Journal of Health Economics 57 (2018) 206–220

Contents lists available at ScienceDirect

Journal of Health Economics

journal homepage: www.elsevier.com/locate/econbase

Intergenerational transmission of human capital: Is it a one-way street?☆

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ARTICLE INFO

Article history:
Received 27 April 2017
Received in revised form 31 October 2017
Accepted 6 December 2017
Available online 13 December 2017

Keywords:
Intergenerational transmission
Education
Mortality
Health
Mobility

ABSTRACT

Studies on the intergenerational transmission of human capital usually assume a one-way spillover from parents to children. However, children may also affect their parents' human capital. Using exogenous variation in education, arising from a Swedish compulsory schooling reform in the 1950s and 1960s, we address this question by studying the causal effect of children's schooling on their parents' longevity. We first replicate previous findings of a positive and significant cross-sectional relationship between children's education and their parents' longevity. Our instrumental variables estimates are not statistically different from zero. However, they hide substantial heterogeneity by the gender of the child and the parent; female schooling is found to affect longevity of fathers and especially those from low socioeconomic background. Taken together, our results point to the importance of daughters' schooling for parental health and to the importance of considering heterogeneous impacts.

1. Introduction

Economists have become increasingly interested in the non-pecuniary benefits of schooling. Besides increasing wages, schooling has been shown to improve health, reduce crime, and increase trust and social interactions (Oreopoulos and Salvanes, 2011; Lochner, 2011; Grossman, 2006). Moreover, recent evidence suggests that some of these effects transcend across generations, thus creating positive externalities. Such spillovers from one generation to the other should be taken into account when valuing the societal returns to schooling (Bjorklund and Salvanes, 2010; Black and Devereux, 2011).[1]

Despite the widespread interest in intergenerational spillovers, previous studies have been based on the assumption that externalities only work in one direction; from parents to children. However, there are reasons to believe that externalities might work the other way around as well. Well-educated children might, for instance, have more resources to invest in their elderly parents' health. Parents' morale may also increase if their children are more successful and have a better life as a result of getting more education. In addition, well-educated children have better knowledge of health and technology to share with their parents and can help them with informal care, medication adherence and act as their agents in the health and long-term care system (Friedman and Mare, 2014).

In this paper, we provide the first set of evidence on the *causal* effect of children's schooling on their parents' health. We do so by exploiting the Swedish compulsory schooling reform, that was rolled out over the country during the 1950s and 1960s. An important feature of the reform was that the timing of the roll-out varied across municipalities. This gives us variation in reform exposure both within and between cohorts and provides us with plausibly

☆ The data used in this paper comes from the Swedish Interdisciplinary Panel (SIP) administered at the Centre for Economic Demography, Lund University, Sweden. We thank Helena Holmlund for generously sharing the reform coding with us. We also thank Silke Anger, Bhashkar Mazumder, and Kjell Salvanes for useful comments and suggestions and seminar participants at Lund University, SFI Copenhagen, and Essen for the discussion.

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[1] The range of topics that has been explored includes, but is not limited to, the effect of parental education on children's educational outcomes (Black et al., 2005; Magnuson, 2003; Oreopoulos et al., 2006) cognitive and non-cognitive abilities (Lundborg et al., 2014) and health (Currie and Moretti, 2003; McCrary and Royer, 2011; Lundborg et al., 2014). In most cases, studies that have looked into the causal effects of parental education have found positive and significant effects of increases in both or one of the parents' educational attainments on children's outcomes. In addition to schooling, other studies have examined the effect of parental health on children's outcomes (Black et al., 2014; Persson and Rossin-Slater, 2017), and transmission of IQ and cognitive and non-cognitive skills (Black et al., 2009; Anger and Heineck, 2010; Grönqvist et al., 2010; Björklund et al., 2010).

https://doi.org/10.1016/j.jhealeco.2017.12.001
0167-6296/

exogenous variation in schooling.[2] We use data from the Swedish Cause of Death Register and proxy parents' health by their age at death.

Our paper relates to a recent literature studying the influence of children on parents. Using data from the U.S., Friedman and Mare (2014) show that parents whose children go to college live longer on average, even after controlling for financial resources and level of education of the parents.[3] Zimmer et al. (2007) use data from Taiwan and show that offspring's schooling is associated with older parents' mortality and the severity of parents' health in old age. Torssander (2013) links parents born between 1932 and 1941 to their children in the Swedish Multi-generation Register and shows a similar relationship for parental mortality and children's education. Controlling for parents' education, social class, and income, she finds a positive association between children's education and parents' mortality risk. Even after comparing siblings in the parental generation, to control for family background characteristics, the results hold.[4]

Although these papers try to control for a number of variables that could be correlated with both parents' longevity and children's schooling, none of them are able to identify the causal effect of children's schooling. Since schooling is an endogenous variable, one should be worried that it correlates with unobserved factors that are shared between children and parents, such as intrinsic abilities and underlying health. In addition, the relationship could work the other way around, where healthier parents invest more in their children's human capital. These identification threats become all the more important since a positive association between children's education and parents' longevity is not the only conceivable relation. There are also reasons to think that more education for children could negatively affect parents' during the old age, the most important of which being that individuals with more education are more likely to move to other municipalities or even other countries and are more likely not to live close to their parents, as a result (Machin et al., 2012).

We are aware of only one other study that estimates the causal effect of children's human capital on that of their parents. Kuziemko (2014) models how children's acquisition of a specific type of human capital generates incentives for adults in the household to either learn from them or lean on them. She tests the model using variation in compliance with an English-immersion mandate in California schools and shows that improved language skills among immigrants leads to lower language skills among their parents. She interprets this as evidence of crowding out, where parents lean on their children instead of learning on their own.

In this paper, we first replicate the previous findings of a positive and significant cross-sectional relationship between children's education and their parents' longevity; our OLS estimates suggest that both daughters' and sons' schooling are strongly associated with parents' longevity and that the relationship is equally strong for mothers and fathers. Acknowledging that our instrumental variables estimates only reflect variation at the lower part of the education distribution, we provide OLS estimates showing that the positive relationship between children's schooling and parental longevity is obtained both at the lower and upper part of the education distribution. However, we obtain small and insignificant IV estimates when we pool all children and parents and, in most cases, we can reject the null that the OLS and IV estimates are the same (at the 10% level). Our conclusion does not change when we study separate causes of death.

The estimated mean impacts hide substantial heterogeneity. When we study the effect of female schooling separately, we find positive and significant effects on the survival of parents. These effects are strongest for fathers, who typically are among the frailest, and are especially strong for low-educated fathers. Since females are often primary care givers, our estimates suggest that when the group that are most involved in care-giving obtain more schooling, fathers gain in terms of longevity. Our results also suggest that health knowledge may be an important mechanism since the effect is strongest for cardiovascular mortality, where well-known risk factors such as obesity, smoking, and lack of physical activity, could all be affected by having access to more and better health knowledge.

To interpret our findings, we study the effect of schooling on a number of intermediate outcomes of the children and their parents. We find that the positive effects of female schooling on fathers' survival arise despite the lack of an effect of female schooling on earnings and on parental economic outcomes, such as financial wealth, income, and retirement age. The effect of female schooling on parental survival might instead reflect increased health knowledge leading to higher quality care and better knowledge on how to navigate the health care and long-term care systems. We also find that females who obtain more schooling marry more highly educated males so that the total human capital of the household increases. We obtain no such corresponding effect for males.

Our findings suggest that the positive cross-sectional relationship between children's years of schooling and elderly parents' health to a large extent reflects the influence of unobserved factors that affect both children and parents. Our results also illustrate the importance of moving beyond analyzing the mean impact when examining the effect of children's schooling, as female schooling is found to be of greater importance than male schooling for parental survival. Although we are aware that the institutional context for elderly could be different in Sweden compared to some other Western countries, it is important to note that the parents we study in this paper were born in the first part of the 20th century and belong to cohorts where a high fraction live with the minimum level of pension income.[5] Many of them were financially vulnerable and it is reasonable to believe that they could have potentially benefited from having better-educated children.

The paper unfolds as follows. Section 2 discusses potential channels through which children's schooling might affect parental mortality. Section 3 discusses the compulsory schooling reform, while Section 4 describes the relevant institutional context. Section 5 describes our data. Section 6 outlines our empirical strategy and Section 7 discusses the validity of our instrument. Section 8 presents the main results and Section 9 examines potential mechanisms. Section 10 provides additional robustness checks and Section 11 concludes.

[2] The crucial assumption in our identification strategy is that conditional on birth cohort fixed effects, municipality fixed effects, and municipality-specific linear trends, exposure to the reform is as good as random. We provide evidence for this later in the paper.

[3] The authors employ a Cox proportional hazard for their analyses on parents' age at death. For the analyses on specific causes of death, the authors use competing risk models. Only individuals who survived to the age of 50 are included in their analyses. The authors aim to identify the causal effect of education by controlling for a set of potential (observed) confounders.

[4] More generally, our paper relates to the literature on the determinants of mortality and the role of economic conditions and education. Previous papers have shown the importance of early life conditions for adult mortality (e.g. Case et al., 2005; van den Berg et al., 2006). A related literature has estimated the effects of education, income, and wealth on mortality with mixed evidence. Some papers have found positive effects of income (Adda et al., 2009), education (e.g. Lleras-Muney, 2005; Lager and Torssander, 2012; García-Gómez et al., 2013; Lundborg et al., 2016), whereas others have found no effects of education (e.g. Clark and Royer, 2013) or wealth (Cesarini et al., 2016).

[5] We provide more details about the lives of this generation of parents in Section 4.