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Comment

Elaine Kelly

A recent literature has shown that retirement has a negative impact on cognition (Adam et al. 2007; Bonsang, Adam, and Perelman 2012; Rohwedder and Willis 2010). Börsch-Supan and Schuth's chapter uses data on European retirees from SHARE to extend this work along two margins. First, by considering the impacts on cognition of different types of retirement. Second, by assessing whether the effect of retirement on cognition operates in part through changing social networks. Understanding the mechanisms

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behind the relationship between retirement and cognition is particularly important if research is to be used to derive policy implications. At present, it is unclear whether workers should be discouraged from retiring early to protect their cognition, or whether cognition could be safeguarded through changing behaviors or systems of support for retirees.

The chapter is motivated by two observations. First, that cognition declines with age, but is lower for early retirees than normal retirees. Second, that the number of friends and colleagues in a person's social network declines with age, but is lower and declines more steeply for early retirees. Börsch-Supan and Schuth assess whether these patterns are related, and in particular whether the relationship between early retirement and social networks explains part of the association between early retirement and cognition.

The challenge for identification is that both early retirement and the size of social networks are not exogenous. Perhaps most importantly, the timing of retirement may be determined by both current and expected future health and cognition. Lower cognition among early retirees might therefore reflect who retires early, rather than the effect of early retirement on cognition. Similarly, unobserved health and psychological characteristics might affect cognition, early retirement, and the extent of social networks. The authors address these potential sources of endogeneity by instrumenting both early retirement and social networks.

I start by providing comments on the background to early retirement and the identification strategy, before moving on to suggestions about how to extend the analysis in future work.

Early and normal retirement ages in Europe are complex and differ by country, age, gender, work history, and disability status. The chapter starts to exploit this rich source of variation and therefore builds on variation in legal retirement ages used by Rohwedder and Willis (2010). There are, however, two pieces of additional information that would be useful when interpreting the results. The first is the relative prevalence of normal, early, and disabled retirement. Given the focus on social networks, the extent to which people retire at the same time as their peers is potentially very important. The impact of retiring early on your social network when the early retirement rate is 5 percent is plausibly very different from when the rate is 40 percent. The second is evidence for why people retire early. For some older people, early retirement is the result of an active decision to give up work; for others, early retirement is the result of redundancy or unemployment. The composition of early retirees is likely to vary by cohort, depending on the strength of the job market around the time of retirement.

The omission of this information does not affect identification, but inclusion could make the chapter richer, the results easier to interpret, and provide potential extensions to baseline specifications.

The strategy for identifying the impact of early retirement on cognition

borrows from Bonsang, Adam, and Perelman (2012) and Rohwedder and Willis (2010), who define the cognition of individual *i* as the following:

$$c_i = r_i\beta_1 + x_i\beta_2 + \varepsilon_i, \tag{1}$$

where r_i is an indicator for whether the individual is retired, and x_i are exogenous characteristics. To address the endogeneity of retirement decisions, r_i is instrumented using statutory early and normal retirement ages (Bonsang, Adam, and Perelman 2012; Rohwedder and Willis 2010), or aggregate employment rates by age and sex (Bonsang, Adam, and Perelman 2012).

The baseline specification used by Börsch-Supan and Schuth is different. Rather than considering the effect of retirement relative to remaining in work, the chapter seeks to identify the impacts on cognition of different types of retirement among retirees. Early retirement is thus an object of interest, as opposed to statutory early retirement laws providing an instrument for retirement. Börsch-Supan define two retirement types (normal and early) and specify the cognition of retiree *i* along the following lines:[1]

$$c_i = \alpha_1 RetE_i + \alpha_2 YrsRet_i + \alpha_3(RetE_i{\cdot}YrsRet_i) + x_i\gamma_1 + \varepsilon_i, \tag{2}$$

where $RetE_i$ is a dummy for early retirement, and $YrsRet_i$ represents years since retirement. The coefficients of interest are therefore α_2, the effect of years since retirement on cognition for normal retirees, and α_3 the differential effect of years since retirement for early retirees.

Comparing specifications equations (1) and (2) illustrates that Börsch-Supan and Schuth are estimating something different and more complex than Bonsang, Adam, and Perelman (2012) and Rohwedder and Willis (2010). The chapter would therefore benefit from a more thorough discussion about how the estimation strategy relates to existing work, and whether any further identifying assumptions are required.

I next turn to the treatment of social networks, and their relationship to early retirement and cognition.

Social networks are regarded as important sources of information, support, and mental stimulation for older people (Pinquart and Sörensen 2000; Stoddart 2000). However, as in most contexts, social networks are almost certainly not exogenous, with the same unobserved factors that impact social network size also likely to affect cognition. The authors' solution is to instrument social networks with population density and regional variation in average "trust in people" from the European Social Survey. For these instruments to be valid they must: (a) be correlated with individual social networks; and (b) influence cognition only through their effects on social networks. The first condition is certainly fulfilled, as demonstrated in table 6.7, but the second is unlikely to hold. Take the example of Italy, which has

1. No specification is provided in the chapter, so this specification represents an interpretation of the approach.

five NUTS-1 regions: Northwestern, Northeastern, Central, Southern, and Insular. The Southern and the Northeastern regions differ from each other in population density and average levels of "trust in people" in ways that correlate with individual social networks. However, both instruments are almost certainly correlated with other aspects of health and behavior, such as diet, exercise, and occupational mix, through mechanisms other than social networks. The authors use the Angrist-Pischke *F*-test for excluded instruments, but this is only informative when at least one of the instruments is valid.

Finding an instrument that fulfills both conditions (a) and (b) is difficult. One possibility is to exploit variations in the number and sex of family members, such as siblings or children. The number of siblings or children may not be entirely exogenous, but at least predate retirement. Conditional on having children, the sex of the oldest child should be random. If, as seems likely, daughters are more involved in caregiving than sons, and the relationship is sufficiently strong, this could prove a suitable alternative instrument.

My final set of comments relates to potential ways to extend the current analysis, and assumes that the previous concerns over identification can be addressed.

In the chapter, all the specifications are linear and do not allow for heterogeneity in the relationships between cognition, social networks, and early retirement across individuals. This is a sensible baseline approach and mirrors earlier work on the impacts of retirement on cognition, which estimate average or local average treatment effects. However, it seems very likely that the impact of early retirement and both social networks and cognition could depend upon factors such as sex, occupational background, education, and marriage or partnership status. Understanding the nature of this heterogeneity is important for at least two reasons. First, where effects are heterogeneous, the instrument will identify a local average treatment effect rather than an average treatment effect, with the estimated coefficient depending on who is affected by the instruments (retirement regulations for early retirement, and population density or regional variation in trust for social networks). This means the estimated effects using alternative instruments might be quite different, potentially limiting external validity.

Second, variation in how social networks relate to early retirement and cognition might reveal more about how the social network effect operates. Where the impacts of retirement upon cognition are concentrated among individuals with certain characteristics, it may be easier to formulate theories about the mechanisms behind the estimated effects. This speaks to a broader point about how to interpret the results in the chapter and what conclusions to draw. The authors find that declining social networks do explain a proportion of the negative impact of early retirement on cognition, but the question that remains is why. How does early retirement affect different elements of the social network, and what part of the decline in social networks explains a portion of the early retirement effect? The descriptive evidence in tables

6.2 and 6.3 does not provide any strong priors. Does the social network effect operate through the reduction in colleagues? If not, what aspects of an individual's social life change on retirement? Does the relationship between social networks and early retirement depend on whether partners, peers, and other potential members of a social network continue to work? Answering these questions is particularly important, if results are to be used to derive policy implications about how to support or advise people around retirement. Given the rich data available in SHARE, the authors should be able to explore some of these issues in future work.

In summary, this chapter provides an interesting and important first step in understanding the relationship between retirement and cognition.

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