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The associations between early life circumstances and later life health and employment in Europe

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Abstract We use data from the Survey of Health, Aging, and Retirement in Europe to estimate for thirteen European countries the associations of early life circumstances—measured by childhood health and socioeconomic status (SES)—with educational attainment, and later life health and employment (at ages 50–64). In all countries and for men and women, favorable early life circumstances, and in particular a higher childhood SES, are associated with a higher level of education. In most countries and in particular for women, favorable early life circumstances are associated with better later life health, also when education is controlled for. The significant associations of favorable early life circumstances with a higher incidence of later life employment are mostly transmitted through education and later life health.

Keywords Early life circumstances · Health · Employment · SHARE

JEL Classification D00 · I10 · J10 · J20

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1 Introduction

A positive association between health and socioeconomic status (SES) in adulthood, often referred to as the SES-health gradient, is widely documented in the literature (e.g. Adler et al. 1994; Marmot and Wilkinson 1999; Pappas et al. 1993; Smith 1999). To identify the origins of this gradient, earlier studies for the U.S. (e.g. Case et al. 2002) and Canada (e.g. Currie and Stabile 2003) focus on childhood circumstances. Specifically, they pinpoint SES and health in early life—the latter mainly in terms of chronic conditions during childhood—as contributors to this positive association. This approach is supported by the extant literature that offers several theories for a relationship between early life events and (health) outcomes in later life. For instance, the *fetal-origins hypothesis* (e.g. Barker 1995; Almond and Currie 2011a) suggests a direct link from the prenatal period to adult health that may be independent of social class in adult life; *life course models* assume that illness and deprivation during childhood may have long-term consequences for health during adulthood, either directly through the illness itself or indirectly by restricting educational achievement and life opportunities (e.g. Kuh and Wadsworth 1993), and *pathways models* suggest that the observed SES-health gradient in adulthood is only indirectly attributable to early life events through later life events (e.g. Marmot et al. 2001). More recent studies for the U.K. (Case et al. 2005) and the U.S. (Case and Paxson 2008) also present evidence in line with the theoretical predictions, and show that having good health during childhood and growing up in a more comfortable environment result in a higher level of education, and good health and higher economic status later in life. Similarly, the literature on intergenerational mobility in class positions provides empirical evidence on the association between parental SES and those of their children (e.g. Erikson and Goldthorpe 2002). Recent evidence for continental Europe also shows that childhood SES is positively associated with economic status and cognitive abilities in later life (Guven and Lee 2011) and negatively correlated with cognitive decline (dal Bianco et al. 2013). All these findings are important to policymakers because they may suggest that policies aimed at improving children's health and SES have long-lasting benefits for both the individual and society because of increased human capital accumulation, hence better employment opportunities and better later life health (see also Marmot et al. 2012).

Although caution is warranted for policy recommendations based on these estimated associations, support for such recommendations is provided by several recent studies that find causal impacts of very specific exogenous early life events on later life outcomes. For instance, using the 1918 influenza pandemic as measure of a health shock around birth is shown to relate to later life outcomes such as education, health, and SES (e.g. Almond 2006; Nelson 2010; Almond and Mazumder 2005). Chen and Zhou (2007) show that the 1959–1961 famine in China adversely affected height, earnings, and labor supply, and Barreca (2010) shows that malaria exposure adversely affects educational attainment and increases poverty risk. Painter et al. (2005) and Roseboom et al. (2001, 2006) provide evidence on long-term effects on later life health of prenatal undernutrition during the Dutch famine of 1944/1945. In addition, van den Berg et al. (2006) show that economic conditions around birth—measured by the business cycle—affect mortality later in life.

Our contribution to the literature on the relationships between early life circumstances and later life health and employment is twofold. First, we expand the findings of the studies discussed above, and present empirical evidence for thirteen European countries on the extent to which an individual's early life circumstances are associated with educational attainment and, once this latter is controlled for, with their later life health (at ages 50–64). Second, and not done in earlier studies, we examine the associations between early life circumstances and later life employment (at ages 50–64) once we control for education and later life health, which can be potential mediators of the associations between early life circumstances and later life employment. If we find that an association with later life employment is still present once education and health are controlled for, then this could be interpreted as empirical evidence in favor of a (direct) transmission of early life circumstances to employment opportunities.

For our empirical analysis we use data from the Survey of Health, Aging, and Retirement in Europe (SHARE) and measure two dimensions of early life circumstances, namely childhood health and childhood SES. The countries in our sample cover Northern, Central, Southern, and Eastern Europe, and we analyze them separately because of the large differences in the levels of development over the period the individuals in our sample were born and raised (1940–1972). To illustrate the differences between, e.g., Northern and Southern Europe over this period, the Netherlands has about one third of the infant mortality rate and about twice the income per capita compared to Spain (United Nations 2010; Maddison 2010). These large differences in economic resources and access to medical treatments may affect the associations between early life circumstances and later life outcomes as a more favorable environment in this respect may dampen the consequences of adverse health shocks early in life (Bengtsson and Mineau 2009).

The remainder of this article is organized as follows. Section 2 describes the data and the main variables for analysis. Section 3 presents estimates of the associations of early life circumstances with educational attainment and later life health and employment. Section 4 analyzes joint significance tests of these associations and looks at possible pathways through which early life circumstances may affect later life health and employment. Section 5 summarizes the main findings and concludes the article.

2 Data and descriptive statistics

We use individual-level data from the first four waves of the SHARE, a multidisciplinary and representative cross-national panel of the European population aged 50 and over. The first, second, and fourth waves belong to the regular panel of SHARE and were conducted in 2004/2005, 2006/2007, and 2010/2012,[1] respectively. These waves include information on socioeconomic background characteristics as well as current employment and health status. The third wave, carried out in 2008/2009 and referred to as SHARELIFE, contains retrospective information on the early life circumstances of about 75 % of the individuals who participated in waves one or two. Additionally,

[1] Almost 94 % of the respondents in the 2010/12 wave were interviewed in 2011.

about 78 % of the individuals who participated in SHARELIFE did so also in wave four.

Our empirical analysis is based on data for respondents aged 50–64 from the first, second, or fourth wave, who also participated in SHARELIFE. This selection yields 27,204 observations for 14,767 respondents from the following thirteen countries: Sweden (SE), Denmark (DK), the Netherlands (NL), Switzerland (CH), Austria (AT), Germany (DE), France (FR), Belgium (BE), Spain (ES), Italy (IT), Greece (GR), Czech Republic (CZ), and Poland (PL). The sample is reduced by 7 % due to missing values on the variables included in the analysis. The result is an unbalanced panel comprising 25,296 total observations for 5,999 male and 7,614 female respondents. Table 1 reports the number of observations and individuals (i.e. respondents) by country and gender. Finally, in all tables we sort the countries in the following order: Northern (Sweden, Denmark), Central (Netherlands, Switzerland, Austria, Germany, France, Belgium), Southern (Spain, Italy, Greece), and Eastern Europe (Czech Republic, Poland).

Details on the definitions of all variables used in the empirical analysis are in Table 7 of the appendix. Following most previous literature, we use self-reported health (SRH) status as a measure for health. Because of the low frequencies in the extreme categories for some countries we follow, e.g., Idler and Kasl (1991) and Thong et al. (2008) and combine the five SRH categories (from 1 to 5: poor, fair, good, very good, and excellent) into three (from 1 to 3: poor or fair, good, very good or excellent). Employment status is equal to one if the respondent is employed or self-employed, and zero otherwise.

As Table 1 shows, there is substantial variation in later life health (SRH) and employment rates across countries. For example, the proportion of men aged 50–64 who report being in very good or excellent health ranges from almost 60 % in Northern Europe and in Switzerland to 11 % in Poland. Also the employment rates of the same-aged men are the highest and above 80 % in Northern Europe and in Switzerland, and the lowest and below 50 % in Poland. Similar patterns are present for same-aged women, except that their employment rates are lower than those of their male peers at the country level. Concerning educational attainment across countries, Table 2 shows that men and women aged 50–64 from Northern and Central Europe are on average more educated than those from Southern and Eastern Europe.

Table 3 reports statistics on the early life circumstances by country which, to conform to the studies cited in the introduction, are classified into two categories: those related to childhood SES, and those that measure childhood health. As in earlier research (e.g. Dutton and Levine 1989), we treat childhood SES as a composite measure that typically includes parental economic status, social status, and work status, measured by income, education, and occupation, respectively. We thus measure childhood SES based on three variables that refer to the respondent's circumstances at age 10. The first is the number of rooms per person in the household (*rooms*), which proxies for the parents' financial status (see Cavapozzi et al. 2011).[2] The second is an indicator for whether there were enough (26+) books in the parental home to fill one bookcase (*bookcase*) and is meant to capture the parents' cultural background or education (see Cavapozzi et al. 2011), and perhaps also their cognitive and socio-emotional skills

[2] Our variable *rooms* is sometimes also considered a proxy for physical and social environment-related variables like crowding (see Stokols 1992).

Table 1 Number of individuals and observations (for all waves), and health and employment status by gender and country at ages 50–64

			Health status (SRH)			Employment status
	Number of individuals	Number of observations	Poor or fair (%)	Good (%)	Very good or excellent (%)	Work (%)
Men						
Sweden	418	822	13	31	56	85
Denmark	567	1,065	16	24	60	81
Netherlands	555	1,080	20	45	35	72
Switzerland	282	537	10	33	57	87
Austria	171	343	32	31	37	50
Germany	444	841	33	40	27	69
France	528	1,079	21	47	32	61
Belgium	657	1,464	18	44	38	57
Spain	358	644	27	46	27	66
Italy	529	994	24	44	32	54
Greece	703	1,055	13	31	56	77
Czech Rep.	391	555	33	41	26	66
Poland	396	616	48	41	11	48
Women						
Sweden	554	1,082	18	30	52	78
Denmark	655	1,224	18	20	62	76
Netherlands	701	1,393	23	46	31	50
Switzerland	385	728	13	37	50	73
Austria	226	451	26	37	37	29
Germany	556	1,099	29	46	25	62
France	663	1,313	24	48	28	57
Belgium	760	1,679	22	43	35	43
Spain	460	875	39	42	19	34
Italy	757	1,483	36	40	24	29
Greece	797	1,196	16	41	43	34
Czech Rep.	552	819	31	46	23	46
Poland	548	859	50	40	10	29

More details on the definitions of the variables are in the text and in the appendix. The percentage calculations are based on the number of observations

(see Brunello et al. 2012). The third indicates whether the primary breadwinner for the household worked as a farmer or in an elementary occupation (*breadwinner*), thereby capturing the household's work status. The variables that measure childhood health refer to health conditions that respondents experienced before the age of 16. These are indicators for whether respondents suffered from chronic conditions during childhood and whether they spent 1 month or more in bed during childhood because

Table 2 Educational attainment and household composition by gender and country

	Educational attainment			Household composition				
	Low (ISCED 0–2) (%)	Medium (ISCED 3–4) (%)	High (ISCED 5–6) (%)	Married (%)	No children (%)	One child (%)	Two children (%)	Three or more children (%)
Men								
Sweden	39	34	27	85	15	12	45	28
Denmark	11	50	39	85	15	15	46	24
Netherlands	36	31	33	90	18	9	47	26
Switzerland	21	63	16	85	16	11	44	29
Austria	15	53	32	88	17	22	33	28
Germany	4	58	38	87	16	26	40	18
France	31	40	29	86	10	14	39	37
Belgium	38	30	33	85	12	22	39	27
Spain	72	14	15	91	13	12	37	38
Italy	60	30	10	93	12	19	46	23
Greece	40	35	25	88	16	12	55	17
Czech Rep.	58	29	13	88	9	17	49	25
Poland	22	66	12	86	10	13	40	37
Women								
Sweden	35	32	33	82	9	16	46	29
Denmark	15	35	50	81	10	14	51	25
Netherlands	51	24	25	86	14	11	45	30
Switzerland	31	59	10	75	18	13	43	26
Austria	34	52	14	66	10	23	37	30
Germany	14	58	28	86	12	21	42	25
France	40	35	25	77	10	17	39	34
Belgium	40	32	28	81	10	23	40	27
Spain	77	13	10	89	11	10	37	42
Italy	67	26	7	89	11	17	46	26
Greece	50	34	16	77	14	15	53	18
Czech Rep.	49	44	7	77	4	17	55	24
Poland	34	59	7	82	7	11	39	43

More details on the definitions of the variables are in the text and in the appendix. The percentage calculations for the educational attainment and household composition variables are based on the number of individuals and observations, respectively (see Table 1)

of illness (*bed*).[3] A further indicator for childhood health that we use is height at the time of interview, which arguably also serves as a proxy for childhood SES (Case and Paxson 2008; Batty et al. 2009).

[3] We do not use self-reported childhood health as it may suffer from coloring problems (Havari and Mazzonna 2011).

Table 3 Early life circumstances by gender and country

	SES at age 10			Childhood health (0–15 years)		
	Bookcase (%)	Breadwinner (%)	Rooms (average)	Chronic conditions (%)	1 month or more in bed (%)	Height (in cm) (average)
Men						
Sweden	67	28	0.84	9	8	179
Denmark	61	46	0.95	12	7	179
Netherlands	49	23	0.83	12	15	179
Switzerland	59	23	0.88	10	10	176
Austria	29	39	0.73	12	16	176
Germany	48	21	0.79	12	14	177
France	38	41	0.84	9	12	174
Belgium	38	44	1.00	11	13	175
Spain	21	58	0.62	6	8	170
Italy	12	60	0.61	6	5	172
Greece	16	60	0.54	2	3	174
Czech Rep.	52	20	0.59	7	13	177
Poland	26	47	0.44	8	9	173
Women						
Sweden	66	28	0.80	10	8	166
Denmark	64	46	0.93	12	8	166
Netherlands	51	25	0.81	14	17	167
Switzerland	57	24	0.92	13	11	164
Austria	34	37	0.72	14	15	164
Germany	48	21	0.79	16	15	165
France	40	38	0.82	17	14	161
Belgium	41	44	1.00	16	15	163
Spain	20	56	0.63	12	6	160
Italy	14	65	0.58	6	7	161
Greece	17	55	0.56	2	3	163
Czech Rep.	63	21	0.56	14	20	165
Poland	26	52	0.40	12	10	162

More details on the definitions of the variables are in the text and in the appendix. The percentage calculations are based on the number of individuals (see Table 1)

Concerning the variable *bookcase*, Table 3 shows, for instance, that the proportion of men and women who at age 10 lived in households with more than 25 books is substantially higher in Northern Europe and in Switzerland than in Southern Europe. For example, for men (women) this proportion ranges from 67 (66) % in Sweden to only 12 (14) % in Italy. This finding suggests a higher parental cultural background for these Northern European and Swiss respondents. Likewise, the proportion of parents who worked as farmers or in elementary occupations is much higher in Southern Europe

than in Northern and Central Europe, whereas the opposite is true for the rooms per person (*rooms*). Both the variables *breadwinner* and *rooms* point to a higher work status and income in (the average) households in Northern and Central Europe when the respondents were 10 years old.

With regard to the childhood health-related variables, and in line with previous studies such as Cavelaars et al. (2000), the height variable unfolds important country differences and shows that men and women are on average tallest in Northern Europe and in the Netherlands and shortest in Southern Europe (in particular in Spain and Italy). Chronic conditions show a larger incidence among women than men in most countries, except, for instance, in Italy and Greece, where their incidence is also the lowest. Individuals from Southern Europe report also a lower incidence of spending 1 month or more in bed during childhood because of a health condition. This incidence is similar to that in Northern Europe, but most probably for very different reasons. One possible explanation for these perhaps counterintuitive findings is that although such negative health shocks might seem more likely for children from poorer households who are more likely to be located in Southern and Eastern Europe over the time period our respondents were born and raised, a household's SES, and in particular parental cultural background, may in fact contribute not only to the ability to treat and prevent but also to detect a negative health shock (Currie and Stabile 2003). Also, because high-educated parents invest more time in child care than low-educated parents (Guryan et al. 2008) and may be more likely to screen their children and take preventive health care (Brunello et al. 2012). In line with this explanation is the relatively high incidence of spending 1 month or more in bed during childhood because of a health condition for women (and to a lesser extent also men) from the Czech Republic, whose parental cultural background ranges among the highest in our sample.

3 Empirical results

This section examines the associations of early life circumstances with educational attainment, later life health (SRH), and employment. For this purpose we estimate (ordered) probit models by Maximum Likelihood (Cameron and Trivedi 2005) and report the (average) marginal effects of the explanatory variables on the probability of having the highest level of education (ISCED 5 or 6) in Table 4, on the probability of being in very good or excellent health in Table 5, and on the employment probability in Table 6. In all models, we merge for Germany the categories low and medium educational attainment in the estimations as there are very few individuals with low-educational attainment (see Table 2). We also include dummies for every age and survey year, and, thereby, control for (birth) cohort effects.[4]

[4] These three variables are linearly dependent (age = year-cohort). In the education equation, we control only for a linear time trend because we use the sample of individuals (see footnote to Table 4), and there are very few new respondents in the fourth wave for some countries (for instance in Switzerland, there is only one new male respondent in wave four). For completeness, we note that the reference age category is age 50–51, except for men in Austria where it is 50–53 because there were no men of age 53 and only one of age 52 in the category "no work" in our sample.

Table 4 The marginal effects (m.e.'s) of childhood SES and health variables on the probability of having a highest level of education (ISCED 5 or 6) by country and gender

Country	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Men													
Bookcase[a]	0.149*	0.201*	0.164*	0.114*	0.220*	0.204*	0.207*	0.149*	0.193*	0.290*	0.129*	0.135*	0.091*
	(0.045)	(0.037)	(0.038)	(0.035)	(0.089)	(0.051)	(0.042)	(0.038)	(0.055)	(0.066)	(0.042)	(0.034)	(0.036)
Breadwinner[b]	−0.032	−0.133*	−0.069*	−0.065*	−0.120	−0.042	−0.106*	−0.122*	−0.083*	−0.078*	−0.117*	−0.025	−0.102*
	(0.027)	(0.028)	(0.028)	(0.025)	(0.065)	(0.044)	(0.026)	(0.029)	(0.027)	(0.025)	(0.024)	(0.020)	(0.023)
Rooms[c]	0.117*	0.070	0.140*	0.119*	−0.026	0.156*	0.115*	0.027	0.193*	0.089*	0.114	0.036	0.129*
	(0.036)	(0.039)	(0.036)	(0.044)	(0.050)	(0.058)	(0.039)	(0.037)	(0.054)	(0.035)	(0.061)	(0.037)	(0.061)
Chronic conditions[d]	0.067	0.009	0.011	0.078	0.098	0.052	0.035	−0.002	0.054	−0.032	0.119	−0.010	0.061
	(0.051)	(0.047)	(0.043)	(0.054)	(0.102)	(0.062)	(0.047)	(0.055)	(0.068)	(0.055)	(0.099)	(0.039)	(0.057)
Bed[e]	−0.019	−0.114*	−0.028	−0.037	0.053	0.033	−0.008	0.055	−0.044	0.078	−0.114*	−0.021	0.050
	(0.045)	(0.050)	(0.035)	(0.035)	(0.098)	(0.057)	(0.043)	(0.048)	(0.037)	(0.071)	(0.055)	(0.025)	(0.055)
Height[f]	0.042*	0.075*	0.058*	0.059*	−0.006	0.054*	0.064*	0.031	0.056*	0.049*	0.073*	0.033*	0.057*
	(0.017)	(0.020)	(0.017)	(0.018)	(0.051)	(0.025)	(0.020)	(0.023)	(0.023)	(0.020)	(0.016)	(0.011)	(0.018)
Joint significance childhood SES & health[g]	0.000*	0.000*	0.000*	0.000*	0.027*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
Joint significance childhood SES[g]	0.000*	0.000*	0.000*	0.000*	0.004*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
Joint significance childhood health[g]	0.072	0.001*	0.020*	0.016*	0.601	0.162	0.028*	0.326	0.050	0.071	0.000*	0.047*	0.020*
Pseudo R^2	0.097	0.116	0.077	0.143	0.085	0.096	0.128	0.052	0.203	0.143	0.078	0.120	0.133

Table 4 continued

Country	SE	DK	NL	CH	AT	DE	FR	BE	ES	IT	GR	CZ	PL
	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]
Women													
Bookcase[a]	0.200*	0.203*	0.213*	0.075*	0.168*	0.227*	0.279*	0.199*	0.250*	0.166*	0.185*	0.060*	0.126*
	(0.037)	(0.036)	(0.033)	(0.026)	(0.056)	(0.046)	(0.041)	(0.033)	(0.052)	(0.040)	(0.041)	(0.020)	(0.031)
Breadwinner[b]	−0.141*	−0.170*	−0.068*	−0.061*	−0.163*	−0.084*	−0.085*	−0.143*	−0.156*	−0.121*	−0.114*	−0.059*	−0.077*
	(0.030)	(0.032)	(0.026)	(0.019)	(0.033)	(0.040)	(0.024)	(0.025)	(0.027)	(0.018)	(0.019)	(0.013)	(0.016)
Rooms[c]	0.160*	0.179*	0.074*	0.051*	0.017	0.033	0.126*	0.066*	0.079	0.149*	0.044	0.072*	0.086*
	(0.044)	(0.044)	(0.038)	(0.021)	(0.048)	(0.043)	(0.037)	(0.032)	(0.051)	(0.033)	(0.042)	(0.031)	(0.044)
Chronic conditions[d]	0.030	0.030	0.011	0.005	0.024	0.095	0.067	−0.060	−0.001	−0.025	−0.019	−0.020	0.000
	(0.057)	(0.048)	(0.036)	(0.035)	(0.053)	(0.053)	(0.038)	(0.033)	(0.045)	(0.037)	(0.080)	(0.019)	(0.023)
Bed[e]	0.043	−0.077	0.018	−0.037	0.035	−0.091*	0.003	0.056	−0.041	−0.006	−0.020	0.033	−0.012
	(0.066)	(0.062)	(0.033)	(0.026)	(0.055)	(0.042)	(0.036)	(0.041)	(0.049)	(0.037)	(0.053)	(0.024)	(0.023)
Height[f]	0.009	0.042	0.057*	0.024	0.047	0.004	0.039	0.011	0.072*	0.009	0.044*	0.022	−0.020
	(0.024)	(0.027)	(0.018)	(0.019)	(0.029)	(0.028)	(0.022)	(0.022)	(0.028)	(0.016)	(0.020)	(0.013)	(0.014)
Joint significance childhood SES & health[g]	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*

Table 4 continued

Country	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Joint significance childhood SES[g]	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
Joint significance childhood health[g]	0.690	0.231	0.014*	0.302	0.310	0.144	0.061	0.235	0.031*	0.842	0.134	0.112	0.540
Pseudo R^2	0.095	0.096	0.090	0.119	0.170	0.106	0.149	0.086	0.232	0.193	0.120	0.082	0.136

Standard errors (s.e.'s) are in parentheses. Significance level: $^*p < 0.05$. Sample sizes are in Table 1 (number of individuals). The ordered probit models include age dummies and survey year as explanatory variables

[a] 1 = more than 25 books, 0 otherwise

[b] 1 = farmer or elementary occupation, 0 otherwise

[c] An increase of one room (in the number of rooms per person)

[d] 1 = one or more chronic conditions, 0 otherwise

[e] 1 = 1 month or more in bed, 0 otherwise

[f] A 10 cm increase

[g] p values are reported

Table 5 The marginal effects (m.e.'s) of childhood SES and health variables on the probability of being in very good or excellent health by country and gender

Country	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Men													
Bookcase[a]	−0.001	0.007	0.097*	0.014	0.067	0.068*	0.035	0.095*	0.034	0.050	−0.064	−0.030	0.025
	(0.042)	(0.038)	(0.033)	(0.049)	(0.063)	(0.034)	(0.038)	(0.033)	(0.049)	(0.051)	(0.047)	(0.037)	(0.029)
Breadwinner[b]	−0.060	−0.080*	0.065	−0.055	−0.098	−0.074*	−0.023	−0.020	0.075	−0.011	−0.004	−0.005	0.044
	(0.039)	(0.036)	(0.037)	(0.057)	(0.055)	(0.029)	(0.032)	(0.030)	(0.043)	(0.032)	(0.034)	(0.044)	(0.024)
Rooms[c]	−0.002	0.033	0.022	−0.016	−0.034	0.075	−0.028	−0.054	−0.008	0.003	0.081	0.068	0.043
	(0.050)	(0.049)	(0.046)	(0.079)	(0.039)	(0.044)	(0.036)	(0.036)	(0.060)	(0.032)	(0.076)	(0.068)	(0.043)
Chronic conditions[d]	0.006	−0.156*	−0.056	−0.183*	0.051	−0.070*	−0.029	−0.105*	−0.116	0.040	−0.007	0.078	−0.002
	(0.061)	(0.052)	(0.042)	(0.076)	(0.091)	(0.034)	(0.053)	(0.046)	(0.066)	(0.061)	(0.117)	(0.079)	(0.040)
Bed[e]	−0.164*	0.018	−0.039	0.038	−0.061	0.039	0.047	−0.015	0.018	−0.095	−0.217*	−0.046	−0.061*
	(0.047)	(0.075)	(0.037)	(0.067)	(0.070)	(0.045)	(0.054)	(0.042)	(0.070)	(0.056)	(0.083)	(0.050)	(0.024)
Height[f]	0.013	0.021	0.025	0.044	0.018	0.002	0.019	−0.001	0.020	0.039	0.040	0.009	0.027
	(0.027)	(0.027)	(0.020)	(0.039)	(0.038)	(0.019)	(0.023)	(0.022)	(0.025)	(0.022)	(0.022)	(0.020)	(0.017)
Medium level of education	0.124*	0.136*	0.120*	0.049	0.153*		0.030	0.123*	0.075	−0.012	0.126*	0.055	0.066*
	(0.042)	(0.056)	(0.038)	(0.058)	(0.076)		(0.039)	(0.036)	(0.052)	(0.032)	(0.037)	(0.041)	(0.031)
High level of education	0.188*	0.185*	0.173*	0.175*	0.331*	0.132*	0.168*	0.163*	0.196*	0.132*	0.215*	0.210*	0.114*
	(0.045)	(0.059)	(0.041)	(0.080)	(0.087)	(0.035)	(0.051)	(0.038)	(0.071)	(0.060)	(0.043)	(0.068)	(0.058)
Joint significance education[g]	0.000*	0.013*	0.000*	0.115	0.001*	0.000*	0.001*	0.000*	0.007*	0.042*	0.000*	0.003*	0.027*
Joint significance childhood SES & health[g]	0.023*	0.013*	0.009*	0.123	0.124	0.002*	0.577	0.007*	0.303	0.304	0.042*	0.677	0.031*

Table 5 continued

Country	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Joint significance childhood SES[g]	0.494	0.126	0.009*	0.737	0.088	0.000*	0.568	0.011*	0.308	0.684	0.477	0.619	0.124
Joint significance childhood health[g]	0.006*	0.020*	0.217	0.048*	0.737	0.345	0.595	0.098	0.385	0.186	0.025*	0.611	0.052
Pseudo R^2	0.070	0.039	0.056	0.054	0.097	0.060	0.036	0.039	0.050	0.029	0.058	0.062	0.050
Excluding education													
Joint significance childhood SES & health[g]	0.004*	0.001*	0.000*	0.076	0.004*	0.000*	0.017*	0.000*	0.202	0.124	0.002*	0.510	0.017*
Joint significance childhood SES[g]	0.122	0.015*	0.000*	0.370	0.003*	0.000*	0.037*	0.000*	0.247	0.235	0.325	0.689	0.129
Joint significance childhood health[g]	0.003*	0.016*	0.075	0.058	0.795	0.438	0.461	0.102	0.369	0.228	0.001*	0.447	0.028*

Table 5 continued

Country	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Women													
Bookcase[a]	0.051	0.067	0.034	0.141*	0.191*	0.064*	0.072*	0.035	0.110*	0.049	−0.046	−0.036	0.013
	(0.039)	(0.037)	(0.028)	(0.047)	(0.057)	(0.032)	(0.034)	(0.029)	(0.048)	(0.041)	(0.040)	(0.028)	(0.023)
Breadwinner[b]	0.046	−0.005	0.035	0.017	0.039	0.022	0.045	−0.034	−0.021	0.004	0.029	−0.062	−0.027
	(0.040)	(0.033)	(0.032)	(0.053)	(0.056)	(0.034)	(0.030)	(0.028)	(0.029)	(0.028)	(0.030)	(0.034)	(0.017)
Rooms[c]	0.221*	0.026	−0.021	0.019	−0.066	0.094*	0.051	−0.026	0.002	0.035	−0.047	0.097	−0.030
	(0.047)	(0.040)	(0.042)	(0.047)	(0.055)	(0.030)	(0.034)	(0.029)	(0.046)	(0.046)	(0.057)	(0.054)	(0.038)
Chronic conditions[d]	−0.096*	−0.153*	−0.080*	−0.074	−0.129*	−0.052	−0.019	−0.082*	−0.113*	−0.137*	−0.203*	−0.065	−0.011
	(0.045)	(0.047)	(0.035)	(0.058)	(0.059)	(0.034)	(0.035)	(0.034)	(0.036)	(0.040)	(0.096)	(0.046)	(0.027)
Bed[e]	−0.057	−0.060	−0.130*	−0.108	0.066	−0.016	−0.032	−0.036	0.010	−0.026	−0.214*	0.072	−0.010
	(0.059)	(0.066)	(0.030)	(0.059)	(0.073)	(0.039)	(0.038)	(0.040)	(0.061)	(0.049)	(0.059)	(0.045)	(0.029)
Height[f]	0.003	0.044	0.026	0.017	0.054	0.015	−0.019	0.025	0.015	0.038	0.070*	−0.002	0.005
	(0.028)	(0.028)	(0.020)	(0.039)	(0.036)	(0.023)	(0.022)	(0.021)	(0.024)	(0.023)	(0.024)	(0.025)	(0.016)
Medium level of education	0.082*	0.121*	0.030	0.052	0.127*		0.055	0.073*	0.100*	0.094*	0.146*	0.122*	0.012
	(0.040)	(0.050)	(0.034)	(0.048)	(0.061)		(0.032)	(0.032)	(0.050)	(0.033)	(0.034)	(0.033)	(0.021)
High level of education	0.209*	0.238*	0.109*	0.146	0.155*	0.084*	0.146*	0.192*	0.097	0.123*	0.235*	0.337*	0.082
	(0.045)	(0.047)	(0.037)	(0.076)	(0.076)	(0.035)	(0.049)	(0.038)	(0.071)	(0.063)	(0.046)	(0.077)	(0.050)
Joint significance education[g]	0.000*	0.000*	0.008*	0.172	0.062	0.011*	0.004*	0.000*	0.045*	0.005*	0.000*	0.000*	0.124
Joint significance childhood SES & health[g]	0.000*	0.005*	0.000*	0.011*	0.001*	0.002*	0.087	0.025*	0.009*	0.014*	0.001*	0.121	0.712

Table 5 continued

Country	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Joint significance childhood SES[g]	0.000*	0.260	0.443	0.017*	0.004*	0.001*	0.030*	0.260	0.044*	0.422	0.244	0.049*	0.362
Joint significance childhood health[g]	0.050*	0.005*	0.000*	0.153	0.066	0.350	0.550	0.018*	0.043*	0.005*	0.000*	0.349	0.908
Pseudo R^2	0.068	0.052	0.033	0.047	0.063	0.034	0.039	0.038	0.050	0.034	0.061	0.050	0.034
Excluding education													
Joint significance childhood SES & health[g]	0.000*	0.000*	0.000*	0.002*	0.000*	0.000*	0.000*	0.000*	0.000*	0.001*	0.001*	0.013*	0.428
Joint significance childhood SES[g]	0.000*	0.001*	0.186	0.005*	0.001*	0.000*	0.000*	0.002*	0.001*	0.014*	0.970	0.004*	0.149
Joint significance childhood health[g]	0.094	0.005*	0.000*	0.111	0.047*	0.411	0.677	0.011*	0.048*	0.008*	0.000*	0.252	0.886

Cluster-robust standard errors (s.e.'s) are in parentheses. Significance level: $^*p < 0.05$. Sample sizes are in Table 1 (number of observations). The ordered probit models include age dummies, survey year dummies, marital status and dummies for having one, two and three or more children as explanatory variables

[a] 1 = more than 25 books, 0 otherwise

[b] 1 = farmer or elementary occupation, 0 otherwise

[c] An increase of one room (in the number of rooms per person)

[d] 1 = one or more chronic conditions, 0 otherwise

[e] 1 = 1 month or more in bed, 0 otherwise

[f] A 10 cm increase

[g] p values are reported

Previous studies such as Almond and Currie (2011b) and Doblhammer and van den Berg (2011) have shown that the effects of early life circumstances on health differ between men and women, and we therefore estimate the models separately for men and women (see also Marmot et al. 2012). In addition, and as discussed in the introduction, we analyze the thirteen countries in our sample separately. Earlier studies in, e.g., Börsch-Supan et al. (2011), Brunello et al. (2012), and Guven and Lee (2011) often pool the data from the countries included in SHARE. For each model, and by gender, we tested for pooling of data and rejected it in each case at a 1 % level of significance.[5] This finding indicates, and as will also become clear from the discussion of the results below, that there are important differences across countries in the strength of the associations between the various childhood health and SES variables and later life outcomes.

We refer to the estimated effects of early life circumstances on later life outcomes as associations because of the widely recognized difficulties in identifying causal relationships between the childhood SES and health variables and later life outcomes. The first difficulty is that SES (or factors correlated with it) is likely to affect health during childhood. For instance, Case et al. (2002) and Currie and Stabile (2003) show that income buffers children from the negative effects of chronic conditions, which are also more common among low-SES children. In the same vein, and as discussed in Sect. 2, Case and Paxson (2008) and Batty et al. (2009) argue that adult height may be an indicator not only for a healthier but also for a financially more comfortable early life environment among others. The second, and most important difficulty, is that, as these authors and others (e.g. Case et al. 2005; Smith 2009) suggest, unobserved "third or confounding factors" may be driving the correlations between early life variables and later life outcomes. Hence, in our analysis, we consider the childhood SES and health variables to be proxies for early life circumstances.

Sample selection because of (early) mortality of relatively unhealthy individuals, due to, for instance, high-infant mortality rates, is unlikely to invalidate our estimated associations between early life circumstances and later life outcomes. For instance, Bozzoli et al. (2009) show that infant mortality rates need to be extremely high for this. Moreover, for Spain, where these rates were highest—with the possible exception of Poland (United Nations 2010), these authors and others such as Spijker et al. (2012) do not find evidence for the typical positive relationship between infant mortality rates and average adult height by birth cohort that shows up when selection dominates scarring, and report instead a negative one for the period our respondents were born.[6]

[5] We test the null-hypothesis that the associations are equal for all countries, and country-specific intercepts are included in the model when pooling data. The test statistics with the degrees of freedom in parentheses and p values in the second parentheses are as follows. Educational attainment equation (Table 4): For men, $\chi^2(225) = 881.32(0.000)$; for women, $\chi^2(228) = 1148.66(0.000)$. SRH equation (Table 5): For men, $\chi^2(307) = 588.28(0.000)$; for women, $\chi^2(309) = 706.12(0.000)$. Employment equation (Table 6): For men, $\chi^2(331) = 764.10(0.000)$; for women, $\chi^2(333) = 836.78(0.000)$.

[6] Still, environmental disease or nutritional burden in early life—as measured by infant mortality rates—could have an effect beyond diminishing adult height, which may become evident later in life as the *fetal-origins hypothesis* and *life course models* suggest. We find, however, only evidence of a negative (or no) relationship between adverse childhood health and later life health (see Table 5) which suggests that if there is a selection effect, then it does not dominate the scarring effect of childhood disease.

Similarly, and of relevance for the Netherlands, Painter et al. (2005) and Roseboom et al. (2001; 2006) provide evidence on negative, and not positive, long-term effects on later life health of prenatal undernutrition during the Dutch famine of 1944/45.

Furthermore, it is likely that our childhood health and SES variables are measured with error, and this most probably attenuates the estimated associations toward zero (Bound et al. 2001). A validation study of Havari and Mazzonna (2011), however, finds no evidence of recall error in the childhood variables in SHARELIFE, which show a good level of internal and external consistency. In particular, these authors do not find evidence that memory capacity—measured by two cognitive ability tests consisting of a verbal registration and recall of a list of ten items—is significantly associated with the reported number of childhood illnesses.

Finally, as discussed in the introduction, we examine the role of education and later life health as potential mediators of the associations between early life circumstances and later life employment and, once controlled for these two mediators, if there still is a (direct) transmission of early life circumstances to employment opportunities. As we cannot control for all individual characteristics, one has to bear in mind that there might be other variables such as (lifetime) income that can act as mediators, and also possibly mitigate any (in)direct transmissions we find between early life circumstances and later life employment. The same can be argued for any (in)direct transmissions we find between early life circumstances and later life health.

3.1 Educational attainment

In Table 4, we examine the relationship between early life circumstances and educational attainment and identify the same significant and positive associations found in previous investigations. Like, for instance, Case et al. (2005) for the U.K., and Case and Paxson (2008) for the U.S., we find that height is strongly associated with educational attainment for men (except in Austria and Belgium). Unlike Case et al. (2005), however, we do not find such an association for women (except in the Netherlands, Spain and Greece). When significant, a 10 cm increase in height is associated with a 3–8 (4–7) % point increase in the probability that men (women) have the highest educational level. Childhood SES variables show a remarkably strong association with educational attainment: for both men and women, education levels are significantly higher among individuals whose parents had a bookcase in all countries and are positively associated with rooms per person for most countries in our sample. For individuals whose parents had a bookcase, the associated rise in the probability of having the highest educational level ranges for men from 29 in Italy to 9 % points in Poland and for women from 28 in France to 6 % points in the Czech Republic. Moreover, for women in all countries and men in most countries, educational attainment is significantly lower among individuals raised in households whose main breadwinner worked as a farmer or in an elementary occupation.

Among the childhood health variables, other than height, and for both men and women, we do not find much evidence of an association with educational attainment. For instance, unlike Case et al. (2005), we find no evidence of a negative association between chronic conditions in childhood and education, and only find a (significant)

negative association between having spent 1 month or more in bed during childhood because of illness and education in Denmark and Greece for men and in Germany for women.

In sum, we find that for both men and women in all countries a higher childhood SES, and for men in almost all countries also height, is strongly associated with a higher level of education.

3.2 Later life health

Table 5 shows the associations between early life circumstances and later life health, which, as discussed in Sect. 2, is SRH and classified into three categories (poor or fair, good, and very good or excellent). Here, we condition this association on educational attainment, which only reduces the size of the early life variables' coefficients but leaves the levels of significance virtually unchanged in most countries and for both men and women (we return to this observation in Sect. 4). This outcome stands in contrast to the Case and Paxson (2008) finding that for U.S. elderly the association between childhood SES and SRH at older ages becomes insignificant once education is controlled for.

Overall, the table shows positive and significant associations between educational attainment and later life health for men in all countries and women in most countries. In line with Case and Paxson (2008), we conclude that education appears to be protective of health. Based on the variable *bookcase*, we find mainly for Central Europe a better later life health among men and women whose parents had a higher SES. Moreover, for men in Denmark and Germany growing up in households whose main breadwinner worked as a farmer or in an elementary occupation is significantly associated with worse later life health, and for women in Sweden and Germany growing up in households with more rooms per person is significantly associated with better later life health. Quantitatively, and in particular for women, the differences in later life health associated with a different childhood SES are comparable to the differences in health between those with the lowest and the highest levels of education, which underscores the relative importance of childhood SES for later life health.

Also childhood health is strongly associated with later life health. In most countries, and for both men and women, childhood chronic conditions or having spent 1 month or more in bed during childhood because of illness is significantly and negatively associated with later life health. When significant, having suffered from chronic conditions during childhood is associated with a 7–18 (8–20) % point lower probability of reporting very good or excellent health for men (women). This evidence resembles that offered by Case et al. (2005) for adults aged 33 and 42. Comparing all the significant effects of the childhood health variables with the effect of having obtained the highest level of education indicates that the magnitude of their association with reporting very good or excellent health is rather similar for men in Northern Europe, Switzerland, and Greece, and for women in the Netherlands, Austria, and in Southern Europe. This finding underscores the relative importance of childhood health for later life health.

Overall, the results show that a higher level of education and, in particular for women, favorable early life circumstances (i.e. better childhood health and higher childhood SES) are significantly associated with better later life health.

3.3 Later life employment

Table 6 shows the marginal effects of early life circumstances and educational attainment on later life employment probabilities once also later life health (SRH) is controlled for. In this way, we obtain insights into possible direct associations of early life circumstances with employment opportunities that do not operate through health.[7] The same associations but without controlling for later life health are analyzed by means of joint significance tests. These test results are reported in the bottom part of Table 6 and discussed in Sect. 4 (the full set of estimation results are available upon request). As in the previous section, conditioning on educational attainment changes only the size of the early life variables' coefficients and not their levels of significance for men in most countries (except in France, Italy, and in the Czech Republic), but this is not true for women; and in particular not for women from Northern Europe, Austria, Germany, and Spain. We do not report these results (available upon request), but instead present joint significance tests in the bottom part of the table that are discussed in Sect. 4.

As the table shows, there are positive and significant associations between later life health (SRH) and employment for men and women in all countries. For instance, the associated increase in the employment probability for reporting very good or excellent health at older ages ranges for men from 32 in Switzerland to 9 % points in Italy and for women from 27 in Sweden to 10 % points in Greece. Conditional on later life health, there are significant associations between educational attainment and later life employment for women in all countries (except in Germany) but for men in only half of the countries. The associated increase in the employment probability for having the highest level of education (relative to the lowest level) is mostly larger among women than men, and is largest among Italian women.

As the table shows, most associations between early life circumstances and later life employment are insignificant when later life health is controlled for. There are, however, a few notable exceptions. For women, the variables *bookcase* in Belgium, *breadwinner* in the Netherlands and *rooms* in Switzerland and in the Czech Republic are significantly associated with later life employment (and with the correct sign). For men, we find mainly associations with childhood health and only in a few countries. For instance, having suffered from chronic conditions during childhood is associated with a 12 % point lower employment probability in Sweden and Austria which increases to 19 and 17 % point in Spain and Poland, respectively. These estimates are somewhat larger than the ones reported in Case et al. (2005) for U.K. men at ages 33 and 42. But, as suggested by these authors, this may in part be due to our older sample as they find that childhood chronic conditions have an increasing impact on employment

[7] As, e.g., argued in Bound (1991), for reasons such as measurement error and reverse causality, SRH is likely to be an endogenous explanatory variable in an employment equation. We do not take this into account, and this may attenuate the estimated associations.

Table 6 The marginal effects (m.e.'s) of childhood SES and health variables on the employment probability by country and gender

Country	SE	DK	NL	CH	AT	DE	FR	BE	ES	IT	GR	CZ	PL
	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]	[m.e. (s.e.)]
Men													
Bookcase[a]	0.019	0.024	0.049	−0.046	0.115	0.067	0.045	−0.025	−0.035	0.047	−0.060	0.054	0.032
	(0.029)	(0.032)	(0.030)	(0.044)	(0.060)	(0.037)	(0.032)	(0.032)	(0.053)	(0.046)	(0.049)	(0.028)	(0.046)
Breadwinner[b]	−0.016	−0.010	−0.015	−0.036	0.073	−0.041	0.001	−0.063*	−0.007	−0.038	−0.028	0.021	0.047
	(0.033)	(0.031)	(0.034)	(0.051)	(0.048)	(0.047)	(0.029)	(0.030)	(0.039)	(0.031)	(0.034)	(0.034)	(0.041)
Rooms[c]	0.029	0.074	0.036	0.104	−0.049	0.089	0.006	0.026	0.268*	−0.002	0.108	0.084	−0.015
	(0.038)	(0.044)	(0.037)	(0.075)	(0.049)	(0.066)	(0.031)	(0.036)	(0.060)	(0.036)	(0.077)	(0.053)	(0.068)
Chronic conditions[d]	−0.121*	−0.095	−0.057	0.095	−0.121*	−0.049	−0.064	−0.052	−0.191*	−0.041	−0.076	−0.069	−0.172*
	(0.053)	(0.053)	(0.051)	(0.058)	(0.061)	(0.063)	(0.047)	(0.047)	(0.094)	(0.069)	(0.119)	(0.053)	(0.076)
Bed[e]	0.081*	0.072	−0.059	−0.043	−0.072	0.049	0.078*	0.009	−0.091	−0.099	0.045	0.024	−0.010
	(0.037)	(0.061)	(0.044)	(0.066)	(0.062)	(0.058)	(0.036)	(0.043)	(0.073)	(0.067)	(0.083)	(0.040)	(0.078)
Height[f]	−0.003	0.013	0.030	0.073*	0.073*	0.060*	−0.027	0.042	−0.020	0.030	0.050*	0.025	0.039
	(0.021)	(0.024)	(0.023)	(0.033)	(0.035)	(0.029)	(0.021)	(0.025)	(0.029)	(0.022)	(0.022)	(0.018)	(0.034)
Medium level of education	0.015	0.041	0.013	0.015	0.033		0.085*	0.083*	0.052	0.036	−0.047	0.069*	0.071
	(0.031)	(0.048)	(0.035)	(0.049)	(0.068)		(0.030)	(0.034)	(0.052)	(0.031)	(0.040)	(0.028)	(0.050)
High level of education	0.030	0.056	0.042	0.064	0.200*	0.122*	0.182*	0.104*	0.099	0.263*	−0.035	0.132*	0.202*
	(0.034)	(0.048)	(0.035)	(0.065)	(0.071)	(0.037)	(0.037)	(0.034)	(0.053)	(0.036)	(0.045)	(0.035)	(0.068)
Good health	0.099*	0.179*	0.193*	0.280*	0.121*	0.190*	0.169*	0.116*	0.174*	0.020	0.182*	0.149*	0.132*
	(0.031)	(0.034)	(0.029)	(0.041)	(0.051)	(0.033)	(0.030)	(0.031)	(0.032)	(0.030)	(0.034)	(0.026)	(0.035)
Very good or excellent health	0.190*	0.229*	0.235*	0.318*	0.157*	0.226*	0.189*	0.156*	0.213*	0.093*	0.202*	0.193*	0.094
	(0.031)	(0.030)	(0.030)	(0.040)	(0.052)	(0.035)	(0.033)	(0.035)	(0.033)	(0.032)	(0.034)	(0.026)	(0.058)

Table 6 continued

	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Joint significance later life health[g]	0.000*	0.000*	0.000*	0.000*	0.019*	0.000*	0.000*	0.000*	0.000*	0.009*	0.000*	0.000*	0.001*
Joint significance education[g]	0.720	0.537	0.510	0.660	0.005*	0.002*	0.000*	0.007*	0.225	0.000*	0.465	0.008*	0.024*
Joint significance childhood SES & health[g]	0.070	0.190	0.114	0.042*	0.011*	0.031*	0.142	0.126	0.000*	0.216	0.114	0.100	0.228
Joint significance childhood SES[g]	0.630	0.216	0.230	0.236	0.221	0.065	0.517	0.132	0.000*	0.370	0.355	0.123	0.679
Joint significance childhood health[g]	0.031*	0.262	0.124	0.047*	0.007*	0.139	0.077	0.255	0.077	0.199	0.099	0.225	0.077
Pseudo R^2	0.236	0.259	0.251	0.310	0.475	0.218	0.392	0.277	0.203	0.301	0.189	0.342	0.183
Excluding later life health													
Joint significance education[g]	0.205	0.214	0.118	0.186	0.000*	0.000*	0.000*	0.001*	0.056	0.000*	0.857	0.001*	0.011*
Joint significance childhood SES & health[g]	0.166	0.040*	0.025*	0.080	0.011*	0.005*	0.088	0.097	0.000*	0.145	0.044*	0.166	0.135

Table 6 continued

	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Joint significance childhood SES[g]	0.625	0.097	0.084	0.231	0.231	0.010*	0.478	0.133	0.001*	0.342	0.287	0.167	0.546
Joint significance childhood health[g]	0.075	0.128	0.067	0.126	0.009*	0.124	0.050	0.192	0.038*	0.136	0.048*	0.327	0.052
Excluding later life health and education													
Joint significance childhood SES & health[h]	0.115	0.010*	0.001*	0.060	0.002*	0.000*	0.001*	0.012*	0.000*	0.001*	0.044*	0.002*	0.105
Joint significance childhood SES[g]	0.279	0.022*	0.007*	0.237	0.031*	0.000*	0.002*	0.023*	0.000*	0.002*	0.283	0.006*	0.622
Joint significance childhood health[g]	0.117	0.109	0.043*	0.081	0.031*	0.090	0.177	0.119	0.047*	0.198	0.051	0.159	0.039*

Table 6 continued

	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Women													
Bookcase[a]	0.031	0.034	−0.031	0.037	−0.062	0.058	−0.026	0.116*	0.047	−0.072	−0.037	0.012	−0.014
	(0.028)	(0.032)	(0.034)	(0.047)	(0.044)	(0.035)	(0.038)	(0.032)	(0.062)	(0.047)	(0.039)	(0.028)	(0.038)
Breadwinner[b]	−0.001	0.036	−0.099*	0.053	−0.074	0.015	−0.013	−0.005	−0.056	0.069*	0.015	−0.032	−0.010
	(0.029)	(0.030)	(0.037)	(0.046)	(0.041)	(0.041)	(0.034)	(0.030)	(0.045)	(0.033)	(0.030)	(0.036)	(0.036)
Rooms[c]	−0.030	0.006	−0.011	0.109*	0.061	0.007	0.072	−0.029	0.032	−0.017	−0.065	0.103*	−0.025
	(0.039)	(0.040)	(0.054)	(0.047)	(0.039)	(0.040)	(0.051)	(0.034)	(0.073)	(0.050)	(0.061)	(0.050)	(0.064)
Chronic conditions[d]	0.049	−0.031	0.063	0.024	−0.011	−0.009	0.002	0.048	0.094	−0.050	0.143	0.060	−0.051
	(0.039)	(0.052)	(0.047)	(0.066)	(0.056)	(0.048)	(0.041)	(0.044)	(0.068)	(0.065)	(0.122)	(0.037)	(0.051)
Bed[e]	0.018	−0.019	−0.035	0.063	0.065	−0.024	−0.033	−0.061	0.043	0.012	−0.080	−0.021	0.086
	(0.047)	(0.059)	(0.043)	(0.057)	(0.060)	(0.051)	(0.042)	(0.043)	(0.080)	(0.056)	(0.066)	(0.035)	(0.063)
Height[f]	0.043*	0.038	−0.012	0.006	−0.084*	−0.026	−0.024	−0.010	−0.023	0.015	−0.005	0.012	0.025
	(0.022)	(0.022)	(0.025)	(0.037)	(0.031)	(0.029)	(0.026)	(0.023)	(0.033)	(0.025)	(0.026)	(0.022)	(0.030)
Medium level of education	0.061*	0.044	0.069	0.100*	0.085		0.015	0.034	0.111	0.226*	0.039	0.079*	0.039
	(0.030)	(0.042)	(0.040)	(0.043)	(0.050)		(0.037)	(0.035)	(0.067)	(0.037)	(0.034)	(0.026)	(0.040)
High level of education	0.165*	0.196*	0.194*	0.122	0.339*	0.030	0.091*	0.132*	0.216*	0.479*	0.367*	0.230*	0.218*
	(0.025)	(0.037)	(0.038)	(0.075)	(0.077)	(0.039)	(0.045)	(0.040)	(0.084)	(0.047)	(0.055)	(0.041)	(0.071)
Good health	0.207*	0.178*	0.213*	0.133*	0.105	0.103*	0.193*	0.176*	0.094*	0.108*	0.094*	0.181*	0.080*
	(0.024)	(0.032)	(0.033)	(0.049)	(0.055)	(0.032)	(0.031)	(0.032)	(0.039)	(0.029)	(0.039)	(0.029)	(0.032)
Very good or excellent health	0.274*	0.255*	0.231*	0.103*	0.126*	0.162*	0.173*	0.200*	0.151*	0.145*	0.099*	0.202*	0.124*
	(0.023)	(0.028)	(0.037)	(0.051)	(0.059)	(0.038)	(0.036)	(0.036)	(0.055)	(0.037)	(0.041)	(0.033)	(0.047)

Table 6 continued

	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Joint significance later life health[g]	0.000*	0.000*	0.000*	0.049*	0.073	0.000*	0.000*	0.000*	0.010*	0.000*	0.020*	0.000*	0.006*
Joint significance education[g]	0.000*	0.000*	0.000*	0.078	0.000*	0.452	0.096	0.003*	0.023*	0.000*	0.000*	0.000*	0.007*
Joint significance childhood SES & health[g]	0.251	0.336	0.120	0.145	0.055	0.740	0.724	0.010*	0.499	0.077	0.450	0.097	0.802
Joint significance childhood SES[g]	0.651	0.473	0.058	0.051	0.134	0.443	0.523	0.003*	0.395	0.018*	0.374	0.089	0.951
Joint significance childhood health[g]	0.142	0.337	0.524	0.665	0.050	0.755	0.681	0.479	0.390	0.809	0.422	0.420	0.390
Pseudo R^2	0.224	0.315	0.186	0.128	0.364	0.185	0.273	0.220	0.135	0.262	0.154	0.339	0.225
Excluding later life health													
Joint significance education[g]	0.000*	0.000*	0.000*	0.068	0.000*	0.288	0.047*	0.000*	0.012*	0.000*	0.000*	0.000*	0.003*
Joint significance childhood SES & health[g]	0.332	0.057	0.134	0.124	0.109	0.562	0.671	0.012*	0.470	0.094	0.421	0.090	0.820
Joint significance childhood SES[g]	0.460	0.267	0.116	0.033*	0.211	0.251	0.497	0.003*	0.271	0.038*	0.307	0.026*	0.908
Joint significance childhood health[g]	0.299	0.102	0.314	0.736	0.079	0.739	0.595	0.483	0.560	0.588	0.451	0.865	0.426

Table 6 continued

	SE [m.e. (s.e.)]	DK [m.e. (s.e.)]	NL [m.e. (s.e.)]	CH [m.e. (s.e.)]	AT [m.e. (s.e.)]	DE [m.e. (s.e.)]	FR [m.e. (s.e.)]	BE [m.e. (s.e.)]	ES [m.e. (s.e.)]	IT [m.e. (s.e.)]	GR [m.e. (s.e.)]	CZ [m.e. (s.e.)]	PL [m.e. (s.e.)]
Excluding later life health and education													
Joint significance childhood SES & health[g]	0.003*	0.000*	0.060	0.058	0.003*	0.359	0.309	0.000*	0.017*	0.099	0.631	0.003*	0.756
Joint significance childhood SES[g]	0.007*	0.004*	0.031*	0.014*	0.005*	0.113	0.117	0.000*	0.004*	0.073	0.649	0.001*	0.725
Joint significance childhood health[g]	0.172	0.039*	0.409	0.767	0.087	0.741	0.632	0.677	0.616	0.266	0.425	0.766	0.510

Cluster-robust standard errors (s.e.'s) are in parentheses. Significance level: $^{*}p < 0.05$. Sample sizes are in Table 1 (number of observations). The probit models include age dummies, survey year dummies, marital status and dummies for having one, two and three or more children as explanatory variables

[a] 1 = more than 25 books, 0 otherwise

[b] 1 = farmer or elementary occupation, 0 otherwise.

[c] An increase of one room (in the number of rooms per person)

[d] 1 = one or more chronic conditions, 0 otherwise

[e] 1 = 1 month or more in bed, 0 otherwise

[f] A 10 cm increase

[g] p values are reported

with age. In addition, we find a positive and significant association between height and later life employment for men in Switzerland, Austria, Germany, and Greece. Relative to the employment differences between those with poor or fair and very good or excellent later life health (SRH), the associations with childhood health and SES are substantial for men from Spain (the variables *rooms* and chronic conditions), Poland (the variable chronic conditions), and Austria (the variables chronic conditions and height).[8] For Swedish and French men the variable *bed* is positively and for Austrian women height is negatively associated with employment. We have no explanation for these two findings and also do not wish to speculate as the childhood variables are jointly insignificant for these cases. Finally, for Italian women the positive association between the variable *breadwinner* and employment appears not to be a robust finding as it becomes negative and insignificant when SRH and education are excluded from the employment equation (these results are not shown but available upon request).

In sum, for both men and women we find a strong association between later life health and employment. For women and to a lesser extent for men, we find that educational attainment is positively associated with later life employment. Most associations between early life circumstances and later life employment are insignificant, although there are notable exceptions such as the association with *chronic conditions* for men in a few countries. All in all, we find only weak empirical evidence in favor of associations between early life circumstances and later life employment once later life health and education are controlled for.

4 Pathways

To facilitate an overall interpretation of our empirical results, we discuss the results of joint significance tests on all the associations of early life circumstances and education variables with later life health and employment in the models on which we have reported in Tables 5 and 6. More importantly, these test results provide insights into the role of education as a pathway through which early life circumstances may affect later life health, and education and later life health as pathways through which early life circumstances may affect later life employment. These test results are presented in Tables 5 and 6.[9]

Section 3.1 already discussed the associations of educational attainment with early life circumstances. Taking into account that childhood SES is likely to influence childhood health but not vice versa, these associations occur mainly with the SES-related variables, and for men also with height (see Table 4, also for the joint significance tests).

As shown at the bottom part of Table 5, after controlling for education, we find significant associations between early life circumstances and later life health for men

[8] For Polish men the comparison is done with poor or fair versus good health (and not very good or excellent health).

[9] To perform the tests, we exclude education and/or later life health from the models in Sect. 3 and re-estimate them. Excluding, furthermore, the demographic variables marital status and children leaves the tests results virtually unchanged. All estimation results are available upon request.

in about half of the countries and for women in all countries except in Eastern Europe. Overall, for women from Northern and Southern Europe childhood health links early life circumstances to later life health; but for women from Central Europe, it is childhood SES that does so. For men, we do not find such a pattern. When educational attainment is excluded, childhood health and/or SES become jointly significant in Denmark, Austria, and France for men and women, and for men in Poland and women in Belgium, Italy, and in the Czech Republic. This finding provides some support for education being a pathway through which early life circumstances are associated with later life health.

After controlling for education but not later life health, we find significant associations between early life circumstances and later life employment in most countries for men and to a lesser extent for women. For women from Northern Europe, the Netherlands, Austria, and Spain, and for men from Denmark, the Netherlands, Austria, France, Belgium, Italy, and Eastern Europe, the associations between early life circumstances—and in particular childhood SES—and later life employment become jointly significant once the education variables are excluded from the employment equation. These results are in line with Case and Paxson (2008) who report a positive association between SES and health during childhood and white collar occupations for U.S. individuals above age 50 that becomes insignificant once education is controlled for, and underscores the important role of education as a mediator between early life circumstances and later life employment. For women in Belgium only and men in Switzerland, Austria, Germany, and in particular in Spain, also when later life health is controlled for, early life circumstances remain jointly significantly associated with later life employment. As discussed in Sect. 3, these latter results for men may suggest a long-lasting positive impact of early life circumstances on employment opportunities that do not only operate through health. One explanation for this difference in findings between men and women could be the gender differences in labor market behavior attributed to the persistence of the male-breadwinner model in Southern European countries such as Spain (e.g. Adam 1996; Rica and Iza 2005) and to some extent also in other European countries where the male-breadwinner model was gradually being replaced by the dual-breadwinner model as the most common form of household labor supply (e.g. Gustafsson and Stafford 1994; Lewis 2001).

As also discussed in Sect. 3, with regard to educational effects, and with the exception of Switzerland, we find that education is health protective for men in all and for women in virtually all countries (see bottom part of Table 5). After controlling for later life health, we find significant associations between education and later life employment in almost all countries for women and in half of the countries for men. For example, we find a strong association between educational attainment and later life employment among Northern European and Dutch women that is inexistent among their male peers (see bottom part of Table 6).[10]

[10] This may be due to a series of educational reforms in these countries, which eliminated almost the educational gender gap (see, e.g., Dronkers 1993 for the Netherlands).

5 Summary and discussion

We use data from the SHARE and (ordered) probit models to examine the associations between individuals' early life circumstances (specifically, childhood SES and childhood health) and later life health and employment in thirteen European countries. Childhood SES is approximated by three variables pertaining to the parental home when the respondent was 10 years old: enough books to fill one bookcase, a main breadwinner working as a farmer or in an elementary occupation, and the number of rooms per person. Childhood health is measured based on chronic conditions during childhood (at ages 0–15) and lengthy confinement to bed because of illness. We also control for the individual's height at the time of interview as a proxy for both childhood SES and childhood health.

Although the empirical results show that there are differences across the thirteen European countries in the strength of the associations between the various childhood health and SES variables and later life outcomes, they also show similarities that enable us to draw general conclusions. In all countries and for both men and women, favorable early life circumstances, and in particular a higher childhood SES, are associated with a higher level of education, which in turn is protective of later life health. Once educational attainment is controlled for, we find for most countries and in particular for women, strong empirical support that favorable early life circumstances are associated with better later life health. Although, and mainly for men, we find evidence for some countries of significant associations between early life circumstances and later life employment when later life health is controlled for, most of the association between early life circumstances and later life employment appears to be transmitted through education and later life health.

Our empirical findings may suggest that public policies which invest in children's health and parents' SES can benefit children in terms of better education, (later life) health, and employment opportunities. Examples of such policies are free health care for children and (means tested) income and in-kind support programs which cover the domains of parent's SES and children's health (e.g., Marmot et al. 2012, pp. 1016–1017). However, it is still an open question what the most effective and cost efficient ways are to implement such policies, as well as the optimal timing when to intervene (e.g., Almond and Currie 2011b), even if with regard to the latter point there is an increasing consensus on the advantages for intervening as early as possible (e.g. Doyle et al. 2009).

As discussed in the introduction, caution is warranted for policy recommendations based on these estimated associations. And though the literature provides evidence in support of causal relationships between early life circumstances and later life outcomes, more research is needed to identify the mechanisms that drive these relationships. Nonetheless, concerning this latter issue important advances have been made in this area. For instance, van den Berg and Gupta (2011) find a causal effect of economic circumstances at birth—measured by the business cycle—on mortality later in life and that operates for Dutch women (but not for men) through marriage, and Maccini and Yang (2009) provide suggestive evidence that the causal effect of weather conditions early in life—measured by birth year rainfall—on the adult SES of Indonesian women

is mediated more strongly by improved schooling attainment, and not as importantly by adult health.

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Appendix

See Table 7 in Appendix.

Table 7 Variable definitions

Variable	Definition
Respondent's later life characteristics	
SRH	The five SRH categories (from 1 to 5: poor, fair, good, very good, and excellent) are combined into three (from 1 to 3: poor or fair, good, very good or excellent)
Employment status	The categories no work and work. As suggested by Maestas (2010), we combine more objective information on hours of work and subjective employment status (both self-reported) to construct our measure of employment. No work includes those who are retired; permanently sick, or disabled; homemakers; the unemployed; and other individuals who make a living from owning properties, doing voluntary work, and so forth. Work refers to employed or self-employed individuals who report a positive number of hours of work per week in their primary job.
Education	Includes three levels of education defined from the 1997 International Standard Classification of Education (ISCED, http://www.unesco.org/education/information/nfsunesco/doc/isced_1997.htm): no education, primary education and lower secondary education (ISCED 0–2), upper secondary and postsecondary nontertiary education (ISCED 3–4), and tertiary education (ISCED 5–6)

Table 7 continued

Marital status	Is equal to 1 if living with spouse/partner, 0 if living as a single. Six individuals who live alone but report a marital status "other" are included as singles
Number of children	Includes biological children. Four intervals are considered: no children, 1 child, 2 children, and 3 or more children
Age	Includes dummy variables for each age year
Time	Includes dummy variables for each survey year
Respondent's early life circumstances	
More than 25 books at home when 10 years old (*bookcase*)	Is equal to 1 if there were more than 25 books (at least enough to fill one bookcase) in the household when the person was 10 years old, 0 if less. Magazines, newspapers, and school books are not considered
Breadwinner farmer or elementary occupation when respondent was 10 years old (*breadwinner*)	Is equal to 1 if the main household breadwinner worked as an agricultural-fishery worker or in an elementary occupation when the respondent was 10 years old, 0 otherwise
Rooms per person when 10 years old (*rooms*)	The number of rooms per person in the household when the respondent was 10 years old. Includes bedrooms, but excludes kitchen, bathrooms, and hallways
Chronic conditions during childhood (0–15 years)	Is equal to 1 if a respondent suffered from one or more chronic conditions during his or her childhood (0–15 years), 0 otherwise. Includes the following chronic conditions: severe headaches or migraines; epilepsy, fits, or seizures; emotional, nervous, or psychiatric problem; childhood diabetes or high blood sugar; heart trouble; and other serious health conditions.
1 month or more in bed during childhood (0–15 years)	Is equal to 1 if during childhood (0–15 years) and because of a health condition, the respondent was confined to bed or home for 1 month or more, 0 otherwise
Height (in centimeters)	Adult self-reported height (in centimeters)

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