Does education help “old dogs” learn “new tricks”? The lasting impact of early-life education on technology use among older adults

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ABSTRACT

Technological progress is often at the heart of improvements in quality of life. The development of personal computers (PCs) and the Internet are among the most important technological advances of the last century. PCs and the Internet have profoundly changed the way we access information, shop, view media, communicate, socialize, and spend our time. Despite the many benefits of computer and Internet use, certain population groups – especially low-educated and older consumers – have not yet fully adopted computer technology and the Internet in their daily lives. This paper estimates the effects of early-life education on computer and Internet use among older Italians. Using data on early-life educational attainment and computer and Internet use of older adults from the 2013 Survey of Health, Ageing and Retirement in Europe (SHARE), we exploit a historical increase in compulsory schooling in Italy as an instrumental variable for education to estimate the effects of early-life education on the adoption of PCs and on current use of the Internet. We find large and statistically significant effects of early-life education on later-life technology use among older persons who obtained additional education due to increased schooling requirements. In our benchmark estimations, one additional year of schooling resulted in an eight percentage point increase in the probability of having ever used a computer and in a 12 percentage point increase in the probability of reporting to have at least good computer skills. Individuals affected by the reform were also six percentage points more likely to have used the Internet in the last week. These findings are robust across different sample selection and model specification strategies. Our analysis also suggests that occupational choice and computer use at work are important channels through which education affects the adoption and use of computers and the Internet. Our findings thus highlight the likely importance of early-life education for later-life computer and the Internet use and perhaps technology adoption more broadly.

1. Introduction

Technological progress is often central for improvements in human development (United Nations Development Programme, 2001; Martinez-Garcia, 2013). Facilitating the accomplishment of individual goals ranging from bare necessities to advanced personal aspirations, new technologies are frequently instrumental in performing or facilitating daily activities and can thereby help individuals to improve their functioning, social participation and quality of life. The potential benefits of new technologies are often especially large among otherwise disadvantaged population groups such as frail individuals or persons with disabilities, as these new designs can often help to reduce physical barriers to independent living and social participation (Wellman et al., 2001; Czaja and Lee, 2007; Levy and Strombeck, 2002; Solberg, 2014; Charness and Boot, 2009). Digital inclusion, i.e., the empowerment of people through information and communication technologies, is therefore often among the top priorities for public infrastructure investments and public policy (World Bank, 2016; European Commission, 2016; Cabinet Office et al., 2014; Executive Office of the President of the United States, 2012).

Despite the commonly large benefits of new technologies for consumers, broad adoption and routine use of innovations in the general population often takes many years with widely varying speeds of adoption across different population strata (Rogers, 2003; Pew Research Center, 2014; van Dijk, 2006). Irrespective of the exact technological innovation under consideration, individuals’ adoption speeds and corresponding group memberships generally display similar associations with adopters’ socio-demographic and psychological...
characteristics: Adoption tends to be faster among persons who are more risk-oriented, less conservative, better integrated in society, younger, better educated and better-off (Rogers, 2003). The available empirical evidence clearly indicates important heterogeneity in the speed of technology adoption across population groups with different socio-demographic and psychological characteristics with particularly slow adoption speeds among older persons and persons from lower socio-economic backgrounds.

The invention of personal computers (PCs) and the Internet are two of the most important technological advances of the last decades. PCs and the Internet have had profound effects on many aspects of life including the way we work, communicate, search for information, manage personal finances, shop, view media, plan our travel, spend our time and socialize (European Commission, 2012; Perrin, 2015; Purcell and Rainie, 2014; Horrigan, 2008). PCs and Internet use often facilitate communication and daily transactions even if the benefits of Information and Communication Technology (ICT) use may vary across population groups (van Deursen and Helsper, 2015) and may occasionally also pose risks to users such as Internet fraud and identity thefts (World Health Organization, 2011; Grimes et al., 2010). Notwithstanding the immense potential of ICTs to facilitate life and increase the wellbeing of consumers, PC and Internet use are still far from universal in the general population (Pew Research Center, 2014; van Dijk, 2006). Similar to other technological innovations, the “digital divide” between users and non-users of ICTs is strongly related to individuals’ socio-demographic characteristics, notably age and education (Niehaves and Plattfaut, 2014; Gell et al., 2013; Bucy, 2000; Rideout et al., 2005; O’Brien et al., 2008; Pew Research Center, 2014; Chen and Persson, 2002; Cutler et al., 2003; Carpenter and Buday, 2007; Tak and Hong, 2005; Selwyn et al., 2003; Schiefe, 2006, 2010), but also income, wealth, family ties and social networks (Rideout et al., 2005; O’Brien et al., 2008; Gell et al., 2013; Agarwal et al., 2009; Warschauer, 2003; Bucy, 2000). As a result, important population strata are still left behind with regard to new digital technology, despite its large potential benefits in terms of improved functioning, social participation and quality of life (Wellman et al., 2001; Czaja and Lee, 2007; Lindeman, 2009; Levy and Strombeck, 2002; Solberg, 2014; Andersson et al., 2005; Tarraga et al., 2006).

While the statistical association between socio-demographic characteristics and technology adoption, including the use of computers and the Internet, is well established in the literature, there are only few studies that assess the causal effect of socio-economic background on the use of new technologies. Most existing studies of technology adoption do not account for the likely endogeneity of socio-economic outcomes in the relationship between socio-economic status and technology use, which may stem from persistent cognitive skills or personality traits such as attention, memory, reasoning, persistence, risk aversion or grit that influence both socio-economic status and technology adoption. A notable exception is the study of Riddell and Song (2017), who estimate causal effects of education on workplace technology adoption and use by working age employees in Canada between 1999 and 2005, using historical changes to compulsory schooling requirements between 1920 and 1970 as instruments for schooling. They find that one additional year of education in response to new compulsory schooling laws resulted in a seven percentage point higher probability of on-the-job computer use among Canadian employees. However, Riddell and Song (2017) do not provide any evidence on digital exclusion and the “digital divide” more broadly due to their exclusive focus on employees and ICT use at the workplace, as non-employed individuals and persons who do not use computers at work may still use ICT for communication, information acquisition or online shopping in private.

In contrast to the work of Riddell and Song (2017), our paper considers older persons’ ICT use both at work and at home, thereby providing direct evidence on the role of education as an underlying factor for the “digital divide” and digital exclusion of older adults. What is more, our focus on older adults rather than current employees also zooms in on persons who tend to be at especially high risk of digital exclusion, as highlighted by existing descriptive data on the “digital divide”. Our study thus provides new evidence on the long-term impact of early-life education on the adoption of computer technology, computer skills, and later-life use of the Internet, representing key innovations of the past decades. Using data on early-life educational attainment and computer and Internet use of older adults from the 2013 Survey of Health, Ageing and Retirement in Europe (SHARE), we exploit a historical increase in compulsory schooling in Italy as an instrumental variable for education to estimate the effects of early-life education on the adoption of PCs and current use of the Internet. Our identification strategy thereby follows a large body of previous research exploring the effects of schooling on pecuniary and non-pecuniary outcomes such as the distribution of earning (Brunello et al., 2009; Pischke and Watcher, 2008; Harmon and Walker, 1995), body mass (Brunello et al., 2013a), fertility (Fort et al., 2016), health and mortality (Mazzonna, 2014; Juerges et al., 2013; Clark and Royer, 2013; Gathmann et al., 2015; Mazumder, 2008; Lleras-Muney, 2005; Oreopoulos, 2006) and depression and cognitive abilities (Crespo et al., 2014; Banks and Mazzonna, 2012) to name but a few (see also Oreopoulos and Salvan, 2011 for an overview). By considering the effect of education on later-life computer and Internet use, our paper assesses how much of the “digital divide” in the older population is linked to differences in early-life education. As a result, our paper analyzes education as a potential risk factor for digital exclusion at advanced ages, adding later-life technology use as an important new dimension to the rapidly expanding literature on the non-pecuniary benefits of early-life education throughout the life course (Oreopoulos and Salvan, 2011).

Italy represents an interesting case in point for our study of the impact of early-life education on later-life technology adoption. Firstly, with 21.7% of persons aged 65 and older in 2015 (Eurostat, 2016b), the Italian population is among the “oldest” in the world, making issues of technology adoption, continued social participation and quality of life at advanced ages especially pertinent in this country. Secondly, in 2013 less than two thirds of Italian households had an Internet connection at home (Istat, 2014), which was among the lowest levels of Internet penetration in the European Union (Eurostat, 2016a). What is more, computer and Internet use of Italians aged 60 and older was even lower at roughly 30% (Istat, 2014), highlighting an especially high risk of digital exclusion among Italy’s older population. Thirdly, Italy implemented a large compulsory schooling reform in 1963, which made junior high school mandatory and thus increased required years of schooling from five to eight years for persons born in 1949 or later. This reform has been used in several previous studies on the longer-run returns to education in Europe and is thus well documented in the literature (Brunello et al., 2009, 2013a, 2016; Fort et al., 2016; Mazzonna, 2014). As this change in compulsory schooling has plausibly no direct long-term effect on the use of new technologies by affected cohorts (other than through education), it provides a credible instrumental variable (IV) to identify the effects of education on later-life ICT use. What is more, the Italian reform was substantial enough to give us sufficient statistical power to estimate the long-run effects of increased education even in our relatively small cross-sectional sample of older adults commonly found in household survey data.

We find large and statistically significant effects of early-life education on later-life technology use among older persons who obtained additional education due to increased schooling requirements but would have left school earlier in the absence of the compulsory schooling reform (compliers). In our benchmark estimations, one
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