'fluid intelligence', consists of the basic mechanisms of processing information which are closely related to biological and physical factors. One important aspect of these abilities is the speed with which many operations can be executed. The second type, 'crystallized intelligence', consists of the knowledge acquired during the life with education and other life experiences. Unlike fluid intelligence, which is subject to a clear decline as people get older, crystallized intelligence tends to be maintained at older ages and is subject to a lower rate of age-related decline. As argued by Salthouse (1985), dimensions of cognitive functioning such as orientation, memory, fluency and numeracy, are generally based on different combinations of fluid and crystallized intelligence. This suggests that accounting for the different dimensions of cognitive functioning may be important for an analysis of the process of cognitive ageing.

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Another conceptual framework, due to Stern (2002), is that individuals have different levels of cognitive reserve and a higher level allows them to prevent or slow down the process of neurodegeneration associated with ageing. Individual heterogeneity in cognitive performance may reflect both genetic differences in the level of cognitive reserve and life events – individual choices or exogenous shocks – that may affect the cognitive endowment and the rate of age-related decline.

Recent research in neuroscience (see van Praag et al., 2000 for a review) has questioned the idea that age-related cognitive decline is inevitable and fixed. Although neural plasticity is reduced in old age, it remains more substantial than previously recognized. In their comprehensive review, Hertzog et al. (2008) describe how the age-profiles of cognitive abilities can differ over the life span in response to various types of behavior ('cognitive-enrichment hypothesis'). As revealed by many empirical studies, important factors in this process are education (Banks and Mazzonna, in press), occupational and retirement choices (Adam et al., 2006; Bonsang et al., 2010; Rohwedder and Willis, 2010), leisure activities (Scarmeas and Stern, 2003), home environment and parental influences in childhood (Cunha and Heckman, 2007; Case and Paxson, 2009) and adolescence (Richards et al., 2004), lifestyles (Cervilla et al., 2000), and chronic diseases like hypertension or heart disease (Meyer et al., 1999).

Most of this literature is descriptive, with only few efforts at interpreting the empirical evidence within a well-defined model. For instance, the popular 'use-it-or-lose-it hypothesis' (see for example Rohwedder and Willis, 2010), by which intellectually engaging activities help buffer individuals against cognitive decline, does not explain individual differences in the time and effort allocated to these intellectually engaging activities (Stine-Morrow, 2007). Further, empirical results are often based on small cross-sectional samples and cross-country comparisons are lacking. The few existing longitudinal studies (Schaie, 1989; Richards et al., 2004; Bonsang et al., 2010) do not account for sample selection due to attrition, a potentially serious problem in the panels of older people.

There are at least two reasons why understanding the process of age-related decline in cognitive abilities is important to economists. First, cognitive functioning is fundamental for decision making, for it influences individuals' ability to process information and to make the right choices. As many countries have moved more towards systems of individual provision for retirement income, decision making ability is becoming a crucial element for the appropriate formulation of consumption and saving plans (Banks and Oldfield, 2007; Christelis et al., 2010).

Second, cognitive abilities may be regarded as one aspect of human capital, along with education, health, and noncognitive abilities. Economists have focused their attention mainly on human capital accumulation, much less on human capital deterioration. As stressed by McFadden (2008), "natural questions to ask are how human capital at various stages in the life cycle can be measured [...]; the degree to which the depreciation of human capital components is an exogenous consequence of ageing or can be controlled through work, study, and behavioral choices; and the degree to which depreciation is predictable or random".

Following the human capital approach, in this paper we adapt the model of health capital accumulation originally proposed by Grossman (1972) to derive a framework that allows us to better understand the link between cognitive abilities, ageing and retirement. One insight of this model is that the observed age-related decline in cognitive abilities need not be the same as natural deterioration, because people may respond to ageing by investing in cognitive repair activities. Another insight is that the amount of repair investment depends on market and nonmarket incentives, relative prices, discount rates, etc. In particular, the fact that retired individuals lose the market incentive to invest in repair activities may cause an increase in the rate of cognitive decline after retirement. In the empirical part of the paper, we employ microdata from the Survey of Health, Ageing, and Retirement in Europe (SHARE), a large household panel which contains data on the individual life circumstances of about 30,000 individuals aged 50+ in 11 European countries, including measures of cognitive functioning based on simple tests of orientation in time, memory, verbal fluency and numeracy. Based on the predictions of our theoretical framework, our empirical specification accounts for the distance from retirement to capture the increase in the rate of cognitive decline after retirement. We also control for individual differences by gender, education and country of residence. A key issue is, of course, the endogeneity of retirement. We address this issue using an instrumental variables (IV) approach that exploits variation between and within countries in eligibility ages for early and normal retirement.

Recent papers by Bonsang et al. (2010) and Rohwedder and Willis (2010) also employ the SHARE data, along with other data sets, to estimate the causal effect of retirement on cognitive abilities using a somewhat similar IV approach. These papers lack a clear conceptual framework, which has important implications for their empirical strategy. First, they essentially consider retirement as a binary treatment that only causes a one-time shift in the level of cognitive abilities, with no effect on the slope of their age profile. As a result, they model its effects through a simple dummy variable for being retired. Second, the lack of a clear theoretical framework implies that important explanatory variables are omitted, while some of the included regressors are likely to be endogenous. For example, Rohwedder and Willis (2010) ignore important controls such as gender, education and country of residence. On the other hand, Bonsang et al. (2010) adopt a "kitchen sink" approach by including a very long list of controls some of which, like health conditions, can hardly be treated as exogenous. Both papers also have specific limitations in their identification strategy. For example, when using the SHARE data, they only rely on the cross-country variation in eligibility ages for early and normal retirement at one point in time. Not only they do not exploit the substantial within-country variation arising from the pension reforms of the 1990s, but their cross-sectional variation is actually quite small, as more than half of the countries in their sample have the same eligibility ages.

The remainder of this paper is organized as follows. Section 2 describes the data used for this study. Section 3 describes our theoretical framework. Section 4 discusses features of the data that complicate identification of the causal effect of