I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 18304

Long Lasting Health Effects of Soviet Education

Joan Costa-Font
Anna Nicińska

DECEMBER 2025

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 18304

Long Lasting Health Effects of Soviet Education

Joan Costa-Font
London School of Economics and IZA

Anna Nicińska
University of Warsaw

DECEMBER 2025

Any opinions expressed in this paper are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but IZA takes no institutional policy positions. The IZA research network is committed to the IZA Guiding Principles of Research Integrity.

The IZA Institute of Labor Economics is an independent economic research institute that conducts research in labor economics and offers evidence-based policy advice on labor market issues. Supported by the Deutsche Post Foundation, IZA runs the world's largest network of economists, whose research aims to provide answers to the global labor market challenges of our time. Our key objective is to build bridges between academic research, policymakers and society.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Long Lasting Health Effects of Soviet Education

Education systems serve various purposes, including the enhancement of later-life health, though its effect can differ by socio-political regime. This paper examines the effects of exposure to communist education, which exposed children to a distinct curcurriculum and ideological content on later-life health. We exploit a novel dataset that collects information on compulsory education reforms in several European countries, with different cohorts exposed and unexposed to Soviet communist education. Using a difference-in-differences (DiD) design, we show that while the extension of compulsory education improved some relevant measures of health, communist education encompassed an additional health-enhancing effect. We document that the effect remains robust when using staggered DiD approaches and various robustness tests, and that it is explained by the priority given to physical education in school curricula, together with an increased likelihood of marriage.

JEL Classification: I18, I26, P36

Keywords: communist education, health education gradient, later-life health, physical activity, Europe, Soviet Communism

Corresponding author:
Anna Nicińska
University of Warsaw
Dluga 44/50
00-241 Warsaw
Poland

E-mail: anicinska@wne.uw.edu.pl

1 Introduction

Education underpins the development of human capital and the formation of common social norms and values, equipping students to participate effectively in society. Consequently, a central aim of educational design is to influence the later-life trajectories of people by promoting academic performance, enduring reading habits, alongside other long-term goals such as later-life health and fitness, as well as strengthening support for the political system. The latter includes steering civilised citizenship alongside conflict avoidance.[1] The education system can influence health-related behaviors and other health production inputs through several pathways, including the ability to process health information, the supply of esteem and status to those that excel in physical activity, the provision of additional motivation to stay active and increased access to health information, and more generally by encouraging individuals to adopt healthy routines (Kenkel, 1991; De Walque, 2010; Brunello et al., 2016). However, the influence of education largely depends on the priorities of the educational curriculum, which can differ across socio-political regimes, and more specifically back in time, between liberal and communist regimes. Indeed, there were deep differences between Soviet Bloc and Western Europe in the organization of education systems, the specific content of (and times allocated to) the school curricula with physical education (PE) being the most common activity after math and Russian language in Soviet schools, alongside extracurricular activities and homework load.

This paper studies the effect of an additional year of communist education on later-life health outcomes. We draw on a difference-in-differences (DiD) design comparing cohorts that were exposed to longer compulsory school years in communist and non-communist systems. Given that the educational attainment of an individual is influenced by unobservables (e.g., time preferences, ability, etc.), we draw on the variation in compulsory education regulations across countries and time as a source of exogenous variation (Lleras-Muney, 2005; Brunello

[1] Although some studies recommend the implementation of politically neutral education systems (Goodin and Reeve, 2018), inevitably countries, and arguably regimes, differ in their priorities about subjects and activities, which can exert a long-lasting influence on later-life (Costa-Font et al., 2024).

et al., 2016), analogously to Angrist and Krueger (1991) and Brunello et al. (2013b). Our analysis estimates the intention-to-treat effect of an additional year of communist education versus non-communist (i.e. Western and post-communist) education. Unlike previous studies, we exploit rich evidence of all relevant educational reforms in countries exposed to Soviet communism,[2] drawing on individual data from a wide set of European countries collected in the Generations and Gender Survey (GGS) and the Survey on Health and Ageing in Europe (SHARE). The robustness of our estimates is examined with respect to staggered DiD designs, different specifications, and sub-samples.

We contribute to the literature as follows. First, the literature devoted to exploiting evidence from state- or country-specific changes in compulsory education (Lleras-Muney, 2005) does not specifically consider important cross-country differences. The only exception is a study by Gathmann et al. (2015) which exploits cross-country variations and documents effects driven by men alone. Second, so far research about the effects of communist education focuses primarily on country-specific labour market behaviour (Fuchs-Schündeln and Masella, 2016; Costa-Font et al., 2024). However, such effect even when significant might reflect in other later life welfare outcomes and mechanisms that remain unexplored. Third, to date, the literature examining the effects of the design of education systems has disregarded later-life outcomes. The exception is a study by Van Kippersluis et al. (2011) documenting later-life effects in the Netherlands. Finally, most studies do not take into account the effect of the design of school curricula. That said, some studies hint that the schooling contents might be critical in understanding the heterogeneity in the estimates of education effects (Courtin et al., 2019). Our study aims to fill in the gaps by exploiting evidence of differential effects driven by different priorities of the education systems' goals and curricula as well as extracurricular school activities in communist and non-communist Europe in the past century.

[2]Soviet communism refers to "Soviet-led Communism" which is a "wide categorization" that exhibited huge heterogeneity, including the Visegrad Group (Czech republic, Hungary, Poland, and Slovakia), the Baltic States (Estonia, Latvia, and Lithuania), and the Western Balkans/Former Yugoslavia (Croatia and Slovenia) in addition to Soviet Union.

We present evidence on the impact of Soviet communist education on various health outcomes and health-related behaviours in later life. More specifically, we document evidence of the protective effects of an additional year of education to be significantly more pronounced among individuals exposed to communist as opposed to non-communist education. Additionally, we observe that the positive effects of communist education stem from a relative higher priority of physical activity in educational curriculum and a greater chance of marriage of people exposed to communist education, with men experiencing these effects more strongly than women.

The rest of the paper is structured as follows. We discuss related literature exploring the effect of education on later-life health and relate it to the paper's goals in Section 2. We then proceed to the empirical strategy employed to identify the effect of communist education in Section 3. The results are reported along with heterogeneity analysis in Section 4 and followed by robustness checks in Section 5 and conclusion in Section 6.

2 Education content and later-life health

2.1 Education and health

The term "education gradient" refers to the well-established relationship between the level of education attained and various health outcomes. This gradient has been observed across a wide range of populations and health indicators, suggesting that education acts as a key determinant of health across individuals (Adler et al., 1994; Lleras-Muney, 2005). Recent studies examining behavioural and psycho-social mechanisms underlying this phenomenon find that the gradient is driven by differences in health-related behaviours, especially among younger age individuals (Cutler and Glaeser, 2005). According to Hoque et al. (2019), the education gradient is a universal phenomenon, including post-communist countries. However, little is known about the causal effects and their heterogeneity in political regimes.

A seminal paper by Kenkel (1991) attributes part of the positive impact of education

on health with the access to information and knowledge of behaviours relevant to health, in addition to ability. Such a preventive role of additional exposure to education has been documented for smoking decisions (De Walque, 2010), showing that further education increases the likelihood of quitting smoking after the information about the dangers of tobacco use became a topic of national discussion. Another body of literature argues that there is a correlation between endowments in ability and health, which can be explained by the mutual influence of higher education and better health over the course of a person's life (Card, 1999; Murtin and Viarengo, 2011; Gathmann et al., 2015).

Consistently, Lleras-Muney (2005) documents a strong effect of education on mortality in the United States (US). Subsequent studies examined a set of possible channels, specifically the presence of an education-based selection of health-related behaviours (Brunello et al., 2016; Jürges et al., 2010; Conti et al., 2010; Braakmann, 2011). Nonetheless, these studies mainly focus on some contemporary health measures and Western Europe, omitting countries under the Soviet communism influence (i.e. those with centrally planned economies in the past, to a set of which we further refer as the Eastern Bloc). The analysis by Brunello et al. (2016) including one formerly communist country (Czech Republic) is the exception.

One of the most challenging issues for the literature to address is the endogeneity between education and health. This concern has received considerable attention, particularly in studies that exploit expansions of compulsory education laws. Educational reforms, particularly those that change the entry age for compulsory schooling or the duration of mandatory education, are typically considered exogenous and are therefore commonly used as an identification strategy for estimating the causal effects of education (Arendt, 2005; Duflo, 2001). A number of studies have identified the effect drawing on an instrumental variable approach (Mazumder, 2008; Silles, 2009), though more recent contributions draw on regression discontinuity designs, which typically identify the counterfactual effects of education expansion (Clark and Royer, 2013; Davies et al., 2018; Avendano et al., 2020). Importantly, to date, the analysis of the effects of education on later life health, and specifically on longevity (Lager

and Torssander, 2012), self-reported health measures (Arendt, 2005; Brunello et al., 2013a; Grabner, 2009), and biomarkers (Courtin et al., 2019; Jürges et al., 2013) has produced ambiguous results.[3]

2.2 Soviet communist education

Education – especially public compulsory schooling – can play a central role as a channel for transmitting the basic social values on which any socio-political system depends for its survival. These civilising aims complement the core human-capital functions of developing skills and abilities, as well as disseminating useful information that fosters desirable behaviors among future citizens, including knowledge and habits related to health (Lott, 1999; DeBray, 2006). Consistently, the educational narrative of communist regimes reflected exceptionally high ambitions, aiming to shape physically strong "Soviet men" who were loyal to communist authorities and free from the influences of family and religion (Tomiak, 1985; Soboleva, 2017).[4]

One of the tenets of Soviet communist education was the strong reliance on physical education (Riordan, 1980; Metsä-Tokila, 2002) aimed not only at finding talents to direct them into a professional sport, but also actively facilitating mass and life-long participation in sport. For instance, all children at the age of 10 were subject to the 'Ready for Labor and Defense' test of physical ability and skills including elements of military preparation (Zilberman, 1990; Ulyanova et al., 2018). In contrast, liberal Western European education systems lacked these features, focusing instead on participation and engagement over sporting success and defense ability (Bain, 1990). In communist countries, PE was compulsory at all levels of education, whereas in many Western European countries the focus was placed on the playfulness of sports (Sallis et al., 1997) and voluntary participation on physical education activities (Kirk and Colquhoun, 1989; Pellegrini and Smith, 1998; Shephard and Trudeau,

[3]See Hamad et al. (2018) for a review of the literature and a meta-analysis.
[4]Alternative forms of education outside the public school system did not exist under communism.

2000, e.g.),[5] which became also a feature of PE in formerly communist countries after the regime fall (Roubal, 2003; Prokopenko, 2018).

Alongside compulsory PE instruction, communist schools supported pupils' involvement in complimentary after-school sports activities and inter-school competitions. Sports equipment and facilities were freely accessible to all students, including those in rural and peripheral districts[6] (Kurkowska-Budzan and Stasiak, 2016), which is important in sustaining physical activity over the life cycle (Halonen et al., 2015). In less-developed areas of communist countries schools were the main (if not the sole) provider of opportunities for sport-related physical activities to children before the regime changed (Szubert, 2010). Following the fall of the Soviet system, support for some sports declined, as did people's interest in them (Roberts and Fagan, 1999; Lenartowicz and Jankowski, 2014; Pawlaczek, 2005; Jankowski, 2010; Drozdek-Małolepsza and Rodziewcz-Gruhn, 2011). Although variation in physical-activity preferences could help account for health disparities between post-communist and other developed nations, prior research has documented the influence of socio-economic status (SES) and relative income (Bobak et al., 2000), as well as the sense of instability and work-related stress (Salavecz et al., 2010; Jenkins et al., 2005) during the transition period to a liberal economy.

Finally, schools in Soviet communist regimes engaged in the promotion of hygiene, and access to physicians was to be secured by local schools (Barrett et al., 2000), creating conditions under which beneficial health-related life-long habits might prevail. Such a unique role of schools was of paramount importance in areas with limited access to health care, as they served as a way to reduce the demand for such care. The public and free nature of education might have in turn inhibited health deterioration stemming from an inefficient public health care system (Sheiman et al., 2018; Costa-Font and Nicińska, 2023) and limited

[5]For example in USSR PE took place almost daily in the 1970s (Kamer and Kabaoglu, 2021) while in Poland two teaching of PE per week were compulsory throughout the education at the primary and secondary level (Urniaż and Jurgielewicz-Urniaż, 2015). Participation in PE classes was below 70% in the US elementary schools in 1994 (Pate et al., 1995).

[6]Sports facilities were widespread across countries rather than concentrated in major cities.

access to advanced medical technologies (Grant, 2017), and compensated for cultural norms accepting, or at time even promoting, risky behaviours (Hinote and Webber, 2012), all of which were faced by countries under the Soviet influence. Thus, the beneficial aspects of communist education on healthy lifestyles and habits may have mitigated the regime's overall detrimental impact on health, which could account for the absence of major differences in health inequality between Soviet and Western Europe in the past (Costa-Font et al., 2025).

3 Empirical strategy

3.1 Data

To examine the effects of communist education on later-life health, we dwa on two datasets that collect information from representative samples across several European countries. The Gender and Generations Survey (GGS) and the Survey of Health, Ageing and Retirement in Europe (SHARE) provide data on health outcomes in both Western (countries that never experienced communism) and the Eastern Europe. The different country and cohort compositions of GSS and SHARE samples allow us to examine the effect and its robustness across population subgroups. The distinct longitudinal samples of these two data sources provide the opportunity to investigate the role of communist education in later life health drawing from various analytical settings. However, it is worth noting that they cannot be fully compared with each other due to substantial differences in sample composition.

The samples of the two surveys differ as follows. The GGS data comprises two survey waves collected between 2002 and 2015 in nine formerly communist countries (Bulgaria, Czech Republic, Estonia, Georgia, Hungary, Lithuania, Poland, Romania, Russia) and six non-communist countries (Austria, Belgium, France, Italy, Netherlands, Sweden) as well as Germany. The research sample covers adults aged at least 18 years old. GGS contains information on self-reported health (on a 1-5 scale) and the presence of any chronic diseases. To overcome some of the limitations of GGS data, we use SHARE to examine the effects

of compulsory education reforms on some key health-related behaviours in later life, and specifically on individual mortality. SHARE collects records of individuals over the age of 50 in the majority of European countries in a longitudinal survey conducted bi-annually since the early 2000's. We use the data from regular interviews that provide detailed information on health-related outcomes as well as the information on respondents' deaths between waves 7 and 8 of SHARE data collection.

Table 1: Descriptive statistics of GGS and SHARE research samples

	GGS		SHARE	
	Mean	St. D.	Mean	St. D.
Age (years)	47.60	16.42	70.31	9.49
Female (per cent)	55.48	49.70	56.83	49.53
Compulsory schooling (years)	8.19	1.41	7.43	1.33
Communist compulsory schooling (years)	3.84	3.86	1.38	2.95
Self-reported health (1-5 scale)	3.66	0.97	2.77	1.03
Chronically ill (per cent)	34.42	47.51	50.74	50.00
Tertiary education (per cent)	23.70	42.52	23.74	42.55
Married (per cent)	67.47	49.44	63.30	48.19
Ends met easily (per cent)	41.83	49.32	62.09	48.52
Cigarette smoking (years)	n.a		10.34	16.77
Ever smoked (per cent)	n.a		37.65	48.45
Moderate physical activity (1-4 scale)	n.a		3.26	1.11
Vigorous physical activity (1-4 scale)	n.a		2.31	1.31
Any physical activity (per cent)	n.a		86.53	34.13
Ever >6 drinks at a time (per cent)	n.a		27.02	44.41
	Sample structure by country (per cent)			
Bulgaria	7.43		3.56	
Czech Republic	5.79		10.62	
Estonia	4.54		12.48	
Georgia	5.78		0.00	
Hungary	7.83		3.43	
Lithuania	5.80		3.06	
Poland	11.56		8.28	
Romania	6.93		3.37	
Russia	6.51		0.00	
Eastern Germany	0.68		0.00	
Western Germany	4.90		0.00	
Austria	2.89		6.17	
Belgium	4.14		7.92	
France	5.83		9.36	
Italy	8.86		8.52	
Netherlands	4.72		7.45	
Sweden	5.60		9.08	
Number of observations	172 961		27 963	

Source: Authors' own tabulation based on GGS waves 1-2 and SHARE wave 8.

The most recent, eighth SHARE wave was collected in 2021-22, and covers eight formerly communist countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania). To make the SHARE sample composition similar to GGS, we use the entire set of formerly communist countries and six non-communist countries (Austria, Belgium, France, Italy, the Netherlands, and Sweden).

Given the significant internal mobility within Germany after the collapse of the communist regime (Becker et al., 2020), we are unable to uniquely identify the exact length of exposure to communist education for the German SHARE sub-sample. Hence, we have opted for excluding it from the analysis. Given that the GGS records the exact date of migration, we could assign years of compulsory education under both the communist and non-communist systems. Although the German GGS sub-sample is excluded from the main analysis, we included it in the robustness section. Furthermore, we have used SHARE data to examine nicotine consumption (total years smoking cigarettes and having ever smoked), excessive alcohol consumption (frequency of having more than six drinks at a time) alongside physical activity (frequency of undertaking vigorous and moderate physical activity) to unravel possible mechanisms underlying the effects of communist education.

Table 1 reports the descriptive statistics of the GGS and SHARE datasets, alongside the cross-country sample structure. The average self-reported health status is comparable across both research samples (3.66 and 3.20 in GGS and SHARE, respectively) and significant differences in the prevalence of individuals with at least one chronic disease (34 and 77 per cent, respectively), which results from the older age of the SHARE sample. The differing age structures of the GGS and SHARE samples allow for the examination of cohort-specific exposure to compulsory education reforms, with the GGS sample showing an average of eight years of compulsory schooling (47.6 years of age on average) as compared to seven years of compulsory schooling in SHARE sample (70.3 years of age on average). The proportion of countries exposed to communism in each research sample yields the average number of compulsory communist formal education of almost four years in GGS and slightly more than

one year in the SHARE sample. Finally, it is worth noting that the descriptive statistics of later-life health and health-related outcomes point to significant differences between the Eastern and Western Blocs, in line with existing evidence on the geographical divide in Europe (cf. Table A1).

3.2 Specification and empirical strategy

Our empirical strategy involves assessing the impact of compulsory education using a cohort-based difference-in-differences approach. We estimate the following reduced-form model at the individual level, where the independent variable is the number of years of compulsory education

$$Y_{i,t,c} = \beta_1 CE_{i,t,c} + \gamma_1 BY_{i,c} + \gamma_2 BC_{i,c} + \gamma_3 X_{i,t,c} + \gamma_4 T_{i,t,c} + \mu_{i,t,c}, \tag{3.1}$$

and in order to examine the effect of one additional year of Soviet communist education versus non-communist education we apply the following modification to specification 3.1:

$$Y_{i,t,c} = \beta_1 CE_{i,t,c} + \beta_2 SCE_{i,t,c} + \gamma_1 BY_{i,c} + \gamma_2 BC_{i,c} + \gamma_3 X_{i,t,c} + \gamma_4 T_{i,t,c} + \mu_{i,t,c} \tag{3.2}$$

where:

$CE_{i,t,c}$ is the number of years individual i spent in compulsory education in country c by year t,

$SCE_{i,t,c}$ - the number of years individual i spent in Soviet communist compulsory education by year t,

$BY_{i,c}$ - individual i's year of birth,

$BC_{i,c}$ - the dummy denoting individual i's country of birth,

$X_{i,t,c}$ - the vector of control variables for individual i's at time t,

$T_{i,t,c}$ - the country-specific time trend,

and $\mu_{i,t,c}$ is the random term.

Given that GGS data does not collect information on the total number of years in schooling, we are unable to use compulsory education as an instrumental variable (IV) for schooling. However, such information is available in the SHARE data. Hence, when we perform an analysis of mortality conditional on survival to the age of 50, we use the IV design in addition to our main empirical strategy.

Table 2: Compulsory education reforms and dates of their implementation in selected European countries.

Current country name	Age at school entry	Compulsory years in full-time education
Austria	6	8(1869), 9(1962)
Bulgaria	7	7(1921), 8(1959)
Belgium	6	3(1914), 8(1919), 9(1983)
Czech Republic	6	8(1869), 9(1944), 8(1953), 9(1960)
Estonia	7, 6(1958), 7(1992)	7(1949), 8(1958), 11(1979), 9(1992)
France	6	7(1882), 8(1933), 10(1967)
Georgia	7, 6(1958)	9(1921), 7(1934), 8(1958), 10(1979), 9(1992)
Germany (East)	6	8(1763), 10(1959), 9(1992)
Germany (West)	6	8(1763), 9(1949)
Hungary	6	8(1869), 10(1962)
Italy	6	2(1859), 5(1902), 8(1963)
Latvia	7	4(1918) 7(1938), 8(1952),10(1967), 11(1980)
Lithuania	7	4(1928) 7(1940), 8(1958), 11(1979), 9(1992)
Netherlands	6, 5(1985)	6(1900), 7(1921), 6(1924), 7(1928), 9(1950), 10(1975), 12(1985)
Poland	7	7(1919), 8(1961), 9(1995)
Romania	7, 6(1968), 7(1995)	7(1864), 4(1948), 7(1956), 8(1963), 10(1968), 8(1995)
Russia	8(1930), 7(1943)	4(1919), 7(1938), 8(1952), 10(1967), 11(1980), 9(1992)
Slovakia	6	8(1869), 9(1944), 8(1953), 9(1960)
Sweden	7	3(1894), 4(1928), 6(1950), 9(1962)

Notes: Dates reported in the parentheses refer to the year of legal enactment of the compulsory education regulation. Detailed information on compulsory education at the beginning of 20th century is unavailable in some countries. Compulsory education in Bulgaria was introduced in 1879. In Berlin, Bremen, Hamburg and Schleswig-Holstein nine-year compulsory education was introduced in 1949. Additional part-time compulsory education was present in Belgium - 3 years since 1983, France - 2 years since 1963, and Germany (West) - 3 years since 1949.
Sources: Latvia and Lithuania national archives, UNESCO International Yearbooks of Education (1949 to 1970); Lacombe (1997), Abakumov (1974), Ivanova (2018), Laizāne (2019), Golubeva (1987), Kurian (1988), Marlow-Ferguson (2002), Nica and Birzea (1973), Szakács (2017), Gathmann et al. (2015), Oosterbeek and Webbink (2007).

The effect of an additional year of education comes from exploiting the evidence from data gathered using different sources (including national archives) where the year of introduction of compulsory education reforms per country is known, as reported in Table 2. This provides cohort variation across countries and political regimes (Soviet communist vs non-communist). As a result, we are able to assign the number of years in compulsory education for each individual, based on the date of birth and country-specific regulations of entry age to the

education system and duration of compulsory education.

Specifically, individuals who began compulsory education in formerly communist countries after the fall of communism were not exposed to communist education, unlike earlier cohorts. For example, a person born in Poland in 1982 would have started compulsory education in September 1988, completing eight years under the 1961 regulation, with only the first year under the communist system (in Poland communism ended in 1989). In contrast, someone born the same year in Estonia began school in 1987 and completed 11 years of education according to the 1979 regulations, four of which were under the communist system (in Estonia communism ended in 1991).

The estimate of the years of exposure to compulsory education is based on the regulation and year of birth cut-off date. Exposure might be affected by three possible effects: first, repetition of class; second, earlier enrollment to the education system, and third, interruptions in the education system operations during World War II. Additionally, we address the potential bias in the estimates arising from countries with the highest average treatment effects (De Chaisemartin and d'Haultfoeuille, 2023) as well as the varying degree of education systems' decentralization. We address all these and other concerns in Section 5.

The vector of individual characteristics includes gender and squared age, in order to avoid incorporating potentially endogenous covariates. In the GGS sample, we use country-specific time trends, as the large number of observations and the substantial variation in data collection periods make this feasible. For the SHARE data, we rely on non-country-specific time trends due to the smaller sample size, fewer countries, and the fact that data collection in SHARE wave 8 occurred over only two years. While country-specific time trends cannot capture country-wide non-linear shocks that may be correlated with increases in compulsory education, these non-linear effects cannot be disentangled from education effects, making it impossible to assess their magnitude. In alternative specifications, we cluster by the year of birth and country, and refer to event study analysis, among other.

4 Results

4.1 Education effects and later-life health

In this section, we report the intention to treat (ITT) effects of an additional year of education on self-reported health and chronic diseases observed in GGS. Table 3 documents that consistently with Gathmann et al. (2015), the effects are particularly pronounced in the male population, where we find that an additional year of education reduces the risk of chronic diseases by 4.6% and increases self-assessed health by 0.6%, on average.

Table 3: The effects of an additional year in education on health outcomes in GGS

	Self-reported general health (1-5)			Chronic diseases (0-1)		
	Total	Women	Men	Total	Women	Men
Education	0.012	0.004	0.023	-0.010	-0.008	-0.014
	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
N	138301	76759	61542	114489	63249	51240
R^2	0.337	0.353	0.313	0.175	0.186	0.155
Sex	Yes	-	-	Yes	-	-
Age, Age^2	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

Furthermore, in Table 4 we report the estimates of mortality as observed by the end-of-life component of the SHARE survey. That is, by drawing on longitudinal data from SHARE on population 50+, we estimate a significant reduction in individual mortality resulting from an additional year in education in the past. Compared to the average mortality rate, we document highly statistically significant average effects of 4.7% in the entire 50+ population, 6.3% for the population of women and 3.0% for men (aged at least 50). These estimates are

consistent with Lleras-Muney (2005).

Table 4: The effects of and additional year in education on mortality in SHARE

	Total 50+	Women 50+	Men 50+
Education	-0.004	-0.005	-0.003
	(0.001)	(0.001)	(0.001)
N	27963	16074	11889
R^2	0.923	0.922	0.923
Sex	Yes	-	-
Age	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes

Notes: Robust standard errors in parentheses.
Source: Authors' own analysis based on SHARE wave 8.

In sum, Tables 3 and 4 document statistically significant positive effects of additional year in education on health measures and mortality reduction in the past century in Europe.

4.2 Communist versus non-communist education

Next, Table 5 displays the estimates differentiated by political regime, communist or non-communist. The estimates suggest evidence of significant differences in the effects of an additional year of communist education as compared to non-communist education.

We find that an additional year of communist education significantly improves self-reported general health and reduces the likelihood of chronic illness in later life, an effect that adds to the impact of an additional year of education. These estimates are statistically significant both for the total sample as well as for the sample of individuals aged at least 50. Specifically, individuals exposed to an additional year of Soviet communist education are on average 1.9% less likely to have a chronic disease than those with additional non-communist education. Our estimates suggest that an extra year of communist education improves the

self-reported health Likert points in addition to the by 0.004 compared to 0.011 as a result of non-communist education. Hence, this evidence suggests that the effect resulting from communist education is substantial, increasing the positive effect of non-communist education by 36%.

Table 5: The effects of communist education on health outcomes as compared to non-communist education in GGS

	Self-reported general health (1-5)		Chronic diseases (0-1)	
	Total	50+	Total	50+
Education	0.011	0.002	-0.009	-0.001
	(0.003)	(0.006)	(0.002)	(0.003)
Communist education	0.004	0.008	-0.007	-0.007
	(0.001)	(0.003)	(0.001)	(0.002)
Joint stat. significance	12.71	3.22	67.19	7.24
N	138301	60787	114489	62191
R^2	0.337	0.222	0.176	0.075
Sex	Yes	Yes	Yes	Yes
Age, Age^2	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

Furthermore, our estimates are consistent with the evidence of previous studies drawing on evidence from different set of countries, documenting that education protects from health deterioration. The effects are significant after controlling for country-fixed effects and country-specific time trends.

Nonetheless, when we turn to the effects on mortality, as shown in Table 6, which are estimated from the SHARE survey, the estimates are not significant. Despite improved health outcomes due to communist education (cf. Table 5), and in contrast to Van Kippersluis et al. (2011), we find no additional protective effects of communist education on the risk

of death conditional on surviving till the age of 50 (see Table 6). That is because SHARE sample excludes younger cohorts of individuals exposed to communism and its sub-sample of formerly communist countries is significantly smaller than GGS, which results in a reduced power of our estimations. Nonetheless, there is no evidence of health benefits in terms of reduced mortality from an additional year of communist education, conditional on survival to the age of 50.

Table 6: The effects of communist education on mortality as compared to non-communist education in SHARE

	50+	Women 50+	Men 50+
Education	-0.004	-0.004	-0.003
	(0.001)	(0.001)	(0.001)
Communist education	0.000	0.001	-0.000
	(0.001)	(0.001)	(0.001)
Joint stat. sig.	17.57	13.24	4.57
N	27963	16074	11889
R^2	0.923	0.922	0.923
Sex	Yes	-	-
Age, Age^2	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on SHARE wave 8.

4.3 Mechanisms

In this section we examine a number of potential mechanisms driving our results including the role of education, income and a series of health related behaviours. More specifically the results in Table 7 indicate that communist education has no effect on tertiary educational attainment or on the ability to make ends meet, which we use as a proxy for income status. Therefore, neither higher education nor income status explains the positive effects of an

additional year of communist education on health.

Table 7: Potential mechanisms underlying health outcomes in GGS

	Tertiary education (0-1)	Married (0-1)	Making ends meet easily (0-1)
Education	0.001	0.009	-0.006
	(0.001)	(0.001)	(0.002)
Communist education	-0.001	0.015	0.001
	(0.001)	(0.001)	(0.001)
Joint stat. sig.	0.87	295.02	5.62
N	168325	166298	122440
R^2	0.105	0.166	0.198
Sex	Yes	Yes	Yes
Age, Age^2	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

However, our estimates suggest there is a significant and positive effect of communist education on the likelihood of being married or partnered (cf. Table 7), which explains better health outcomes and reduced mortality risks, as the literature suggests (Ramezankhani et al., 2019; Wang et al., 2020). This mechanism seems to be particularly relevant in communist countries as an additional year of communist education poses a significantly more pronounced effect than non-communist education. Although early communist policies sought to weaken marriage and family as institutions, exposure to communism ultimately strengthened family ties, as the family became the primary source of protection against adverse life events in the absence of market alternatives (Tay, 1972; Shlapentokh, 1991; Costa-Font and Nicińska, 2023). The latter might be reinforced by pro-natalistic policies aimed at development of military and economic power that were adopted in some communist countries (Desfosses, 2013).

The results in Table 8 shed light on the long-term effects of communist versus non-

communist education on health-related behaviors among individuals aged 50 and older. We confirm that higher educational attainment protects against excessive alcohol and nicotine consumption (De Walque, 2010). The reduction of excessive alcohol consumption is similar for both communist and non-communist education (by 7.4% on average). One additional year of education reduces by half a year the total period of regular cigarette smoking for Europeans aged 50+ on average. In relative terms, it means the reduction by 5% due to one additional year of education. However, this effect is significantly smaller (reduction of 2.6% on average) in the case of communist education.

Table 8: The effects of communist education on health-related behaviours compared to non-communist education in population 50+ in Europe

	Ever smoked	Years smoked	Excessive drinking	Any physical activity	Moderate activity
Education	-0.001	-0.123	-0.024	-0.006	-0.009
	(0.005)	(0.185)	(0.014)	(0.004)	(0.012)
Communist education	-0.003	-0.054	-0.018	0.007	0.027
	(0.004)	(0.129)	(0.007)	(0.004)	(0.010)
Joint stat. sig.	0.30	0.33	4.36	2.61	3.63
N	25469	25244	25411	25437	25431
R^2	0.119	0.088	0.073	0.129	0.133
Sex	Yes	Yes	Yes	Yes	Yes
Age, Age^2	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on SHARE wave 8.

The estimated effect of communist education on smoking may seem counterintuitive in Western countries at the time, where higher education is associated with improved health literacy and lower nicotine consumption (De Walque, 2010). However, in communist countries, particularly for the cohorts of individuals over 50, it is not unexpected as smoking was culturally incentivised.[7]

[7]The communist state maintained a monopoly on tobacco products and imposed minimal public health restrictions on smoking (Starks, 2023). Cigarettes were promoted as essential goods, representing equity, socialist welfare, and democratization (Zatoński et al., 2004, p.236), while smoking came to symbolize

Low prices of cigarettes and no access to international evidence showing the addictive nature of smoking and the links to lung cancer explain the higher prevalence of smoking until communist collapse (Zatoński et al., 2009; Kubik et al., 1995).[8] While smoking rates among men in Soviet Russia showed little variation by education, traditional gender norms largely prevented women from adopting smoking in less modernized areas until the late 1970's. Contrary to the educational gradient observed in Western countries, women with vocational and secondary education were considerably more likely to smoke (by 39% and 26%, respectively) than those with only primary education (McKee et al., 1998). Smoking gradually spread from the most educated women in the 1940's (Kubik et al., 1995), and accelerated in the 1980's and 1990's, when women were specifically targeted by Western tobacco companies (Zatoński et al., 2004).

As expected, we document a significant and long-lasting effect of communist education on physical activity in later life (cf. Table 8), in line with the curricula contents oriented towards physical strength and fitness. According to our analysis, the average person aged 50+ in Europe is by 3.7% more likely to undertake mediocre physical activity as a result of one extra year of communist education, while an additional year of non-communist education is associated with the decline by 2.8% of undertaking such an activity. An additional year in education being associated with more physical inactivity in later life might result from the sedentary lifestyles in European populations of older adults, particularly in Mediterranean countries (Varo et al., 2003). One explanation of this differential effect is that non-communist (i.e. post-communist and Western) education systems are less efficient in instilling lifelong physical activity habits than communist education. This is in line with the literature pointing to the particularly increased prevalence of sedentary lifestyle among younger cohorts

'luxury' and 'freedom' accessible to all (Neuburger, 2012). Cigarettes were ubiquitous (see Figure A1 in the Appendix), and their packaging was used for Soviet propaganda (see Figure A2) (Starks, 2023).

[8]Smoking-attributable mortality rates were substantially higher than those observed in Western Europe (Stefler et al., 2018), where research on the harmful effects of smoking dates back to the early 1950's (Schrek et al., 1950; Breslow et al., 1954). Even after communism collapse, awareness of the adverse effects of smoking on health among school children in the region were significantly scarcer compared to Western countries (Polanska et al., 2022), and initiation commonly took place at a very early age (McKee et al., 1998) (more than a third of school boys aged 10-11 smoked habitually.)

exposed to the post-communist education system in Europe (Nikitara et al., 2021) along with substantial avoidance of PE classes (Urniaż and Jurgielewicz-Urniaż, 2015).

Table 9: The effects of communist education on dietary choices as compared to non-communist education in population 50+ in Europe

	Diary products	Legumes, beans, eggs	Meat	Fruit and vegetables
Education	-0.000	-0.001	-0.001	0.002
	(0.004)	(0.006)	(0.005)	(0.003)
Communist education	0.002	-0.005	-0.003	0.002
	(0.003)	(0.004)	(0.003)	(0.002)
Joint stat. sig.	0.22	1.97	0.38	0.54
N	25425	25412	25425	25429
R^2	0.064	0.063	0.076	0.078
Sex	Yes	Yes	Yes	Yes
Age, Age^2	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on SHARE wave 8.

Finally, we considered the role of dietary choices in later life as a potential mechanism underlying differential effects of communist and non-communist education effects to find insignificant results in the 50+ population (cf. Table 9). We find no evidence that an additional year of education is significantly associated with the frequency of consuming at least three times a week dairy products; legumes, beans, and eggs; meat; and fruits and vegetables.

Based on our findings in this section, we conclude that education exerted a significant long-term impact on certain health-related behaviors. Specifically, we find that education promoted some healthy behavioural traits (reduced alcohol and nicotine consumption). However, these positive effects are not amplified by communist education, with the exception of physical activity. Our results suggest that the stronger effects of an additional year of communist compared to non-communist education on later-life health outcomes are primarily

driven by the lasting impact of communist education in promoting physical activity over the life course.

4.4 Heterogeneity analysis

Given the well established gender differences in health production (Gathmann et al., 2015), we perform a heterogeneity analysis by gender, examining both health outcomes (cf. Table 10) and health-related behaviors (see Table A2 in the Appendix). Our results suggest more pronounced protective effects of education against health deterioration for men than women, and communist education adds up to this difference significantly.

Table 10: The effects of education on health by gender

	Self-reported general health (1-5)		Chronic diseases (0-1)	
	Women	Men	Women	Men
Education	0.004	0.021	-0.007	-0.012
	(0.004)	(0.004)	(0.002)	(0.002)
Communist education	0.000	0.008	-0.006	-0.009
	(0.002)	(0.002)	(0.001)	(0.001)
Joint stat. sig.	0.51	22.32	20.93	50.16
N	76759	61542	63249	51240
R^2	0.353	0.313	0.187	0.156
Age, Age^2	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

Specifically, we find that benefits of Soviet communist education, compared to non-communist education, on the likelihood of being chronically ill are more pronounced for men than for women. Table A3 reveals substantial differences in risk behaviours of women

and men aged at least 50 in formerly communist countries, pointing to highly risky nicotine use by men. Additional analysis suggests that the documented heterogeneity might result from the differential reductions in the periods of regular cigarette consumption (on average by 2.6 and 1.9 years for men and women, respectively) and in the frequency of excessive alcohol consumption (respectively by 15 and 1 percentage points) due to an additional year of communist education (cf. Table A2). These effects are economically significant if related to population averages, particularly in the case of nicotine consumption. An additional year of communist education reduces the period of regular cigarette smoking and excessive alcohol consumption for men by 25% and 15%, respectively, whereas for women by 27% and by 1%, respectively.

Another mechanism related to health-related behaviors could contribute to the gender heterogeneity in the education effects seems to be the substantially more pronounced increase of physical activity for men as a result of communist than non-communist education (see Table A2). An additional year of communist education increases the frequency of undertaking physical activity requiring moderate effort for men by 1.3% on average, on top of the effect of non-communist education. The positive effects for women are also present, but slightly less pronounced (1.0%).

Furthermore, we examine the heterogeneity of education effects across the formerly communist countries and find results that are broadly reassuring, as shown in Table 11. Although the effects are heterogeneous across countries, especially with regards to self-reported health in Czech Republic, Georgia, Hungary, Lithuania and Russia, the protective effects of an additional year in communist education reducing the risk of being chronically ill in later life are documented for all examined countries except for Hungary. Our results show that the effect of an additional year of communist education is not driven by any one post-communist country.

Table 11: The effects of education on health by formerly communist country

	Bulgaria	Czech R.	E. Germany	Estonia	Georgia	Hungary	Lithuania	Poland	Romania	Russia	Total
						Self-reported general health (1-5)					
Education	0.010	0.009	0.011	0.005	0.003	0.012	0.001	0.004	0.015	0.006	0.011
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.004)	(0.005)	(0.003)
Communist education	0.013	-0.004	0.016	0.006	-0.016	-0.011	-0.006	0.002	0.005	-0.000	0.004
	(0.003)	(0.003)	(0.006)	(0.004)	(0.003)	(0.007)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)
N	61279	54518	49623	56305	56645	51344	58482	68430	60437	57297	138301
R^2	0.199	0.179	0.138	0.198	0.228	0.238	0.258	0.123	0.214	0.236	0.337
						Chronic diseases (0-1)					
Education	-0.006	-0.005	-0.006	-0.000	-0.007	-0.011	-0.001	-0.007	-0.005	-0.014	-0.009
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)
Communist education	-0.007	-0.006	-0.018	-0.009	-0.002	0.007	-0.013	-0.006	-0.008	-0.010	-0.007
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
N	41734	39459	36361	42375	38110	42842	43944	55173	44041	138301	114489
R^2	0.117	0.089	0.090	0.098	0.096	0.132	0.117	0.154	0.106	0.099	0.176
Sex	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age, Age^2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-spec. TT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: TT - time trends. FE - fixed effects. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

5 Robustness analysis

5.1 Alternative estimation methods

Next, we replace the reduced form used in our main analysis with the two-stage least squares linear instrumental variable regression, exploiting the SHARE data with detailed information on the years spent in schooling along with compulsory education reforms. We use the number of years in (communist) compulsory education as the instrument for endogenous (communist) schooling.

The results displayed in Table A4 point to the protective effects of communist education on health deterioration for men over 50 years of age (reduced risk of death due to an additional year of education under communism, conditional on surviving till the age of 50 years). Our main identification strategy fails to yield a significant effect for any of the examined SHARE subsamples, which might suggest the superiority of IV design. Unfortunately, GGS data prevent us from conducting similar IV analysis due to the lack of data on schooling years in the survey.

Our main identification strategy relies on the assumption of constant treatment effects. However, because compulsory education reforms occurred at different times across countries over the past century, this assumption may not hold, and variation in reform timing could bias the estimated effect of education. To address this, our main specification controls for year of birth, includes country fixed effects, and incorporates country-specific time trends. Additionally, we conduct an event study analysis with dynamic effects, following De Chaisemartin and d'Haultfoeuille (2023).

More specifically, initial analysis of the number of negative weights in the difference in differences estimation of the communist education effect shows significantly smaller number of negative than positive weights (cf. Table A5) and the sum of negative weights is small (its absolute value ranges from 0.004 to 0.339), especially in the analyses of self-reported health and chronic diseases using GGS data. Hence, we expect that the contamination stemming

from the heterogeneity of treatment effects is limited.

Finally, the results from the event study analysis that consider the staggered nature of the treatment (cf. Table A6) confirm that indeed, the contamination of the average treatment effects obtained under the constant treatment effect assumption in our main specification is limited. The average treatment effect of communist education is statistically significantly positive for the self-reported health and negative for chronic illness as well as for the mortality over 50 years of age, even though the limited power of the analysis (due to small number of formerly communist countries and exclusion of more recent education reform that did not affect 50+ population). The detailed results of the event study analysis are provided in the Appendix (Figures A3, A4 and A5, respectively).

5.2 Alternative estimation specifications

It is possible that the non-linear gains in life expectancy occurring alongside the expansion of compulsory education affect our results. Therefore, instead of controlling for the country-specific time trends and year of birth, we introduce to the specification year of birth fixed effects, controlling for wave and country fixed effects (cf. Table A7). The results are reassuring, particularly with respect to the communist education protective effects against chronic diseases, although the magnitude of the effect is smaller than in the main specification. Hence, the results on the effects of communist education reducing the risk of having any chronic diseases are robust.

Furthermore, in the main specification the robust standard errors are clustered at the individual level. In Tables A8 and A9 we report results from the estimation with bootstrapped standard errors clustered at the country and cohort level, which is in line with main analysis. Results from both the GGS and SHARE samples are reassuring and support the finding that communist education provided a stronger protective effect against health deterioration than non-communist education.

In addition, we conducted the analyses for the communist education treated as a dummy

variable (cf. Tables A10 and A11), for the cohorts of individuals born only after 1979 (Table A12), and excluding each country one by one (Tables A13 and A14). We also studied the potential bias stemming from variation in the extent of decentralization of the educational systems (Table A15). These additional analyses are in line with our main results.

5.3 Other robustness tests

To exclude the possibility of a spurious effect of education on health, we conduct a placebo check. Specifically, we assign a reform of extending compulsory education by one year in 1963 in all the countries, in the time when no reforms were actually implemented. To avoid picking up the effects of the reforms that were actually deployed before and after 1963, we limit the placebo analysis to the cohorts of individuals born between 1953 and 1972. Table A16 shows the results of the placebo test pointing to insignificant effects of an additional year of education, regardless if communist or not, which supports the robustness of the main results.

The results obtained in the main specification are robust to three additional tests, results of which are reported in Appendix Table A17. Specifically, we examine if the effects documented for the larger set of formerly communist countries are in line with the results obtained using three alternative research samples.

Firstly, we analyze the previously excluded population of individuals living in Germany, where Soviet regime enforced communist educational system in the Eastern part (cf. panel an in Table A17), unlike in the Western Germany. A similar analysis was used to assess the communist education effects in a seminal study by Fuchs-Schündeln and Masella (2016). We find reassuring results for the relative effects of communist and non-communist education using German sub-sample only.

Secondly, in order to focus the analysis on the periods during which the Soviet regime was strongest, we removed the cohorts of individuals born in the years 1970-1991 who experienced the deterioration and final dissolution of Soviet communism (cf. panel b in Table A17). In

this robustness check we examine the cohorts with the deepest differences in the school curricula between communist and Western European education. The results confirm the reliability of our main results.

Thirdly, the research sample was limited to those individuals only who were born in the current country of residence (cf. panel c in Table A17). The results on the risk of being chronically ill remain robust to such sample selection, unlike the results pertaining to self-reported health. The latter might stem from the cultural factors, alongside various reference points for the migrants and non-migrants, to which the self-reported health is compared.

The potential interruptions in the education system operations during World War II are likely to affect the results found in our study, as military activities taking place in many European regions might have disrupted schooling and prevented children from attending classes on a regular basis. In many countries post-war classes were overcrowded, children started schooling at older age than in regular times, and were more likely to skip lower grades and be promoted to higher classes (Chłosta-Sikorska, 2016, e.g.). These however would result in underestimation of the education effects, and hence do not affect the conclusions of our study. As documented in Table A18, our results remain robust to the exclusion of cohorts affected by the war in GGS. The analysis using SHARE (cf. Table A19) are suggestive of reduced mortality due to an additional year of communist education.

Finally, we discuss another source of potential bias that might result from the repetition of a class or earlier entry to the system. However, this concern can be ignored, because we use the reduced form approach in our estimations, and instead of the number of years in schooling, we use the state regulations related to the number of compulsory grades to be completed by all individuals subject to these regulations. Therefore, no measurement error is present in the data. However, the indirect consequence of class repetition might be lower human capital attainment and earlier entry into the labour force. This, in turn, might reduce the size of the protective effects of education on health outcomes and health-related behaviours, which does not affect our conclusion. Earlier than obligatory entry to the education system, which

was possible, might affect the effect sizes documented in the present study. However, in the existing literature, the assumption of the effects of compulsory education being constant regardless of the age of children has been widely accepted. A comparative analysis of the effects of the increased compulsory education implemented through the addition of schooling years and the reduction of the entry age to the education system might shed more light on this question. However, the predominance of the same entry age to compulsory schooling in the examined sample of countries lends little opportunity for such a study. The enrolment ratios for compulsory education in post-war Europe were very high (Benavot and Resnik, 2006), so the intention-to-treat approach used in present study is feasible.

6 Conclusion

Education systems are designed to pursue different goals, including human capital formation, yet there is limited evidence of the extent to which variation across political regimes can explain such differences, especially in explaning later life health. In this paper, we explore the differential priority of health and physical activity in Soviet communist countries, and its effect on later-life health. By comparing cohorts that were exposed to longer compulsory school years, and cohorts that were exposed to shorter compulsory school years – overall and under communism – using a series of reforms in compulsory education, our study documents more pronounced positive education effects on lifelong health for an additional year in Soviet communist as compared to non-communist (i.e post-communist and Western) education systems in Europe. The observed effects are more significant for men than women.

We show that one mechanism underlying the stronger impact of Soviet communist education, compared to non-communist education, is physical activity. Individuals aged 50 and older with longer exposure to Soviet education, where curricula included extensive compulsory PE classes and numerous extracurricular sports opportunities, engage in physical activity requiring moderate effort significantly more often. Additionally, the effects of edu-

cation on the marriage market, which increase the likelihood of being married in later life and are associated with better health, are more pronounced for those with communist education.

Other potential mechanisms include peer effects and their variation across communist and non-communist country cultures, particularly if cohorts affected by the reforms extending compulsory education experienced stronger peer influences (Fischer et al., 2021). However, this is unlikely, as cultural and social norms typically evolve gradually over time. Furthermore, communist education systems were not only affected by the curricula and compulsory education reforms but also by the (under)development of the physical infrastructure, which is particularly relevant in those formerly communist countries that suffered major destruction during the occupation and military activities on the war front, and were challenged with a major post-war increase in birthrates. Improvements in school buildings' infrastructure, associated with the availability of sports facilities and equipment might be another channel of the education effects operating separately from the effects of the role of physical education classes in the school curricula.

Finally, another explanation is that returns to education in formerly communist countries are higher than in Western Europe as far as income is concerned (Myck et al., 2009; Staneva et al., 2022). The latter was true also for education attained under communism. Possibly one explanation for the increased returns to education lies in Soviet education having significantly stronger positive effects on health as well as health-related behaviours than non-communist education in Europe.

Our results document evidence of the positive effects of education (also under Soviet communist regimes) on later-life health and health-related behaviours in a large set of formerly communist countries. Although the Soviet health care systems were less efficient that non-communist counterparts in Europe, and provided lower quality of health care (Costa-Font and Niciński, 2023), they developed an education system successfully protecting against health deterioration in later life, decreasing risk of chronic illnesses and improving self-reported general health. Our analysis of gender heterogeneity points to the protective effects of com-

pulsory Soviet education making men more similar to women concerning nicotine and alcohol consumption throughout their lives, leading to the reduction of health-related risks resulting from these behaviours.

Acknowledgements

The research was supported by the Polish National Science Centre from grant no. 2019/33/B/HS4/00387 and from the Polish National Agency for Academic Exchange, Bekker programme grant no. PPN/BEK/2019/1/00039. We are grateful to three anonymous referees, Martin Karlsson and Jorge Garcia-Hombrados for their valuable support with data analysis and to Andrzej Żak for his support in verifying the data on reforms' implementation dates. All errors are our own and the usual disclaimer applies.

References

Abakumov, A. (1974). *Narodnoe obrazovanie v SSSR. Sbornik dokumentov*. Pedagogika, Moskva.

Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., and Syme, S. L. (1994). Socioeconomic status and health: the challenge of the gradient. *American Psychologist*, 49(1):15.

Angrist, J. D. and Krueger, A. B. (1991). Does compulsory school attendance affect schooling and earnings? *The Quarterly Journal of Economics*, 106(4):979–1014.

Arendt, J. N. (2005). Does education cause better health? A panel data analysis using school reforms for identification. *Economics of Education Review*, 24(2):149–160.

Avendano, M., de Coulon, A., and Nafilyan, V. (2020). Does longer compulsory schooling

affect mental health? Evidence from a British reform. *Journal of Public Economics*, 183:104137.

Bain, L. (1990). A critical analysis of the hidden curriculum in physical education. *Physical education, curriculum and culture: Critical issues in the contemporary crisis*, pages 23–42.

Barrett, D. B., Kurian, G. T., and Johnson, T. M. (2000). *World Christian Encyclopedia*, volume 3. Oxford University Press Oxford.

Becker, S. O., Mergele, L., and Woessmann, L. (2020). The separation and reunification of Germany: Rethinking a natural experiment interpretation of the enduring effects of communism. *Journal of Economic Perspectives*, 34(2):143–171.

Benavot, A. and Resnik, J. (2006). Lessons from the past: A comparative socio-historical analysis of primary and secondary education. *Educating all children: A global agenda*, pages 123–229.

Bobak, M., Pikhart, H., Rose, R., Hertzman, C., and Marmot, M. (2000). Socioeconomic factors, material inequalities, and perceived control in self-rated health: Cross-sectional data from seven post-communist countries. *Social Science & Medicine*, 51(9):1343–1350.

Braakmann, N. (2011). The causal relationship between education, health and health related behaviour: Evidence from a natural experiment in England. *Journal of Health Economics*, 30(4):753–763.

Breslow, L., Hoaglin, L., Rasmussen, G., and Abrams, H. K. (1954). Occupations and cigarette smoking as factors in lung cancer. *American Journal of Public Health and the Nations Health*, 44(2):171–181.

Brunello, G., Fabbri, D., and Fort, M. (2013a). The causal effect of education on body mass: Evidence from Europe. *Journal of Labor Economics*, 31(1):195–223.

Brunello, G., Fort, M., Schneeweis, N., and Winter-Ebmer, R. (2016). The causal effect of education on health: What is the role of health behaviors? *Health Economics*, 25(3):314–336.

Brunello, G., Fort, M., Weber, G., and Weiss, C. (2013b). Testing the internal validity of compulsory school reforms as instrument for years of schooling. Technical report.

Card, D. (1999). The causal effect of education on earnings. *Handbook of Labor Economics*, 3:1801–1863.

Chłosta-Sikorska, A. (2016). Odbudowa edukacji w Krakowie po II wojnie światowej. Wprowadzenie do zagadnienia. In *Miasto w Europie Środkowo-Wschodniej. Procesy modernizacyjne*, pages 314–333. Wydawnictwo Naukowe Uniwersytetu Pedagogicznego.

Clark, D. and Royer, H. (2013). The effect of education on adult mortality and health: Evidence from Britain. *American Economic Review*, 103(6):2087–2120.

Conti, G., Heckman, J., and Urzua, S. (2010). The education-health gradient. *American Economic Review*, 100(2):234–38.

Costa-Font, J., García-Hombrados, J., and Nicińska, A. (2024). Long-lasting effects of indoctrination in school: Evidence from the People's Republic of Poland. *European Economic Review*, 161:104641.

Costa-Font, J. and Nicińska, A. (2023). Soviet communism and later-life health and health care. In *Handbook on the Political Economy of Health Systems*, pages 42–56. Edward Elgar Publishing.

Costa-Font, J., Nicińska, A., and Roig, M. R. (2025). The effects on inequality and mobility of exposure to Soviet Communism in Eastern Europe. *Journal of Comparative Economics*.

Courtin, E., Nafilyan, V., Glymour, M., Goldberg, M., Berr, C., Berkman, L. F., Zins, M., and Avendano, M. (2019). Long-term effects of compulsory schooling on physical, mental

and cognitive ageing: a natural experiment. *Journal of Epidemiology and Community Health*, 73(4):370–376.

Cutler, D. M. and Glaeser, E. (2005). What explains differences in smoking, drinking, and other health-related behaviors? *American Economic Review*, 95(2):238–242.

Davies, N. M., Dickson, M., Davey Smith, G., van den Berg, G. J., and Windmeijer, F. (2018). The causal effects of education on health outcomes in the UK Biobank. *Nature Human Behaviour*, 2(2):117–125.

De Chaisemartin, C. and d'Haultfoeuille, X. (2023). Two-way fixed effects and differences-in-differences with heterogeneous treatment effects: A survey. *The Econometrics Journal*, 26(3):C1–C30.

De Walque, D. (2010). Education, information, and smoking decisions evidence from smoking histories in the United States, 1940–2000. *Journal of Human Resources*, 45(3):682–717.

DeBray, E. H. (2006). *Politics, ideology, and education*. Teachers College Press.

Desfosses, H. (2013). *Soviet Population Policy: conflicts and constraints*. Elsevier.

Drozdek-Małolepsza, T. and Rodziewcz-Gruhn, J. (2011). *Z najnowszych dziejów kultury fizycznej i turystyki w Polsce*. Wydawnictwo im. Stanisława Podobińskiego Akademii im. Jana Długosza.

Duflo, E. (2001). Schooling and labor market consequences of school construction in Indonesia: Evidence from an unusual policy experiment. *American Economic Review*, 91(4):795–813.

Fischer, M., Gerdtham, U.-G., Heckley, G., Karlsson, M., Kjellsson, G., and Nilsson, T. (2021). Education and health: long-run effects of peers, tracking and years. *Economic Policy*, 36(105):3–49.

Fuchs-Schündeln, N. and Masella, P. (2016). Long-lasting effects of socialist education. *Review of Economics and Statistics*, 98(3):428–441.

Gathmann, C., Jürges, H., and Reinhold, S. (2015). Compulsory schooling reforms, education and mortality in twentieth century Europe. *Social Science & Medicine*, 127:74–82.

Golubeva, N. E. (1987). *Narodboe obrazowanie v SSSR. Sbornik normativnykh aktov*. Moskva: Iurid. lit.

Goodin, R. E. and Reeve, A. (2018). Do neutral institutions add up to a neutral state? In *Liberal Neutrality*, pages 201–218. Routledge.

Grabner, M. (2009). The causal effect of education on obesity: Evidence from compulsory schooling laws. *Available at SSRN 1505075*.

Grant, S. (2017). *Russian and Soviet Healthcare from an International Perspective*. Springer.

Halonen, J. I., Stenholm, S., Kivimäki, M., Pentti, J., Subramanian, S., Kawachi, I., and Vahtera, J. (2015). Is change in availability of sports facilities associated with change in physical activity? A prospective cohort study. *Preventive Medicine*, 73:10–14.

Hamad, R., Elser, H., Tran, D. C., Rehkopf, D. H., and Goodman, S. N. (2018). How and why studies disagree about the effects of education on health: A systematic review and meta-analysis of studies of compulsory schooling laws. *Social Science & Medicine*, 212:168–178.

Hinote, B. P. and Webber, G. R. (2012). Drinking toward manhood: masculinity and alcohol in the former USSR. *Men and Masculinities*, 15(3):292–310.

Hoque, M. M., King, E. M., Montenegro, C. E., and Orazem, P. F. (2019). Revisiting the relationship between longevity and lifetime education: Global evidence from 919 surveys. *Journal of Population Economics*, 32(2):551–589.

Ivanova, G. M. (2018). *Sovetskaia shkola v 1950–1960-e gody.* Fond Moskovskoe vremia.

Jankowski, K. (2010). Kultura fizyczna w dobie przemian systemowych. *Wydawnictwo AWF.*

Jenkins, R., Klein, J., and Parker, C. (2005). Mental health in post-communist countries. *BMJ*, 331(7510):173–174.

Jürges, H., Kruk, E., and Reinhold, S. (2013). The effect of compulsory schooling on health - evidence from biomarkers. *Journal of Population Economics*, 26(2):645–672.

Jürges, H., Reinhold, S., and Kemptner, D. (2010). Changes in compulsory schooling and the causal effect of education on health: Evidence from Germany. Technical report, MEA Discussion Paper.

Kamer, S. T. and Kabaoglu, S. Q. (2021). Coeducation and women's education: Opinions to mixed schooling in Russia. *International Online Journal of Educational Sciences*, 13(3).

Kenkel, D. S. (1991). Health behavior, health knowledge, and schooling. *Journal of Political Economy*, 99(2):287–305.

Kirk, D. and Colquhoun, D. (1989). Healthism and physical education. *British Journal of Sociology of Education*, 10(4):417–434.

Kubik, A. K., Parkin, D. M., Plesko, I., Zatoński, W., Kramarova, E., Möhner, M., Friedl, H. P., Juhasz, L., Tzvetansky, C. G., and Reissigova, J. (1995). Patterns of cigarette sales and lung cancer mortality in some central and eastern European countries, 1960-1989. *Cancer*, 75(10):2452–2460.

Kurian, G. T. (1988). *World Education Encyclopedia. Vol. 3. Major Countries-Sudan-Zambia. Middle Countries-Afghanistan-Zimbabwe. Minor Countries-Andorra-Yemen. Appendixes.* Facts on file publications.

Kurkowska-Budzan, M. and Stasiak, M. (2016). *Stadion na peryferiach.* Towarzystwo Autorów i Wydawców Prac Naukowych "Universitas".

Lacombe, G. (1997). Nationalism and education in Latvia, 1918–1940. *Journal of Baltic Studies*, 28(4):309–338.

Lager, A. C. J. and Torssander, J. (2012). Causal effect of education on mortality in a quasi-experiment on 1.2 million Swedes. *Proceedings of the National Academy of Sciences*, 109(22):8461–8466.

Laizāne, I. (2019). Latviešu valoda kā svešvaloda: lingvodidaktikas virziena attīstība latvijā un ārpus tās. *Latvian language as a foreign language: the development of the linguodidactic direction in Latvia and abroad*.

Lenartowicz, M. and Jankowski, K. W. (2014). Reconstructing class sport practices in post-communist Poland. *Physical Culture and Sport*, 63(1):12.

Lleras-Muney, A. (2005). The relationship between education and adult mortality in the United States. *Review of Economic Studies*, 72(1):189–221.

Lott, Jr, J. R. (1999). Public schooling, indoctrination, and totalitarianism. *Journal of Political Economy*, 107(S6):S127–S157.

Marlow-Ferguson, R. (2002). *World education encyclopedia: A survey of educational systems worldwide*, volume 2. Gale Cengage.

Mazumder, B. (2008). Does education improve health? A reexamination of the evidence from compulsory schooling laws. *Economic Perspectives*, 32(2).

McKee, M., Bobak, M., Rose, R., Shkolnikov, V., Chenet, L., and Leon, D. (1998). Patterns of smoking in Russia. *Tobacco Control*, 7(1):22–26.

Metsä-Tokila, T. (2002). Combining competitive sports and education: how top-level sport became part of the school system in the Soviet Union, Sweden and Finland. *European Physical Education Review*, 8(3):196–206.

Murtin, F. and Viarengo, M. (2011). The expansion and convergence of compulsory schooling in Western Europe, 1950–2000. *Economica*, 78(311):501–522.

Myck, M., Nicinska, A., and Morawski, L. (2009). Count your hours: returns to education in Poland. Technical report, IZA Discussion Paper.

Neuburger, M. C. (2012). Balkan smoke: tobacco and the making of modern Bulgaria. In *Balkan Smoke*. Cornell University Press.

Nica, I. and Birzea, C. (1973). Educational innovation in European socialist countries: A comparative overview. *International Review of Education*, pages 447–459.

Nikitara, K., Odani, S., Demenagas, N., Rachiotis, G., Symvoulakis, E., and Vardavas, C. (2021). Prevalence and correlates of physical inactivity in adults across 28 European countries. *European Journal of Public Health*, 31(4):840–845.

Oosterbeek, H. and Webbink, D. (2007). Wage effects of an extra year of basic vocational education. *Economics of Education Review*, 26(4):408–419.

Pate, R. R., Small, M. L., Ross, J. G., Young, J. C., Flint, K. H., and Warren, C. W. (1995). School physical education. *Journal of School Health*, 65(8):339–343.

Pawlaczek, Z. (2005). *Physical education in post-communist Poland: A transitory journey*. PhD thesis, Durham University.

Pellegrini, A. D. and Smith, P. K. (1998). Physical activity play: The nature and function of a neglected aspect of play. *Child Development*, 69(3):577–598.

Polanska, K., Znyk, M., and Kaleta, D. (2022). Susceptibility to tobacco use and associated factors among youth in five central and eastern European countries. *BMC Public Health*, 22(1):72.

Prokopenko, L. (2018). Development of methods aimed at students' strength and speed performance improvement. In *Research Paradigms Transformation in Social Sciences,*

vol 50. European Proceedings of Social and Behavioural Sciences, pages 975–980. Future Academy.

Ramezankhani, A., Azizi, F., and Hadaegh, F. (2019). Associations of marital status with diabetes, hypertension, cardiovascular disease and all-cause mortality: a long term follow-up study. *PloS One*, 14(4):e0215593.

Riordan, J. (1980). *Sport in Soviet society: development of sport and physical education in Russia and the USSR*, volume 22. CUP Archive.

Roberts, K. and Fagan, C. (1999). Young people's participation in sport and other leisure activities in the former Soviet Union. *European Physical Education Review*, 5(1):75–90.

Roubal, P. (2003). Politics of gymnastics: mass gymnastic displays under communism in Central and Eastern Europe. *Body & Society*, 9(2):1–25.

Salavecz, G., Chandola, T., Pikhart, H., Dragano, N., Siegrist, J., Jöckel, K.-H., Erbel, R., Pajak, A., Malyutina, S., Kubinova, R., et al. (2010). Work stress and health in Western European and post-communist countries: an East–West comparison study. *Journal of Epidemiology & Community Health*, 64(01):57–62.

Sallis, J. F., McKenzie, T. L., Alcaraz, J. E., Kolody, B., Faucette, N., and Hovell, M. F. (1997). The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. Sports, Play and Active Recreation for Kids. *American Journal of Public Health*, 87(8):1328–1334.

Schrek, R., Baker, L. A., Ballard, G. P., and Dolgoff, S. (1950). Tobacco smoking as an etiologic factor in disease. I. Cancer. *Cancer Research*, 10(1):49–58.

Sheiman, I., Shishkin, S., and Shevsky, V. (2018). The evolving Semashko model of primary health care: the case of the Russian Federation. *Risk Management and Healthcare Policy*, 11:209.

Shephard, R. J. and Trudeau, F. (2000). The legacy of physical education: Influences on adult lifestyle. *Pediatric Exercise Science*, 12(1):34–50.

Shlapentokh, V. (1991). The soviet family in the period of the decay of socialism. *Journal of Comparative Family Studies*, 22(2):267–279.

Silles, M. A. (2009). The causal effect of education on health: Evidence from the United Kingdom. *Economics of Education Review*, 28(1):122–128.

Soboleva, M. (2017). The concept of the "New Soviet Man" and its short history. *Canadian-American Slavic Studies*, 51(1):64–85.

Staneva, A. V., Arabsheibani, G. R., and Murphy, P. (2022). Returns to education in four transition countries. In *Critical Perspectives on Economics of Education*, pages 182–212. Routledge.

Starks, T. (2023). Tobacco Product Design, Marketing, and Smoking in the USSR. In *Consumption and Advertising in Eastern Europe and Russia in the Twentieth Century*, pages 243–264. Springer.

Stefler, D., Murphy, M., Irdam, D., Horvat, P., Jarvis, M., King, L., McKee, M., and Bobak, M. (2018). Smoking and mortality in Eastern Europe: Results from the Priv-Mort retrospective cohort study of 177 376 individuals. *Nicotine and Tobacco Research*, 20(6):749–754.

Szakács, S. (2017). *Europe in the classroom: World culture and nation-building in post-socialist Romania*. Springer.

Szubert, R. (2010). *Kultura fizyczna w przemianach wsi polskiej w latach 1944-1956*. Wydawnictwo Akademii Wychowania Fizycznego.

Tay, A. E.-S. (1972). The status of women in the Soviet Union. *The American Journal of Comparative Law*, 20(4):662–692.

Tomiak, J. (1985). Education in the USSR. Equality and the 'new Soviet man'. In *Equality and Freedom in Education*, pages 135–177. Routledge.

Ulyanova, S., Fisheva, A., Sosnina, M., Maria, S., et al. (2018). GTO concept: Design and implementation in USSR in late 1920s-early 1930s. *European Proceedings of Social and Behavioural Sciences*, 51.

Urniaż, J. and Jurgielewicz-Urniaż, M. (2015). Rozwój szkolnego wychowania fizycznego na przestrzeni dziejów w Polsce a współczesny problem jego unikania. *Prace Naukowe Akademii im. Jana Długosza w Częstochowie. Kultura Fizyczna*, 14(2).

Van Kippersluis, H., O'Donnell, O., and Van Doorslaer, E. (2011). Long-run returns to education: Does schooling lead to an extended old age? *Journal of Human Resources*, 46(4):695–721.

Varo, J. J., Martínez-González, M. A., de Irala-Estévez, J., Kearney, J., Gibney, M., and Martínez, J. A. (2003). Distribution and determinants of sedentary lifestyles in the European Union. *International Journal of Epidemiology*, 32(1):138–146.

Wang, Y., Jiao, Y., Nie, J., O'Nil, A., Huang, W., Zhang, L., Han, J., Liu, H., Zhu, Y., Yu, C., et al. (2020). Sex differences in the association between marital status and the risk of cardiovascular, cancer, and all-cause mortality: a systematic review and meta-analysis of 7,881,040 individuals. *Global Health Research and Policy*, 5(1):1–16.

Zatoński, W., Boyle, P., Gray, N., Henningfield, J., and Seffrin, J. (2004). Tobacco smoking in central European countries: Poland. *Tobacco Science, Policy and Public Health*, pages 235–252.

Zatoński, W. A., Przewoźniak, K., Sulkowska, U., Mańczuk, M., and Gumkowski, J. (2009). Palenie tytoniu w populacji mężczyzn i kobiet w Polsce w latach 1974–2004. *Zdrowie Publiczne i Zarządzanie*, 7(2).

Zilberman, V. (1990). *Physical education and sport for children and youth in the USSR (1969-1989)*. Papyrus.

A Appendix tables

Table A1: Descriptive statistics in Eastern and Western European countries in GGS and SHARE research samples

	Eastern Bloc		Western Bloc	
	Mean	St. D	Mean	St. D
GGS				
Age (years)	48.29	16.948	46.44	15.410
Female (per cent)	55.81	49.661	54.92	49.758
Compulsory schooling (years)	8.328	1.3380	7.960	1.5046
Self-reported health (1-5 scale)	3.480	0.9805	4.023	0.8390
Chronically ill (per cent)	36.51	48.147	29.52	45.616
SHARE				
Age (years)	70.61	9.1097	70.04	9.6316
Female (per cent)	59.46	49.100	56.49	49.578
Compulsory schooling (years)	7.644	0.6203	7.323	1.5768
Cigarette smoking (years)	10.25	16.822	10.01	16.441
Ever smoked (per cent)	37.20	48.337	37.69	48.462
Moderate physical activity (1-4 scale)	3.211	1.1464	3.244	1.1114
Vigorous physical activity (1-4 scale)	2.080	1.2698	2.324	1.3204
Any physical activity (per cent)	84.18	36.493	86.43	34.251
Ever >6 drinks at a time (per cent)	98.55	11.941	97.81	14.618

Source: Authors' own analysis based on GGS waves 1-2 and SHARE wave 8.

Table A2: The effects of education on health-related behaviours by gender

	Ever smoked		Years smoked		Any physical activity		Moderate activity		Excessive drinking	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Education	-0.011	-0.009	-0.349	-0.714	-0.018	-0.010	-0.036	-0.018	-0.005	-0.044
	(0.005)	(0.007)	(0.169)	(0.265)	(0.004)	(0.005)	(0.013)	(0.015)	(0.010)	(0.022)
Communist education	0.006	0.017	0.139	0.661	0.007	0.011	0.034	0.040	-0.002	-0.009
	(0.003)	(0.005)	(0.087)	(0.181)	(0.003)	(0.004)	(0.009)	(0.012)	(0.005)	(0.011)
Join stat. sig.	5.03	7.49	3.94	11.82	13.66	6.50	11.73	6.77	0.15	2.13
N	14912	10557	14808	10416	14894	10543	14893	10538	14880	10531
R^2	0.101	0.042	0.066	0.030	0.144	0.084	0.153	0.097	0.028	0.049
Sex	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age, Age^2	Yes	Yes								
	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' own analysis based on SHARE wave 8.

Notes: Robust standard errors in parentheses.

Table A3: Descriptive statistics of population 50+ in Eastern Bloc in GGS and SHARE research samples, by gender

	Total		Women		Men	
	Mean	St. D	Mean	St. D	Mean	St. D
			GGS			
Age (years)	63.70	8.755	64.05	8.797	63.21	8.673
Compulsory schooling (years)	7.380	1.015	7.402	0.9991	7.351	1.0363
Self-reported health (1-5 scale)	2.972	0.887	2.903	0.8754	3.069	0.8948
Chronically ill (per cent)	53.01	49.910	56.95	49.515	47.43	49.935
			SHARE			
Age (years)	70.61	9.110	70.62	9.315	70.59	8.7826
Compulsory schooling (years)	7.644	0.6203	7.655	0.6354	7.627	0.5972
Cigarette smoking (years)	10.25	16.822	7.134	14.428	14.86	18.928
Ever smoked (per cent)	37.20	48.337	28.475	45.133	50.00	50.006
Moderate physical activity (1-4 scale)	3.211	1.146	3.203	1.153	3.223	1.1354
Vigorous physical activity (1-4 scale)	2.081	1.270	1.973	1.231	2.246	1.3111
Any physical activity (per cent)	84.18	36.493	83.86	36.79	84.58	36.028
Ever >6 drinks at a time (per cent)	98.55	11.941	99.56	6.629	96.99	17.078

Source: Authors' own analysis based on GGS waves 1-2 and SHARE wave 8.

Table A4: The effects of communist education on mortality as compared to non-communist education in SHARE using IV

	Total 50+		Women 50+		Men 50+	
	Coef. (St.E.)	F	Coef. (St.E.)	F	Coef. (St.E.)	F
Education	0.002	43.17	0.002	37.30	0.002	10.78
	(0.001)		(0.001)		(0.002)	
Communist education	-0.002	128.74	-0.002	76.87	-0.003	62.38
	(0.001)		(0.001)		(0.002)	
Joint stat. sig.	3.10		2.52		0.98	
N	25489		14922		10567	
R^2	0.018		0.019		0.021	
Sex	Yes		-		-	
Age, Age^2	Yes		Yes		Yes	
Year of birth	Yes		Yes		Yes	
Country-specific time trends	Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes	

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses. IV for (communist) schooling: number of years of (communist) compulsory education. F-statistics from the first stage estimation. Source: Authors' own analysis based on SHARE wave 8.

Table A5: Robustness of communist education effects to the heterogeneous effects of the treatment

	Self-reported general health		Chronic diseases		Mortality 50+	
	N. ATTs	Sum weights	N. ATTs	Sum weights	N. ATTs	Sum weights
			Continuous treatment			
Positive weights	375	1.170	376	1.184	231	1.339
Negative weights	119	-0.170	118	-0.184	130	-0.339
			Dichotomized treatment			
Positive weights	469	1.016	474	1.004	318	1.023
Negative weights	25	-0.016	20	-0.004	43	-0.023
Total	494	1	494	1	361	1

Source: Authors' own analysis based on GGS waves 1-2 and SHARE wave 8.

Notes: Other treatment: education.

Table A6: Average cumulative (total) effect of communist education

	Self-reported general health		Chronic diseases		Mortality 50+	
	Coef.	St. E	Coef.	St. E	Coef.	St. E
Communist education	0.060	0.010	-0.025	0.007	-0.004	0.004
N	92061		78671		26204	
Education	Yes		Yes		Yes	
Sex	Yes		Yes		Yes	
Age, Age^2	Yes		Yes		Yes	

Source: Authors' own analysis based on GGS waves 1-2 and SHARE wave 8.

Notes: Event study analysis for continuous treatment of communist education with events number set to 50.

Table A7: Robustness of the education effects to the inclusion of year of birth fixed effects

	Self-reported general health (1-5)	Chronic diseases (0-1)
Education	-0.015	0.009
	(0.003)	(0.002)
Communist education	0.002	-0.003
	(0.007)	(0.001)
N	138301	114489
R^2	0.318	0.170
Sex	Yes	Yes
Age, Age^2	Yes	Yes
Year of birth fixed effects	Yes	Yes
Country fixed effects	Yes	Yes
Time fixed effects	Yes	Yes

Source: Authors' own analysis based on GGS waves 1-2.

Notes: Robust standard errors in parentheses.

Table A8: Results using bootstrapped standard errors clustered at a cohort and country level in GGS

	Self-reported general health (1-5)						Chronic diseases (0-1)					
	Total		Women		Men		Total		Women		Men	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
Education	0.011	0.008	0.004	0.334	0.021	0.002	-0.009	0.000	-0.007	0.018	-0.012	0.000
Communist education	0.004	0.028	0.000	0.870	0.008	0.002	-0.007	0.000	-0.006	0.000	-0.009	0.000
N	138301		76759		61542		114489		63249		51240	
Sex	Yes		-		-		Yes		-		-	
Age	Yes		-		-		Yes		-		-	
Year of birth	Yes		-		-		Yes		-		-	
Country fixed effect	Yes		-		-		Yes		-		-	
Time fixed effect	Yes		-		-		Yes		-		-	

Notes: Standard errors clustered by cohort and country, obtained in wild bootstap with 1000 replications.
Source: Authors' own analysis based on GGS waves 1-2.

Table A9: Results using bootstrapped standard errors clustered at a cohort and country level in SHARE

	Coef.	p-value
Education	0.0021	0.034
Communist education	-0.0023	0.064
N	25489	
Sex	Yes	
Age, Age^2	Yes	
Year of birth	Yes	
Country fixed effects	Yes	
Time fixed effects	Yes	

Notes: Standard errors clustered by cohort and country, obtained in wild bootstap with 1000 replications.
Source: Authors' own analysis based on SHARE wave 8.

Table A10: Results using a dummy for the exposure to communist compulsory education in GGS

	Self-reported general health (1-5)	Chronic diseases (0-1)
Education (years)	0.012	-0.011
	(0.003)	(0.002)
Communist education (dummy)	0.015	-0.029
	(0.010)	(0.006)
N	138301	114489
R^2	0.337	0.175
Sex	Yes	Yes
Age, Age^2	Yes	Yes
Year of birth	Yes	Yes
Country-specific time trends	Yes	Yes
Time fixed effects	Yes	Yes
Country fixed effects	Yes	Yes

Source: Authors' own analysis based on GGS waves 1-2.

Notes: Robust standard errors in parentheses.

Table A11: Results using a dummy for the exposure to communist education in SHARE

	Total 50+	Women 50+	Men 50+
Education (years)	0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)
Communist education (dummy)	-0.015	-0.015	-0.024
	(0.011)	(0.011)	(0.013)
N	25489	25489	14922
Root MSE	0.018	0.018	0.020
Sex	Yes	-	-
Age, Age^2	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes

Notes: Robust standard errors in parentheses.
Source: Authors' own analysis based on SHARE wave 8.

Table A12: Robustness of the education effects to the exclusion of cohorts born before 1980

	Self-reported general health (1-5)	Chronic diseases (0-1)
Education	-0.027	-0.003
	(0.021)	(0.008)
Communist education	0.002	-0.003
	(0.012)	(0.006)
N	17762	13076
R^2	0.092	0.037
Sex	Yes	Yes
Age, Age^2	Yes	Yes
Year of birth	Yes	Yes
Country-specific time trends	Yes	Yes
Time fixed effects	Yes	Yes

Source: Authors' own analysis based on GGS waves 1-2.
Notes: Robust standard errors in parentheses.

Table A13: Results excluding non-communist countries

Excluding:	West Germany	France	Italy	Netherlands	Austria	Belgium	Sweden
			Self-reported general health (1-5)				
Education	0.010	0.012	0.012	0.014	0.012	0.012	0.010
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
N	129900	128222	138301	130155	133301	131140	128637
R^2	0.343	0.347	0.337	0.344	0.331	0.342	0.342
			Chronic diseases (0-1)				
Education	-0.010	-0.010	-0.010	-0.011	-0.010	-0.010	-0.013
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	107904	108241	114489	110032	113403	107333	104829
R^2	0.176	0.179	0.175	0.180	0.175	0.180	0.187
Sex	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age, Age^2	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-specific TT	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: TT- time trends. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

Table A14: Results excluding formerly communist countries

Excluding:	Bulgaria	Russia	Georgia	Hungary	Romania	Estonia	Lithuania	Poland	Czech R.	East Germany
					Self-reported general health (1-5)					
Education	0.010	0.012	0.015	0.011	0.006	0.014	0.014	0.013	0.012	0.010
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
N	125473	129455	130107	135408	126315	130447	128270	118322	132234	137129
R^2	0.333	0.329	0.331	0.338	0.334	0.336	0.325	0.331	0.337	0.337
					Chronic diseases (0-1)					
Education	-0.010	-0.007	-0.010	-0.009	-0.009	-0.013	-0.013	-0.010	-0.010	-0.010
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	107947	105640	111571	106839	102503	107306	105737	94508	110222	113320
R^2	0.171	0.179	0.175	0.167	0.173	0.176	0.170	0.158	0.179	0.175
Sex	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age, Age^2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-specific TT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: TT - time trends. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

Table A15: Results' stability across countries with centralized and decentralized education systems

	Self-reported general health (1-5)	Chronic diseases (0-1)
Education	0.012	-0.010
	(0.003)	(0.002)
Education × Decentralization	-0.000	0.000
	(0.010)	(0.005)
N	138301	1114489
R^2	0.337	0.175
Sex	Yes	Yes
Age, Age^2	Yes	Yes
Year of birth	Yes	Yes
Country-specific time trends	Yes	Yes
Time fixed effects	Yes	Yes

Source: Authors' own analysis based on GGS, waves 1-2.

Notes: Robust standard errors in parentheses. Decentralization (of education system): present in Czech Republic, Hungary, and Estonia.

Table A16: Results of placebo test

	Self-reported general health (1-5)			Chronic diseases (0-1)		
	Total	Women	Men	Total	Women	Men
Education	-0.016	-0.019	-0.015	0.005	0.012	-0.004
	(0.013)	(0.018)	(0.020)	(0.008)	(0.012)	(0.012)
Communist education	0.022	0.004	0.030	-0.005	-0.001	-0.008
	(0.016)	(0.022)	(0.024)	(0.010)	(0.014)	(0.014)
Joint stat. sig.	1.13	0.63	0.83	0.16	1.12	1.17
N	53363	29826	23537	36798	20188	16610
R^2	0.185	0.202	0.164	0.084	0.086	0.078
Sex	Yes	-	-	Yes	-	-
Age, Age^2	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

Table A17: Robustness of the education effects to alternative sample selections

	Self-reported general health (1-5)	Chronic diseases (0-1)
(a) German sub-sample		
Education	0.080	-0.023
	(0.022)	(0.011)
Communist education	0.015	-0.016
	(0.007)	(0.003)
Joint stat. sig.	11.59	14.41
N	9573	7754
R^2	0.209	0.129
(b) Excluding 1970-1990 cohorts		
Education	0.014	-0.012
	(0.003)	(0.002)
Communist education	0.006	-0.006
	(0.002)	(0.001)
Joint stat. sig.	11.62	29.09
N	94113	84301
R^2	0.271	0.127
(c) Excluding migrants		
Education	0.015	-0.011
	(0.004)	(0.002)
Communist education	0.004	-0.005
	(0.002)	(0.001)
Joint stat. sig.	10.62	23.03
N	87093	78132
R^2	0.271	0.126
Sex	Yes	Yes
Age, Age^2	Yes	Yes
Year of birth	Yes	Yes
Country-specific time trend	Yes	Yes
Time fixed effects	Yes	Yes
Country fixed effects	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS, waves 1-2.

Table A18: Robustness to the exclusion of cohorts born before 1945 in GGS

	Self-reported general health (1-5)			Chronic diseases (0-1)		
	Total	Women	Men	Total	Women	Men
Education	-0.004	-0.009	0.001	0.000	0.004	-0.005
	(0.004)	(0.005)	(0.006)	(0.002)	(0.003)	(0.003)
Communist education	0.007	0.003	0.011	-0.007	-0.008	-0.006
	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
Joint stat. sig.	7.45	1.98	16.59	31.59	9.72	15.64
N	110752	61136	49616	84552	46139	38413
R^2	0.268	0.278	0.254	0.135	0.144	0.121
Sex	Yes	-	-	Yes	-	-
Age, Age^2	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on GGS waves 1-2.

Table A19: Robustness to the exclusion of cohorts born before 1945 in SHARE

	Total 50+	Women 50+	Men 50+
Education	0.001	-0.031	0.004
	(0.000)	(0.001)	(0.001)
Communist education	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.002)
Joint stat. sig.	2.38	0.67	5.28
N	17271	10018	7253
R^2	0.0039	0.0029	0.0089
Sex	Yes	-	-
Age, Age^2	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes

Notes: Joint statistical significance of education and communist education. Robust standard errors in parentheses.
Source: Authors' own analysis based on SHARE wave 8.

B Appendix figures

Figure A1: Clockwise from top: Lech Wałęsa (Polish statesman, leader of Solidarność movenent, and Nobel Peace Prize laureate, fot. Wojtek Laski), Krzysztof Kieślowski (film director and screenwriter, fot. Wojtek Druszcz), Tadeusz Mazowiecki (Prime Minister of Poland, fot. Michał Mutor), and Kalina Jędrusik (singer and actress, fot. Jerzy Michalski) smoking a cigarette. Source: Public domain.

Figure A2: Examples of cigarettes brands and packaging in Soviet Bloc. Clockwise from top lef: Sport, Belomorkanal (en. White Sea Canal), Wayka (the dog participating in space expedition), Kosmos (en. space), Pobieda (en. victory), Popularne (en. popular). Source: Public domain.

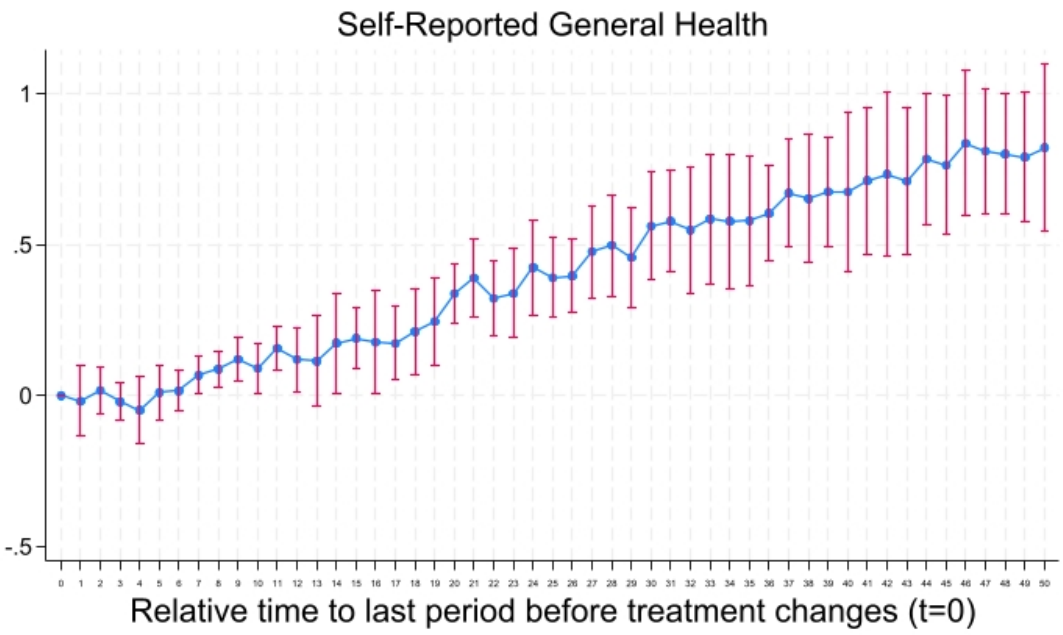

Figure A3: Event study analysis for self-reported health. Source: Authors' own analysis based on GGS waves 1-2.

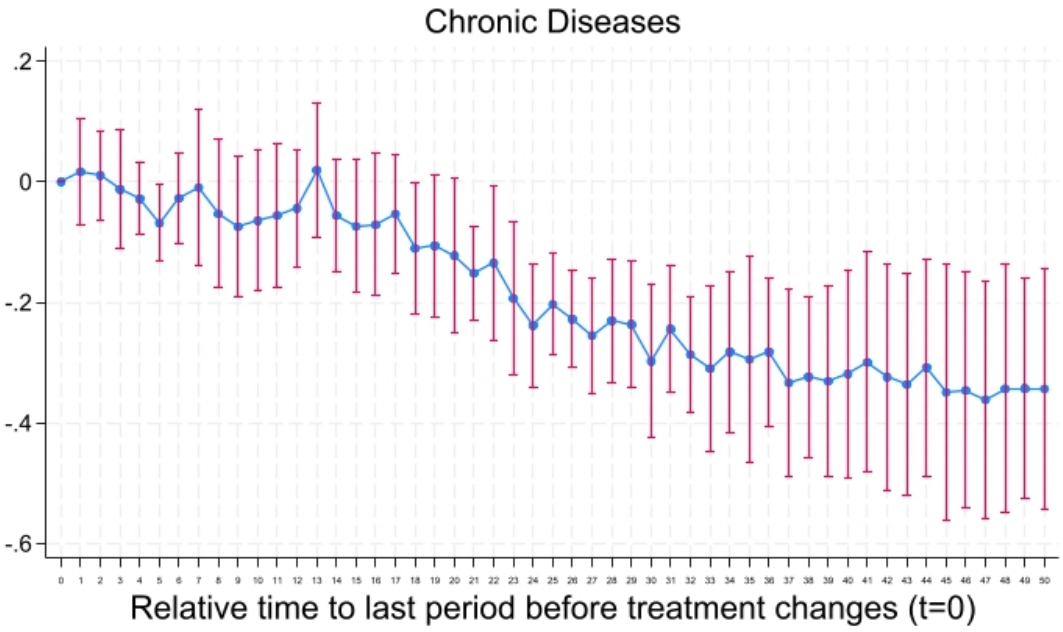

Figure A4: Event study analysis for being chronically ill. Source: Authors' own analysis based on GGS waves 1-2.

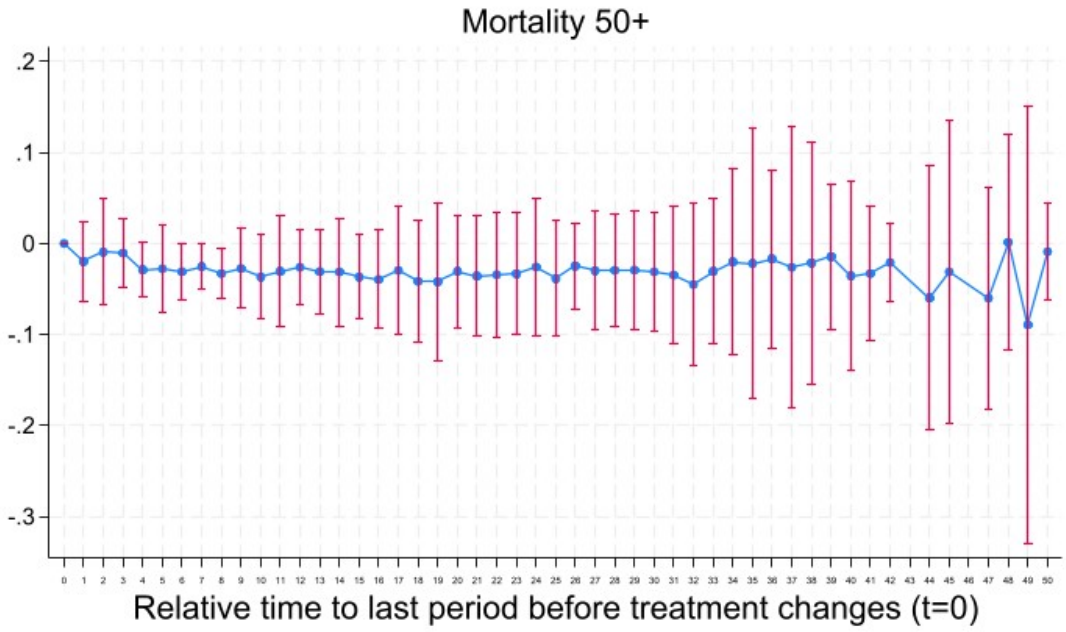

Figure A5: Event study analysis for mortality conditional on survival till the age of 50. Source: Authors' own analysis based on SHARE wave 8.