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Growing up in wartime: Evidence from the era of two world wars

by
Enkelejda Havari
(Università di Venezia "Ca' Foscari")
Franco Peracchi
(Università di Roma "Tor Vergata" and EIEF)

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Enkelejda Havari
University of Venice "Ca' Foscari"

Franco Peracchi
University of Rome "Tor Vergata" and EIEF

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Abstract

We study the long-term consequences of war on health and human capital of Europeans born during the first half of the twentieth century, a period that has been termed the "era of two world wars". This period includes not only WW1 and WW2, but also the Spanish Flu and a long series of armed conflicts which foreshadowed or followed the two world wars. Using a variety of data, at both the macro- and the micro-level, we address the following questions: What are the patterns of mortality and survival among people born during this era? What are the consequences of early-life shocks on the health and human capital of the survivors some 50 years later? Do these consequences differ by gender, socio-economic status in childhood, and age when the shocks occurred? We find that mortality is much higher in war- than in non-war countries during WW1 and WW2, but not during the Spanish Flu. We also find important differences between WW1 and WW2 in the mortality patterns by gender and age. As for the long-term consequences of mortality shocks on the survivors, we find little evidence of increased adult mortality for people born during WW1 and WW2, but some evidence for people born during the Spanish Flu, especially, in England and Wales, France and Italy. On the other hand, war-related hardship episodes in childhood or adolescence (in particular exposure to war events and hunger) are strong predictors of physical and mental health, education, cognitive ability and wellbeing past age 50. The magnitude of the estimated effects differs by socio-economic status in childhood and gender, with exposure to war events having a larger impact on females and exposure to hunger having a larger impact on males. We also find that exposure to hunger matters more in childhood, while exposure to war events matters more in adolescence. Finally, we find that hardship episodes have stronger consequences if they last longer.

Key words: World War I; World War II; Spanish Flu; health; cognitive abilities; wellbeing; financial hardship; hunger; stress; socio-economic status; Europe; Human Mortality Database; SHARE; ELSA.

JEL codes: I0, J13, J14, N34

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1 Introduction

Wars have been fought since ancient times and are still very frequent today. As Koestler (1978) puts it, "the most persistent sound which reverberates through men's history is the beating of war drums." Wars, or more generally armed conflicts at both the interstate and the internal level, produce hardship, social disruption, and large losses of physical and human capital. According to Amnesty International, "where wars erupt, suffering and hardship invariably follow. Conflict is the breeding ground for mass violations of human rights including unlawful killings, torture, forced displacement and starvation."

The available macro-level literature suggests that the long-run effects of war on physical capital are limited and can quickly be reversed. For example, Bellows and Miguel (2009) argue that "the rapid postwar recovery experiences of some African countries after brutal civil wars – notably, Mozambique and Uganda – suggest that wars need not always have persistent negative economic consequences [...] Other recent research has shown that the long-run effects of war on population and economic growth are typically minor. Studies that focus on United States bombing [...] find few if any persistent impacts of the bombing on local population or economic performance. To the extent that war impacts are limited to the destruction of capital, these findings are consistent with the predictions of the neoclassical growth model, which predicts rapid catch-up growth postwar."

As for human capital, although there is a sizeable literature on the effects of military service or combat experience on earnings, health and mortality of veterans (see among others Angrist 1990, 1998, Angrist and Krueger 1994, Imbens and van der Klaauw 1995, Derluyn et al. 2004, Bedard and Deschênes 2006, Betancourt et al. 2010, and Costa and Kahn 2010), much less is known about the long-term consequences of armed conflicts and mass violence on the civilian population. Bozzoli et al. (2008) argue that "the analysis of the consequences of mass violence for the economy during and after its occurrence is a rather neglected field." They also argue that "micro-level studies based on surveys collecting qualitative and quantitative information on livelihood can provide insights into channels of conflicts which cannot be analyzed on basis of macroeconomic indicators alone."

It is useful to regard the long-term consequences of war on health, or human capital more generally, as the net result of two distinct mechanisms: selection and scarring. Selection is the effect on mean health due to changes in the composition of the population caused by differential mortality. This effect is positive if the least healthy are more likely to die. Scarring is the long-term damage to the individual health of survivors caused by war. In the model of Bozzoli, Deaton and Quintana-Domeque (2009), the net effect of the two mechanisms is positive or negative and

varies substantially in magnitude depending on the level of mortality caused by an aggregate health shock, which in turn is an increasing function of both the intensity of the shock and its degree of persistence (that may itself depend on post-shock remediation). If scarring is not constant in the population, the net effect may also depend on survivors' heterogeneity.

In this paper we study the long-term consequences of war on health and human capital of Europeans born during the first half of the twentieth century, a period that Berghahn (2006) calls the "era of two world wars". This period comprises not only World War I (1914–18) and World War II (1939–45) but also a long series of armed conflicts, between and within European countries, such as the Italo-Turkish war (1911–12), the Balkan wars (1912–13), the civil wars in Finland (1918) and Germany (1918–19) and violence in Austria and Italy in the aftermath of World War I (WW1), the Polish-Russian War (1919–21), the Greco-Turkish War (1919–22), the Austrian Civil War (1934), the Spanish Civil War (1936–39), the Italian occupation of Albania (1939), the Greek Civil War (1946–49), and violence in Central and Eastern Europe in the aftermath of World War II (WW2).

We address three main questions: What are the patterns of mortality and survival among people born during the era of two war wars? What are the consequences of early-life shocks on the health and human capital of the survivors some 50 years later? Do these consequences differ by gender, socio-economic status in childhood, or age when the shock occurred? Unlike other papers, we do not try to identify causal effects or some policy-relevant parameter, as we do not see in our data credible sources of exogenous variation that we can exploit. We also make no attempt at modeling the very complicated process that links the individual experience of war-related shocks in childhood or adolescence to adult outcomes. Still, two considerations make our analysis potentially relevant for policy. First, the cohorts that experienced WW2 in their childhood or adolescence represent the bulk of the population aged 70 and older in Europe. The link to specific war-related experiences may help understand their health patterns. Second, our findings may be useful for understanding the long-term consequences of recent armed conflict, for which no long-term data is yet available.

WW1 and WW2 were the deadliest wars in human history in absolute terms, though not in relative terms (see e.g. Diamond 2012), but estimates of war-related casualties are subject to considerable uncertainty. The estimated death toll of WW1 in Europe ranges between 12 and 14 millions (2.5–3 percent of the total population in 1914). The estimated death toll of WW2 in Europe is three to four times higher, ranging between 40 and 50 millions (7–9 percent of the total population in 1940), the large uncertainty reflecting the death counts for Germany, Greece, Poland, the Soviet Union and Yugoslavia. There are no reliable estimates of the death toll of the

other armed conflicts in Europe during this period, but estimates for the Spanish Civil War range between 190,000 and 500,000 deaths. As argued by Berghahn (2006, p. 7), "Europe had not seen mass death on such a scale since the Thirty Years War of the seventeenth century."

Between WW1 and WW2, two health catastrophes – the Spanish Flu (1918–21) and the Ukrainian Famine (1932–33) – added at least another 6 millions to the death count. The Spanish Flu claimed about 3 million lives in Europe (Ansart et al. 2009), making it one of the deadliest natural disasters in history. Excess death from the Spanish Flu in Europe is estimated at 1.0–1.2 percent of the total 1918 population. Erkoreka (2009) suggests a direct link between WW1 and the Spanish Flu, as "the millions of young men who occupied the military camps and trenches were the substrate on which the influenza virus developed and expanded." The Ukrainian Famine claimed more than three million lives. Snyder (2010, p. 53) estimates that "no fewer then 3.3 million Soviet citizens died in Soviet Ukraine of starvation and hunger-related diseases."

The larger death toll of WW2 relative to WW1 reflects not only the enhanced destructive power of weapons, but also the longer duration of the war, its wider geographical spread, and the greater level of involvement of the civilian population. A very crude measure of the latter is the ratio of civilian to total deaths. Estimated civilian deaths in Europe are about 5 millions for WW1 and 20–28 millions for WW2 (three fourths of them in the "bloodlands" of Belarus, Poland, Ukraine, the Baltic States and some of Russia's western fringe). These numbers represent about 40 percent of total human losses in Europe during WW1 and about 60 percent during WW2, with a huge cross-country variability. Key factors that help explain the higher burden of WW2 on the civilian population are the direct impact of war operations and "strategic bombing" on civilians, war-related hunger and disease, and deliberate mass murder of targeted population groups (most notably, Jews).

Apart from the aggregate death toll, we have very little statistical evidence on the consequences of WW1 for the civilian population. For example, Berghahn (2006, p. 45) observes that "to this day we have no reliable statistics on diseases among the civilian population and its fate more generally. What we can say is that for many regions it was no less than disastrous." Recently, Börsch-Supan and Jürges (2012) provide some illustrative evidence showing a substantial hike in early retirement rates (before age 55) among German men and women born during the hunger years of WW1 (1917–18). For the Spanish Flu, we have the evidence in Almond (2006) and Brown and Thomas (2013) for the USA, and several epidemiological studies for Europe.

Unlike the survivors of WW1 and the Spanish Flu, who are now mostly dead, a relatively large

fraction of people who survived WW2 are still alive today and able to recall their experience of specific shocks and hardship episodes. The recent availability of data covering survivors of WW2 has stimulated a growing literature that focuses on the channels through which war affects the civilian population, especially children and adolescents.

The main channels considered sofar are the disruption of the educational process through physical destruction, loss of educators, school closure or conscription of students (Ichino and Winter-Ebmer 2004, Akbulut-Yuksel 2014), the loss of parents during war, the increased risk of prosecution and dispossession, and exposure to hunger or even famine (Havari and Peracchi 2011, van den Berg, Pinger and Schoch 2012, Jürges 2013, and Kesternich et al. 2014). All available studies find important negative consequences of experiencing war-related hardship on education, health and earnings of survivors. These negative consequences may be linked, as lower educational attainments imply large earnings losses but may also impact other domains, such as physical and mental health.

Relative to the economic literature focusing on WW2, our work is novel in several respects. First, we take a longer historical perspective, from the beginning to the middle of the twentieth century. Second, we consider a larger set of countries, including England, Spain, and the Scandinavian countries. Extending the analysis to England is particularly important because of the crucial role of this country in both world wars and because its food and health policies were very different from those in continental Europe (for WW2, see Collingham 2011). Third, we exploit the macro-level information contained in country-specific mortality data by age, gender and year. Fourth, at the micro-level, we study the relationship between experiencing various types of hardship in childhood or adolescence and a broad set of adult outcomes, including physical and mental health, cognitive ability and wellbeing. We also consider differences between people who experienced hardship episodes at different ages in childhood or adolescence.

Our work is also related to three recent strands of the literature. The first is the child development literature, which emphasizes the importance of early life conditions for adult outcomes (Almond 2006, Currie and Moretti 2008, Almond and Currie 2011a) and the role of particular critical periods for certain outcomes (Case, Fertig and Paxson 2005, Cunha and Heckman 2007, Case and Paxson 2008, 2010, Currie 2009, 2011).

The second is the literature that uses extreme and sharp events, such as famines, in order to identify causal relationships of interest. Interestingly, three widely studied famines are directly related to WW2: the Greek famine of 1941–42 (Neelsen and Stratmann 2011), the Leningrad famine of 1941–44 (Sparén et al. 2004), and the Dutch Hunger Winter of 1944–45 (Ravelli, van

der Meulen and Barker 1998, Roseboom, de Rooij and Painter 2006, Lumey, Stein and Susser 2010). Most of this literature focuses on the long-run effects of nutritional deficiencies around birth, or Barker's "fetal origins hypothesis" (see e.g. Almond and Currie 2011b, and Dercon and Porter 2014). Its main finding is that exposure to hunger or famine around birth or early childhood negatively influences a variety of health and non-health outcomes at much later ages.

The third is the recent literature on the short-term effects of civil wars and armed conflicts in Africa and Asia (Alderman, Hoddinott and Kinsey 2006, Bellows and Miguel 2009, Bundervoet, Verwimp and Akresh 2009, Blattman and Annan 2010, Shemyakina 2011, Akresh et al. 2012, Minoiu and Shemyakina 2012, Ampaabeng and Tan 2013). Its main finding is that exposure to armed conflicts has severe negative effects on the health of exposed children.

The remainder of this paper is organized as follows. Section 2 presents our data. Section 3 focuses on country-level data and describes the patterns of mortality for the cohorts born during the first half of the twentieth century. Section 4 focuses on micro-level data and studies the relationship between war and the experience of hardship episodes for individuals born between 1930 and 1956 who were alive 50 years later or more. Section 5 uses these micro-level data to analyze the consequences on later life outcomes of exposure to war and hardship during childhood or adolescence. Finally, Section 6 summarizes and concludes.

2 Data

We combine three types of data. The first type is death rates by country, age, year and gender from the Human Mortality Database (HMD), a joint project by the Department of Demography at the University of California Berkeley and the Max Planck Institute for Demographic Research, which provides detailed and comparable data for eleven European countries over a long time period.

The second is rich micro-level data from two multidisciplinary household panel surveys, namely the Survey of Health, Ageing and Retirement in Europe (SHARE) and the English Longitudinal Study of Ageing (ELSA). Both surveys collect extensive information on socio-economic status (SES), health, social and family networks from nationally representative samples of people aged 50+ in participating countries, including detailed life-history data.

The third, relevant for the cohorts covered by SHARE and ELSA, is detailed and accurate information on war events during the Spanish Civil War and WW2.

2.1 HMD

Death rates in the HMD are obtained as the ratio between death counts and counts of the population at risk, the raw data generally consisting of birth and death counts from vital statistics, plus population counts from periodic censuses or official population estimates (see Wilmoth et al. 2007 for details).

The HMD contains mortality data starting from 1890 or earlier for eleven Western European countries, namely Belgium, Denmark, England and Wales, Finland, France, Italy, the Netherlands, Norway, Spain, Sweden and Switzerland. Unfortunately, data for Belgium are missing for the WW1 period (1914–18). Due to changes in borders and mass population movements, mortality data for Austria, Germany and all Eastern European countries are only available after WW2, often only after 1955. As a result, the HMD only offers a partial view of the patterns of mortality during the era of two world wars. This is a major limitation because both world wars were much more devastating in Eastern Europe (Berghahn 2006). With reference to WW2, Davies (2006, p. 24) argues that "the war assumed a far grander scale in the East than in any of the fronts where the Western Allies were involved." Again with reference to WW2, Snyder (2010, p. 394) points out that "German and Soviet occupation together was worse than German occupation alone. The populations east of the Molotov-Ribbentrop line, subject to one German and two Soviet occupations, suffered more than any other region of Europe."

2.2 SHARE and ELSA

For thirteen continental European countries, namely Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Italy, the Netherlands, Poland, Spain, Sweden and Switzerland, we combine the information from the second and the third wave of SHARE. Notice that the survey does not include England and Wales, Finland and Norway, which are covered by the HMD, but includes countries for which we lack long-term mortality data, most notably Germany and Poland. Its second wave (2006–07) collects information on the current status of survey participants, in particular their health and SES. Its third wave (2008–09), also known as SHARELIFE, collects retrospective information on employment, health and accommodation histories, experience and duration of hardship episodes, and childhood circumstances around age 10. For England, we combine the information on current status from the second wave (2004–05) of ELSA with the retrospective information from ELSALIFE, the life-history interviews in its third wave (2007).

SHARE and ELSA were designed to help understand the patterns of aging in Europe. Both

surveys interview nationally representative samples of people aged 50+ at the time of the interview, who speak the official language of the country and do not live abroad or in an institution. Spouses or partners are included irrespective of age. A key aspect of both surveys, which makes them particularly suited for our purposes, is the detailed retrospective information they collect on individual life histories. We exploit this information to construct a longitudinal data set with annual observations on the occurrence of a number of events.

Although SHARE and ELSA are similar in scope, coverage and organization, several important differences prevent us from merging the two datasets and force us to analyze them separately. In this section we summarize the main differences and refer to Appendix A for a more detailed description.

A unique feature of the public use version of SHARELIFE is the information it provides on the residence in which the respondents lived when they were born and on each subsequent residence in which they lived for six months or more, including the start and end year, the type of residence, and the country, region and area where the residence was located. A drawback is the fact that the level of regional disaggregation varies by country: it is at the coarse NUTS1 level for Belgium, Denmark, France and the Netherlands, at the fine NUTS3 level for the Czech Republic, and at the intermediate but not very detailed NUTS2 level for all other countries. Unfortunately, the public use version of ELSALIFE provide little information on past residence and no information that can be used to determine the country and region of residence in a given year. Basically, we can only determine whether the respondent was living in the U.K. or abroad in a given year.

As for SES in childhood, both surveys collect broadly comparable information on the occupation of the main breadwinner (SHARELIFE) or the respondent's father (ELSALIFE), the number of books at home, the main features of the accommodation, and the household size and composition when the respondent was aged 10. We use this information to construct an index of SES in childhood based on principal component analysis (PCA) and indicators for the absence of the parents when the respondent was aged 10.

As for childhood health, SHARELIFE collects information on self-reported health (SRH), the distinct illnesses experienced by the respondents in childhood, and the age interval (0–5, 6–10 and 11–15) in which each illness was experienced. ELSALIFE also collects information on SRH and the distinct illnesses experienced by the respondents in childhood, but no detail on their timing.

As for hardship episodes in childhood, SHARELIFE asks whether there was a distinct period during which the respondents experienced stress, poor health, financial hardship or hunger, and

the year when this period started and ended. Although we have no information on the intensity of a hardship, we can determine its duration by taking the difference between the year it ended and the year it started. Notice that respondents are asked to report only one episode for each type of hardship, presumably the most salient (phrases such as "distinct period" or "compared to the rest of your life" are meant to capture this idea). Further, hardships are not defined precisely and their perception may vary across individuals, which raises the issue of interpersonal comparability. This may be especially problematic for hunger, as we do not know exactly how respondents interpret the question. Financial hardship is the only type of hardship considered by ELSALIFE. We only know the age when financial hardship started but not when it ended, so duration cannot be computed. On the other hand, ELSALIFE differs from SHARELIFE because it collects direct information on war exposure by asking whether respondents witnessed serious injury or death of someone in war or military action and whether they were evacuated during WW2.

The adult outcomes that we consider include SRH as an overall measure of health, indicators of physical and mental health, educational attainments, and measures of numeracy and recall ability. We also consider two dimensions of subjective wellbeing, namely life satisfaction and happiness. As discussed by Kahneman and Deaton (2010), life satisfaction refers to the thoughts people have about their life, while happiness (or, perhaps more precisely, emotional wellbeing) reflects the emotional quality of individual's everyday life. This distinction is important because the two dimensions correlate differently with income and health outcomes. While the information on SRH, recall ability, life satisfaction and happiness is fairly comparable in SHARE and ELSA, important differences arise with the other outcomes. First, the numeracy test is not administered in waves 2 and 3 of ELSA, and the only available measure of cognitive ability is an indicator of memory (recall total). Second, unlike SHARE, ELSA does not collect detailed information on the chronic conditions diagnosed. Third, unlike SHARE, body height and weight in ELSA are not self-reported but are objective measures taken during a nurse visit which is a key component of the survey. Fourth, SHARE collects information on the years of completed schooling, while ELSA asks the age at which the respondent left full time education. Fifth, SHARE uses the Euro-D index of depression, which considers several dimensions of mental health (depression, anxiety, suicidality, etc.), while ELSA only asks whether the respondent was feeling depressed in the past week.

Like most household surveys, both SHARE and ELSA suffer of sample attrition and item nonresponse. In addition, specific problems with the life-history data collected in the two surveys include recall bias, coloring and limited information on certain variables.

Despite the adoption of preventive procedures, such as training of the interviewers and survey design characteristics, sample attrition is an important feature of both surveys. The level of attrition varies by country and is determined by many factors, such as age, gender and education.

Item nonresponse arises when individuals do not answer a particular question. In household surveys, this is a major problem for income and assets, but is usually a minor problem for health and wellbeing. SHARE and ELSA are no exceptions (Börsch-Supan and Jürges 2005). In both surveys, nonresponse is important for income and wealth, but is unimportant for health, hardships and childhood circumstances.

Recall error arises when respondents do not remember precisely when and how an event took place in the past. There are concerns that retrospective data suffer from recall errors especially when the population of interest consists of elderly people. In fact, Havari and Mazzonna (2014) find little evidence of both. This partly reflects a distinctive advantage of SHARELIFE and ELSALIFE over other surveys, namely the fact that both apply the life-history calendar method, which is based on temporal landmarks (events that are striking or easier to remember) and should therefore lead to better accuracy (see for example Groves et al. 2004).

Even when an event is a temporal landmark, one cannot rule out coloring, namely the fact that respondents may answer questions about the distant past based on post-event information, such as their current status or macro-events that are part of a country's narrative. We find little evidence of coloring in SHARE and ELSA when using information on hardships.

2.3 Major war events

Although SHARE does not collects direct information on war exposure, knowledge of the country and region of residence of the respondents in each single year allows us to construct an indicator of potential war exposure by exploiting historical information on major war events (both combat operations and aerial bombings) during the period between the beginning of the Spanish Civil War in 1936 and the end of WW2 in 1945. Things are just the opposite for ELSA, which collects direct information on war exposure but lacks the temporal and spatial information needed to relate individual experiences to major war events.

For the Spanish Civil War, our main sources of information are Thomas (2003) and Preston (2006), while for WW2 we exploit a variety of sources, including Ellis (1994) and Davies (2006). We refer to the regions affected by major war events as "war regions". The remainder of this section provides some detail for the SHARE regions.

The Spanish Civil War began in July 1936 and initially affected all regions of Spain, except Ceuta and Melilla and the Canary Islands. In 1937 it mostly affected the central, south-eastern, eastern and northern regions. In 1938 and 1939 it mostly affected its central, south-eastern and eastern regions. The Spanish Civil War conventionally ended on April 1, 1939. Exactly five months later, on September 1, 1939, WW2 began with the German invasion of Poland, coordinated with the Soviet invasion from the east on September 17. Thus, for 1939, our war regions include the whole of Poland and some regions of Spain. The regions along the French-German border are not included because only affected by small-scale war operations (the so-called "phony war"). In 1940, our war regions include the whole of Belgium and the Netherland, and the northern and eastern regions of France. In 1941, they include the whole of Greece, plus the German regions of Bremen and Hamburg that were subject to heavy aerial bombing. In 1942, no region considered in SHARE was affected by major combat operations, and our only war regions are some heavily bombed regions of Germany. In 1943, combat was limited to the southern Italian regions, but aerial bombing of Germany extended and intensified. In 1944, combat affected eastern Poland, central Italy, most of Greece, and parts of Belgium, France and the Netherlands, while large parts of Germany were under heavy aerial bombing. In 1945, our war regions include all of Germany, central and western Poland, northern Italy, eastern Austria, most of the Czech Republic, and parts of Belgium, France and the Netherlands. In Europe, WW2 conventionally ended on May 8, 1945 with the unconditional surrender of all German forces to the Allies.

Notice that, although mainland Denmark was under German occupation from April 1940 to the end of WW2, we do not include its regions among the war regions because they were never affected by major war events. More generally, "even countries which suffered grievously from fighting and occupation could have large expanses of their territory virtually untouched" (Davies 2006, p. 17).

3 Mortality and survival

In this section we use the HMD data to illustrate the patterns of mortality for the cohorts born during the first half of the twentieth century in the countries for which we have long-run mortality data. These cohorts have experienced severe mortality shocks earlier in life, so it is important to describe the main features of the selection process caused by mortality during this period. Furthermore, since our micro-level data comes from people who were alive at the time of the SHARE or ELSA interviews, we also provide some evidence on survival rates by country, gender and cohort.

3.1 Mortality patterns

Figures 1 and 2 present contours plots of death rates by age during the period 1890–2009, separately by country and gender (green $\leq$ .1 percent, light blue .2–.8 percent, blue .8–3.0 percent, purple 3–7 percent, red $>$ 7 percent). For simplicity, we only show the results for three countries that participated to both WW1 and WW2, namely England and Wales, France and Italy. As a comparison, we also include one country that was neutral during both world wars, namely Sweden. We consider all years of age from 0 to 80 and all calendar years from 1890 to 2009.

The figures reveal a clear downward trend in mortality, interrupted by sharp increases during the years of WW1, the Spanish Flu and WW2. They also show that the mortality patterns during these three episodes differ substantially by country, gender and age group. First, death rates were much higher in war countries during WW1 and WW2, but not during the Spanish Flu. Second, they were much higher for males than for females during WW1 and WW2, but again not during the Spanish Flu. Third, they were higher for younger adults, especially young males subject to military service. Fourth, for France we observe a bimodal profile of mortality during WW2, with one peak in 1940 and another one in 1944–45, corresponding to the start and the end of German occupation. A similar pattern can be observed for Belgium, the Netherlands and Norway, also occupied by Germany during WW2. As argued by Berghahn (2006, p. 101), "in the west and north a measure of normalcy did return after the respective armies had been defeated by the Wehrmacht's powerful strokes. Only after 1942–43 did these countries experience a renewed escalation of violence." Finally, for all three war countries there is some evidence of higher mortality at older ages for the cohorts aged 20–30 during WW1 and for the cohorts born around the time of the Spanish Flu. However, the latter cohorts were unlucky enough to be aged 20–30 during WW2, so it is hard to distinguish the scarring effects of the Spanish Flu from those of WW2.

To complement the visual information from Figures 1 and 2, and to isolate the long-term consequences of living though our three high-mortality episodes, we consider the following flexible model for the age profile of cohort-specific log death rates, $\ln mx$, by country and gender

$$\mathbb{E}(\ln mx_{ab}) = f(a) + g(b) + h(a,b) + \sum_i \alpha_i A_i + \sum_j \beta_j T_j + \sum_i \sum_j \gamma_{ij} A_i * T_j + \sum_k \delta_k B_k, \qquad (1)$$

where $f(a)$ is a cubic spline in age a (expressed in deviation from age 50), $g(b)$ is a cubic polynomial in the year of birth b (expressed in deviation from year 1935), $h(a,b)$ is a quadratic interaction term between age and birth year introduced to capture changes in the age-profile of mortality across cohorts, the A_i are a set of age dummies for being aged 18–27 and 28–37 introduced to capture

the existence of a "mortality hump" for younger adults reflecting accident mortality for males and accident plus maternal mortality for females (Heligman and Pollard 1980), the T_j are a set of time dummies for the years of WW1 (1914–18), the Spanish Flu (1919–21) and WW2 (1939–45), and the B_k are a set of cohort dummies for being born during WW1, the Spanish Flu or WW2. The term $f(a) + g(b) + h(a, b)$ is a smooth function of age and birth year that captures long-run trends in mortality at ages different from 18–37, the α_i coefficients measure the excess mortality for younger adults (age groups 18–27 and 28–37) in "normal" years, the β_j coefficients measure the excess mortality during WW1, the Spanish Flu and WW2 at ages different from 18–37, the γ_{ij} coefficients measure the excess mortality during WW1, the Spanish Flu and WW2 for younger adults, and the δ_k coefficients measure the long-run consequences of being born during WW1, the Spanish Flu or WW2. All coefficients have the interpretation of percentage differences relative to the long-run trends. The model is estimated separately by country and gender via ordinary least squares (OLS) using all ages from 0 to 99 and all calendar years from 1890 to 2009.

Table 1 presents the estimates of the coefficients in model (1), separately by country and gender, along with the sample size (N) and the adjusted R^2 (R^2_a), separately by country and gender, with the top panel for females and the bottom panel for males. The stars denote p-values, with * for p-values between 5 and 10 percent, ** for p-values between 1 and 5 percent, and *** for p-value below 1 percent.

For the age groups 18–27 and 28–37, excess mortality is always positive, large and statistically significant in all countries, confirming the existence of a mortality hump for younger adults. For the age group 18–27 this effect is much stronger for males than for females, while for the age group 28–37 it is about the same for both genders. In all countries, baseline excess mortality during WW1, the Spanish Flu and WW2 is always higher for males than for females, gender differences being especially large during WW1. Further, during all three periods, the mortality hump for younger adults is magnified, especially in war countries (England and Wales, France and Italy during both world wars, and Finland during WW2). Not surprisingly, excess mortality in war countries is much higher for younger males than for younger females. For males aged 18–27, excess mortality during WW1 is also higher in England and Wales and France than in Italy, partly because Italy joined the war about one year later. During WW2, it is particularly high in Finland, where it is nearly twice that observed in England and Wales, France and Italy, to testify the intensity of the Russian-Finnish wars of 1939–40 and 1941–44. In non-war countries, instead, gender differences in the mortality hump for younger adults are much smaller or are even reversed. There is some evidence of a scarring

effect on mortality at later ages for females and males born during WW1 in war countries, but the scarring effect for people born during the Spanish Flu appears to be very weak. Being born during WW2 is instead associated with a permanent decrease in mortality for both females and males in all countries, including those directly exposed to the war. This may reflect selection effects, but also the rapid economic recovery and the policies adopted in the postwar period.

To summarize, WW1, the Spanish Flu and WW2 are all characterized by strong upward deviations from the long-run trend of falling mortality, but the magnitude of the three shocks varies considerably by country, gender and age group. As for the long-run consequences of these mortality shocks, WW1 and the Spanish Flu leave recognizable scars on survivors, most notably in our three war countries – England and Wales, France and Italy. This does not appear to be true for WW2, as people born during the war are characterized by lower mortality at later ages. Possible reasons for this difference include postwar remediation, rapid increase in postwar income, improvements in health care, etc.

3.2 Survival rates up to the SHARE and ELSA interviews

Since SHARE and ELSA only interview people who reached age 50 at the time of the interview, it is important to understand how selected the reference population is. We use the HMD to address this issue for the nine countries for which we have both micro-level and mortality data, namely Belgium, Denmark, France, England (and Wales), Italy, the Netherlands, Spain, Sweden and Switzerland.

Tables B1 and B2 in Appendix B show the survival rates up to year 2006 for the cohorts born between 1918 and 1956, separately by country and gender. Survival rates have been constructed by multiplying annual survival probabilities (i.e., one minus the death rates) from the year of birth (when they are set equal to 1) to 2006, separately by gender, country and cohort.

Survival rates increase with the year of birth and are always higher for women. For example, about two thirds of the women born in 1930 were still alive in 2006, but only about half of the men born in 1930 were still alive. As another way of saying this, survival rates of men born in 1930 are similar to those of women born six years earlier, in 1924. Survival rates also vary a lot by country. For example, for females born in 1930, they are highest in Switzerland (.745), France (.721) and Sweden (.717), and lowest in England and Wales (.641) and Denmark (.603). For men born in the same year, they are highest in Switzerland (.556) and Sweden (.554), and lowest in Spain (.477) and Denmark (.472). These cross-country differences depend in a complicated way on a number of factors that include more than just war-induced mortality and the experience of hardship in

childhood and adolescence.

An open issue, discussed in Section 5.2.4 is how this selection process affects the estimated relationship between hardship in childhood and adult outcomes.

4 War and hardship in childhood

We now consider the relationship between war and the experience of hardship episodes – stress, absence of the parents at age 10, financial hardship and hunger – among SHARE and ELSA respondents born between 1930 and 1956.

In Sections 4.1–4.4 we exploit the longitudinal dimension of SHARELIFE (see Section 2) and study the prevalence of the various types of hardship among our cohorts of SHARELIFE respondents. We do not consider poor health because most of the reported episodes occur later in life. In Section 4.5 we present comparable evidence from ELSALIFE. Our main conclusion is that the Spanish Civil War, WW2 and their immediate aftermaths are closely associated with many of the hardship episodes experienced by people in our sample, in particular stress, absence of the father and hunger.

4.1 Stress

Figure 3 shows the prevalence of stress during the period 1935–65 for people born between 1930 and 1956. Here and in what follows we use red vertical bars to mark the WW2 period (1939–45). There is some evidence of an association between stress and war, as the prevalence of stress reaches relatively high levels during the WW2 period in France and Poland, and peaks in 1945 in Austria, Belgium, France, Germany and Italy. However, the prevalence of stress tends to increase during the postwar period in many countries, suggesting that stress is also strongly associated with adulthood.

Figure 4 focuses on those who report experiencing a period of stress before age 17 and shows the cumulative distribution function of its starting and ending year for all countries except Denmark (only subject to a mild German occupation) and the two neutral countries (Sweden and Switzerland). The figure confirms an association, albeit weak, between stress and war.

Miller and Rasmussen (2010) emphasize the importance of daily stressors, that is a series of conditions and circumstances of everyday life that can worsen the psychological state of an individual who has been directly exposed to a conflict. Among the daily stressors that can amplify the negative effect of war exposure are the absence of the parents, financial hardship and hunger, for which SHARELIFE also provides evidence.

4.2 Absence of the parents

Figure 5 shows the fraction of SHARE respondents born between 1930 and 1956 who report absence of the parents at the age of 10 in each calendar year between 1935 and 1965. It differs from the other figures because we lack information on the year when absence of the parents began or ended.

In all countries, fathers are more likely to be absent than mothers. Further, unlike absence of mothers, absence of fathers displays a clear temporal pattern, at least in Austria, France, Germany, Poland and, to a lesser extent, Italy and Spain. In Austria and Germany the percentage of respondents reporting an absent father is particularly high towards the end of WW2 and in its immediate aftermath, when it reaches a peak of over 30 percent. The pattern observed for France and Poland is similar but less pronounced.

This evidence is broadly consistent with the fact that POWs, mostly males, were used as forced labor by both Germany and the Soviet Union during WW2, and by the Soviet Union even after the war. Repatriation took a long time, the last German prisoners of war returning home only in 1956 (Davies 2006), while about 600,000 Germans taken as POWs or laborers would die (Snyder (2010, p. 318).

4.3 Financial hardship

Figure 6 shows the prevalence of financial hardship during the period 1935–65 among people born between 1930 and 1956. Although the link between war and financial hardship is not very strong, there is a clear evidence of concentration of financial hardship episodes during the WW2 period in Italy, Greece and Poland, and in the aftermath of WW2 in Germany and of the Civil War in Spain. Two countries stand out as somewhat exceptional. One is Germany, where the prevalence of financial hardship is quite low until the very end of WW2. The other is Greece, for both the high prevalence of financial hardship in the prewar period (more than 5 percent) and the fact that prevalence jumps to about 10 percent at the beginning of the Balkans campaign of WW2 in 1940 and then declines steadily afterwards.

Figure 7 focuses on those who report experiencing a period of financial hardship before age 17 and shows the cumulative distribution function of its starting and ending year for all countries except Denmark, Sweden and Switzerland. The figure confirms an association between financial hardship and war or its immediate aftermath.

4.4 Hunger

Figure 8 shows the prevalence of hunger during the period 1935–65 among people born between 1930 and 1956. The figure reveals a strong link between hunger and either war or the immediate postwar period. In Belgium, France, Greece, Italy, the Netherlands and Poland, the prevalence of hunger is very high during the WW2 period. In France, Greece, Italy and Poland about 10 percent of our respondents report experiencing hunger during the WW2 years. In the Netherlands, we observe a sharp increase of hunger episodes in 1944 and 1945, corresponding to the "Hunger Winter" in the German occupied part of the country, but very little evidence of hunger in the post-WW2 period. In Austria and Germany, instead, hunger episodes are concentrated in 1944–45 and the immediate aftermath of WW2. Germany is the country where the prevalence of hunger is highest, with nearly one fourth of our German respondents reporting this hardship in 1945. In Spain, a large fraction of reported hunger episodes begins not during the Civil War but rather in its aftermath, with a peak in 1940. On the other hand, there is little evidence of hunger for the neutral countries, Switzerland and Sweden. This is also true for the Czech Republic and Denmark, despite the German occupation.

Collingham (2011, p. 218) argues that "it was not until after the war that the German civilian population began to suffer from inadequate rations [. . .] While Germans were well supplied between 1939 and 1945 their European neighbours were systematically plundered, murdered and deliberately starved to death for the sake of a secure food supply for German civilians." In particular, as pointed out by Jan Karski in his 1944 report, "poverty and the malnutrition [...] had increased in Poland by the deliberate design of the Germans to a point where the health of the entire nation was seriously threatened" (Karski 2013, p. 235). These observations are consistent with the evidence in Figure 9, which shows the cumulative distribution function of the year when the hunger episode is reported to start and to end for those who report experiencing hunger before age 17. We exclude Denmark, Sweden and Switzerland because the prevalence of hunger is very low. In Austria and Germany, most reported hunger episodes start at the end of the war in 1945 and their end is spread over the next 3 to 4 years. In the Netherlands, instead, they mostly start in 1944 and mostly end in 1945. In Belgium, France, Greece and Italy, a substantial fraction of hunger episodes starts in 1940 and ends in 1945. In Poland, they mostly begin in 1939 or 1940 and end in 1945. In Spain, instead, a substantial fraction of reported hunger episodes begins in 1936 or 1940 and ends in 1945 or 1951.

To illustrate the close association between hunger and war events, Figure 10 shows their regional distribution in Europe. The two top panels show the percentage of respondents having ever suffered hunger between 5 and 16 years of age, separately for the cohorts born in 1930–39 (top-left panel)

and 1940–49 (top-right panel). The regional disaggregation reflects the actual level of geographical detail available in SHARELIFE. Comparing the two panels reveals that the cohorts more exposed to hunger are those born in 1930–39, mainly because of their exposure to war. In the top-left panel, the color gets darker in many regions of Poland, Germany, France, Spain, Southern Italy, Eastern Greece, etc., with 20–50 percent of respondents suffering hunger, whereas in the top-right panel everything is lighter.

The bottom panel shows the number of years of potential exposure to war for exactly the same regions during the period from the beginning of the Spanish Civil War in 1936 to the end of WW2 in 1945. The shading in the map becomes darker as the number of years of potential exposure to war increases. The darkest color, corresponding to three years or more, is for some regions of Belgium, Eastern France and the Netherlands (ravaged by war first in 1940 and a second time in 1944–45), the Berlin, Bremen, Hamburg and Ruhr regions in Germany (subject to heavy aerial bombing from 1942 to 1945 and to combat in 1945), the regions around Warsaw in Poland (ravaged by war first in 1939 and then again in 1944–45), and Andalusia, Aragon, Castile La Mancha, Catalonia, Extremadura, and the Madrid and Valencia regions in Spain (ravaged by war for at least three years during the Spanish Civil War). It is worth stressing that this is just a measure of potential exposure to war, as we cannot determine whether a particular person living in a war region in a given year was directly exposed to war events. Further, our measure is only weakly related to actual war intensity, for which we have no systematic indicator.

Comparing this panel with the top two panels shows that regions most exposed to war also tend to have a higher prevalence of hunger, especially among people born in 1930–39. The prevalence of hunger is instead fairly low among those born later (1940–49), a signal that its occurrence may be related to poverty issues.

4.5 ELSA

As already mentioned, information on the occurrence of specific hardships is more limited in ELSALIFE than in SHARELIFE. It essentially reduces to two indicators. The first, having witnessed the serious injury or death of someone in war or military action, is a direct measure of exposure to war, different from the indirect measure available in SHARE. The second, having experienced severe financial hardship, is directly comparable with the analogous indicator in SHARELIFE. For both hardships we only know the year in which they were first experienced, so we are not able to compute a measure of duration.

Figure 11 focuses on those who report experiencing the two hardships before age 17 and shows the cumulative distribution functions of the year in which they were first experienced. For financial hardship, the cumulative distribution function is directly comparable with those in Figure 7. As for the measure of war exposure, about two thirds of the reported episodes start between 1939 and 1945, with some evidence of concentration in the period 1941–43. The pattern for financial hardship is very different, as less than 25 percent of the reported hardship episodes start during WW2. This pattern is similar to that of other SHARE countries, where financial hardship tends to be concentrated later in life.

5 Regression analysis

In this section we analyze the long-term consequences of exposure to war and hardship during childhood or adolescence (ages 5–16) on later life outcomes after controlling for SES, other circumstances during childhood, and fixed effects for country and birth cohort. Our basic regression model is estimated separately by gender. Due to differences in the available information, the outcomes considered and the precise regression specifications differ somewhat for SHARE and ELSA. For SHARE, we also consider a number of extensions of the basic regression specification.

5.1 SHARE

SHARE allows one to consider a wide range of adult outcomes. To ensure comparability with both ELSA and previous studies on the long-term consequences of early life shocks, we focus on eight outcomes, namely SRH as an overall measure of health, the number of chronic conditions as a measure of physical health, an overall measure of mental health based on the Euro-D index, educational attainments (years of schooling), two measures of cognitive ability based on the scores in the tests of numeracy and recall, and two measures of well-being (life satisfaction as a measure of life evaluation and happiness as a measure of emotional well-being). Notice that while data on hardships in childhood are collected in wave 3, all adult outcomes are collected in wave 2. This should reduce problems of coloring, as outcomes are collected 2–3 years before the retrospective survey.

To facilitate interpretation and comparison of the results, we recode most of the original outcomes. Thus, `Healthy` is a binary indicator of overall health equal to one if the respondent reports being in good, very good or excellent health, `FewChronic` is a binary indicator of physical health equal to one if the respondent has less than two chronic conditions, `EuroD` is a binary indicator of

mental health based on the Euro-D index and equal to one if the respondent reports less than four mental health problems, `EducYears` is the reported number of years of schooling, `Numeracy` is a binary indicator equal to one if the respondent scores four or five (the maximum) in the numeracy test, `Recall` is a measure of total recall obtained by adding up the scores in the immediate and the delayed recall tests and ranging from a minimum of 0 to a maximum of 20, `LifeSat` is a measure of life satisfaction ranging from a minimum of 0 ("completely dissatisfied") to a maximum of 10 ("completely satisfied"), and `Happy` is a binary indicator equal to one if the respondent reports to be often happy.

The richness of the SHARE data also allows us to examine several contrasts: countries affected by war (e.g., Austria, France or Germany) vs. neutral countries (e.g., Sweden or Switzerland), regions of a country affected by war vs. regions not affected (e.g., Burgenland vs. Tyrol for Austria, or Sicily vs. Trentino-Alto Adige for Italy), having experienced vs. not having experienced hardship episodes in childhood or adolescence, differences by gender and birth cohort (e.g., people born before 1936 or after 1945), differences by family SES and health in childhood, differences in the age when hardships were experienced, and differences in the duration of hardships episodes.

Our basic specification, which only controls for the occurrence not the timing or the duration of hardship episodes in childhood or adolescence, is

$$Y_i = \beta_0 + \beta_1 W_i + \beta_2 H_i + \beta_3 SES_i + \beta_4 C_i + \beta_5 X_i + U_i, \tag{2}$$

where Y_i is the value of the later life outcome of interest for the ith respondent, W_i is a binary indicator for potential exposure to war (i.e., having lived in a war region) when aged 5–16, H_i is a set of binary indicators for experiencing various hardship episodes when aged 5–16 (hunger, financial hardship, stress) and for absence of the parents around age 10, SES_i is a binary indicator for low SES around age 10, C_i is a binary indicator for chronic diseases in childhood, X_i is a set of additional regressors including indicators for absence of the mother, country and birth cohort, and U_i is a regression error. Our binary indicator for low SES in childhood is meant to net out the effects of confounders related to disadvantaged conditions. It is constructed from a continuous indicator of SES obtained via PCA using the number of rooms per capita and binary indicators for being born in a rural area, having few books at home and for the breadwinner being in an elementary occupation when aged 10. To limit problems related to quality of recall, we confine attention to hardship episodes experienced after age 4, ignoring those reported for earlier ages as they may not reflect own memory or personal experience. Interestingly, the Netherlands is the only country where a substantial fraction of respondents recalls the Hunger Winter of 1944–45 even if it

was experienced before age 5, which may reflect the fact that this episode has become part of the countrys narrative.

We estimate the model by OLS, separately for females and males. We restrict the sample to people born between 1930 and 1956 who are present in both the second and third waves of SHARE. We do not consider people born before 1930 partly because of the very limited sample size and partly because differences in the probabilities of survival and institutionalization may induce substantial cross-country heterogeneity. These selection criteria result in a working sample of about 20,500 individuals (about 11,000 females and 9,500 males).

Table 2 summarizes our regression results by presenting the estimated coefficients on our focus regressors – namely potential exposure to war, experience of various hardships, low SES status and chronic diseases in childhood – along with the estimated intercept (`Constant`), the sample size (N) and the adjusted R^2 (R^2_a), separately for each adult outcome, the top panel for females and the bottom panel for males. The stars denote p-values based on heteroskedasticity-robust standard errors, with * for p-values between 5 and 10 percent, ** for p-values between 1 and 5 percent, and *** for p-value below 1 percent.

All else equal, living in a war region during childhood or adolescence (ages 5–16) is associated with worse physical and mental health and with lower life satisfaction (though not with lower happiness) later in life. In line with the some of the findings in the existing literature (see e.g. Justino 2011 and Shemyakina 2011), the negative effects of war exposure on physical and mental health is stronger and statistically much more significant for females than for males. In particular, for females, war exposure reduces the probability of having few chronic conditions and few mental health problems by about 5 percentage points, whereas no strong association is found for men.

While the existing literature provides substantial evidence of a negative effect of war exposure on education and physical or mental health in later life, little is known about its effects on cognitive abilities, often due to the lack of data. We find that people who lived in war regions during childhood or adolescence have lower numeracy and recall scores compared to those who did not, but the differences are not statistically significant except for numeracy among males. We also find only weak evidence that potential exposure to war has a negative effect on educational attainments after controlling for the other channels of war – stress, financial hardship, absence of the father, hunger – and for SES and chronic diseases in childhood. Still, males seem to be more affected than females as war exposure is associated with 0.3 fewer years of schooling on average (significant at 10% level), in line with the main findings in similar papers (see e.g. Akbulut-Yuksel 2014). Thus,

war appears to affect females more in terms of physical and mental health, and males more in term of measures of human capital such as educational attainment and numeracy skills.

For both females and males, the experience of hunger in childhood or adolescence is associated with worse physical and mental health in later life. The effects on other adult outcomes differs instead by gender. For females, hunger is also associated with lower life satisfaction and lower happiness, while for men it is also associated with lower educational attainments (on average about half year less schooling). Notice that exposure to either war or hunger is strongly associated lower educational attainments among males but not among females.

As for the other three hardships, the evidence is more mixed. While financial hardship consistently predicts worse adult outcomes for both females and males, stress and absence of the father seem to matter mostly for females.

For both females and males, low SES in childhood is associated with worse physical and mental health later in life. It is also associated with lower educational attainments (on average about one year less schooling) and lower abilities in terms of numeracy and recall (on average about half word less). In addition, low SES in childhood is associated with lower life satisfaction and lower happiness later in life.

Finally, suffering chronic diseases in childhood is a strong predictor of worse physical and mental health and lower life satisfaction in later life, but not of lower educational attainments. The link with cognitive abilities is also negative but not statistically significant.

Notice that financial hardship in childhood or adolescence is the strongest predictor of good adult health for both females and males, of numeracy and life satisfaction for females, and of years of education and fewer chronic conditions for males. Low SES in childhood is the strongest predictor of recall for both females and males, of years of education for females, and of numeracy for males. War exposure in childhood or adolescence is the strongest predictors of life satisfaction for males, hunger is the strongest predictor of depression for males, while chronic diseases is the strongest predictor of happiness for females.

To summarize, we can say that the magnitude of the estimated effects differs by gender, with females generally more affected by war exposure and males by hunger. Further, focusing on health and wellbeing, we can say that hunger affects females in terms of mental health and wellbeing, and males in terms of physical health and schooling.

5.2 Extensions

In this section we consider a number of extensions of the basic specification (2) for the SHARE data. In these extensions we control for the duration of hardship episodes, the age when they occurred, migration between and within countries, and survivorship bias.

5.2.1 Duration of hardship episodes

Duration of hardship episodes is the only measure we have of hardship intensity in SHARE. It is obtained by taking the difference between the year when a particular hardship is reported to end and to start. A duration of zero years means that the hardship started and ended in the same year, while a duration of 15 years also includes cases (about 5 percent of the total) where the hardship is reported to last more than 15 years. For exposure to war, we simply count the number of years of potential exposure to war.

To illustrate, for the Netherlands hunger duration is typically very short (at most one year), while for Austria and Germany the modal duration is three years. Thus, the evidence from these three countries does not support the hypothesis that people just identify hunger with WW2. For Belgium, France, Greece and Italy, the modal duration of hunger is five years. Longer hunger durations are not uncommon, especially for Greece, Poland and Spain, which are also the countries with the lowest levels of per-capita income.

Table 3 presents the regression results obtained when the binary indicators for occurrence of the various hardships are replaced by their duration. The table has the same structure as Table 2 and the results are also similar. In general, longer durations are associated with more negative consequences for all adult outcomes. Among the duration variables considered, war exposure is the strongest predictor of depression, years of education, numeracy and life satisfaction for both females and males, and of fewer chronic conditions for males, while hunger is the strongest predictor of happiness for females and of good health for males, financial hardship is the strongest predictor of good health for females, and stress is the strongest predictor of happiness for males.

5.2.2 Age when hardships episodes occurred

Table 4 presents the coefficients on the hardship indicators when we also control for the age when hardship episodes were experienced, distinguishing between two age groups: childhood (ages 5–10) and adolescence (ages 11–16). We find that the effects are different depending on whether hardship episodes are experienced in childhood or in adolescence. Further, these effects are different for

females and males.

In particular, financial hardship in childhood is the strongest predictor of good health, fewer chronic conditions, years of education and numeracy for females, while financial hardship in adolescence is the strongest predictor of good health, fewer chronic conditions, depression, years of education and numeracy and recall for males.

Females exposed to war at ages 5–10 have worse physical and mental health conditions compared to women not exposed. This does not occur for men, which seem to be mostly affected in terms of human capital and well being. Males exposed to war at ages 5–10 have in fact lower years of schooling (0.3 years), a lower probability to rate high in the numeracy test and finally are less satisfied with life. As for hunger, females who experienced it at early ages have worse health conditions and lower chances to be satisfied with life. Males instead are mostly affected in terms of physical health and educational attainment. No particularly strong association is found for hunger spells concentrated during adolescence. This is consistent with the findings in the literature that malnutrition leads to detrimental effects when experienced early in life.

5.2.3 Migration

The period 1945–50 was a period of intense ethnic cleansing and massive East-West migration. Fassman and Munz (1994) argue that "at a rough estimate, which takes into account only the main migration flows, some 15.4 million people had to leave their former home countries. As many as 4.7 million displaced persons and POWs were repatriated (partly against their will) from Germany to Eastern Europe and the USSR. The total number – including 'internal' migration flows – would probably be as high as 30 million people." In particular, over 10 million Germans fled from the former eastern provinces of Germany and from Czechoslovakia before the threat of the Red Army's advance or were expelled, while about 1.5 million Poles had to leave the lands annexed by the Soviet Union and were "repatriated", most of them to the newly acquired western provinces of Poland.

Figure 12 shows the percentage of SHARE respondents who, in each year between 1930 and 1955, report changing either the country or the region of residence within a country. This percentage is particularly high for Germany in the last two years of WW2 and in its aftermath, reaching a peak of over 10 percent in 1945. It is also high for the Czech Republic and Poland at the beginning of WW2, and then again towards its end and in its immediate aftermath.

The effects of war exposure and hardship may have been quite different for people forced to migrate during WW2 and its aftermath. Thus, as a robustness check, we re-estimate our basic

model (2) by excluding those who migrated between regions of the same country (at current borders) or between countries during the period 1939–48 (1936–39 for Spain). The latter category includes people who migrated to Germany from the previously German regions now part of Poland or Russia, people who migrated to Italy from the previously Italian regions now part of Croatia or Slovenia, and people who migrated to Poland from the previously Polish regions now part of Belarus, Lithuania or Ukraine. Results, available from the Authors upon request, do not differ much from those in Table 2.

5.2.4 Survivorship bias

To control for survivorship bias, we re-estimate our basic model (2) by adding a polynomial in the survival rate specific to each country, gender and birth cohort using SHARE data for the eight countries for which we have both micro-level and mortality data, namely Belgium, Denmark, France, Italy, the Netherlands, Spain, Sweden and Switzerland. This procedure follows the suggestion by Das, Newey and Vella (2003) of adding to the relationship of interest a flexible term in the probability of selection. The order of the polynomial has been selected using the Bayesian Information Criterion (BIC), leading to a cubic polynomial. Results, available from the Authors upon request, again differ little from those in Table 2.

5.3 ELSA

We use data from wave 2 (2004) and wave 3 (2006–07) of ELSA. The latter come from both the baseline interview (similar to waves 1 and 2) and the retrospective interview (ELSALIFE). To maintain comparability with SHARE, we restrict the sample to those born in 1930–56 and interviewed in both waves. This sample selection criteria result in a working sample of about 5,000 individuals (about 2,700 females and 2,300 males).

Some of the outcomes that we can consider are the same as those available in SHARE, or very similar, but others are different. In particular, ELSA does not record the number of years of completed schooling, but only the age when the respondent finished full-time education. Thus, we can only construct an indicator for finishing full-time education at a certain age. Further, we do not have a measure of the number of chronic conditions comparable to that available in SHARE. As an additional measure of physical health we instead use the body mass index (BMI), computed from objective measures of body height and weight recorded during the nurse visit.

To facilitate interpretation and comparison of the results, we again recode most of the original outcomes. Thus, `Healthy` is a binary indicator of overall health equal to one if the respondent

reports being in good, very good or excellent health, `NotObese` is a binary indicator for not being obese (BMI<30), `NotDepressed` is a binary indicator of mental health equal to one if the respondent reports not being depressed in the last week, `HigherEduc` is a binary indicator of schooling attainments equal to one if the respondent reports completing full-time education after age 15, `Recall` is a measure of total recall ranging from a minimum of 0 to a maximum of 20, `LifeSat` is a measure of life satisfaction ranging from a minimum of 1 ("completely dissatisfied") to a maximun of 7 ("completely satisfied"), and `Happy` is a binary indicator equal to one if the respondent reports looking back often on life with a sense of happiness. Four of these outcomes, namely `Healthy`, `Recall`, `LifeSat` and `Happy`, are comparable with the analogous variables in SHARE.

ELSA allows us to exploit the following contrasts: having been exposed vs. not having been exposed to war-related events, having experienced vs. not having experienced hardship episodes which started in childhood or adolescence (age 5–16), differences by gender and birth cohort, and differences by family SES and health in childhood. However, the range of hardships that we can consider is more limited than in SHARE, and we have no information on duration of hardship episodes.

Several aspects differentiate our basic specification from that used in SHARE. First, unlike SHARE, we do have a measure of direct exposure to war which varies at the individual level, namely the indicator for having ever witnessed the injury or death of someone in war. Second, we have no information on episodes of hunger, stress and poor health. Third, we only have information on whether the respondent ever experienced severe financial hardship and the age when this started, not when it ended.

As for childhood circumstances, we construct an indicator of low SES via PCA using four pieces of information available in ELSALIFE, namely the number of rooms per capita and indicators for few books at home and for living in a bad accommodation when aged 10, and an indicator for having a blue collar father when aged 14. As for childhood health, ELSALIFE does not collect information on the occurrence of specific diseases, so we cannot create an indicator of chronic diseases in childhood similar to that available in SHARELIFE. However, we can construct an indicator of bad health in childhood (ages 0–15), namely whether the respondent's health was fair or poor.

Table 5 is similar to Table 2 and shows the results for our basic specification, which includes as regressors the binary indicators for having witnessed war (`Witnessed war`), having experienced financial hardship, absence of the father, bad health in childhood (`Bad health`), and low SES. For

females, having witnessed war is associated with lower probabilities of being in good health, not being obese, and not feeling depressed, although none of the associated coefficients is statistically different from zero. For males, witnessing war does not imply any meaningful effect on most of the adult outcomes except education, with war exposure being associated with a much lower probability of leaving school after age 15. This result is interesting because it confirms our findings from SHARE and the evidence from the existing literature. Further, for both genders, we observe no specific relationship between witnessing war on the one hand and cognitive abilities, life evaluation or happiness on the other hand.

For both females and males, financial hardship is one of the strongest predictors of adult outcomes. All else equal, experiencing financial hardship translates into worse physical and mental health, higher probability of leaving school early, worse recall abilities, and lower life satisfaction and happiness. Similar results hold for low SES in childhood. Thus, while we see evidence of gender differences in the long-term effects of exposure to war, we see no evidence of gender differences in the long-term effects of financial hardship or low SES.

As for the role of absence of the parents, the evidence is fairly weak for all outcomes except happiness. Both females and males seem to be equally responsive to this indicator.

Table 6 shows the results for a second specification that replaces the indicators for having ever witnessed war or experienced financial hardship with indicators for first witnessing war or experiencing financial hardship starting at an age between 5 and 16. Results are similar to those in Table 5, although the fit is worse and statistical significance is lower. This could be explained by the lack of information on the end of each hardship spell in ELSA, hence the exclusion of relevant information on the occurrence of each episode. This explanation is reinforced by looking at the predicted power of other childhood circumstances, such as health status between age 0–15 and low SES of the family of origin.

6 Conclusions

The era of two world wars brought death and immense suffering to millions of Europeans. In this paper we show that its long-term consequences are still with us today.

As for the nature of the selection process caused by mortality, we find much higher death rates in war- than in non-war countries during WW1 and WW2, but not during the Spanish Flu. We also find important differences between WW1 and WW2 in the mortality patterns by gender and age.

As for the net long-term effect of selection and scarring, we find little evidence of increased adult mortality for people born during WW1 or WW2, but some evidence for people born during the Spanish Flu, especially, in England and Wales, France and Italy. We instead find that war-related hardship episodes in childhood or adolescence (in particular exposure to war operations and hunger) are strong predictors of physical and mental health, education, cognitive ability and wellbeing past age 50. The magnitude of these effects differs by socio-economic status in childhood and gender, with exposure to war events having a larger impact on females and exposure to hunger having a larger impact on males. We also find that exposure to hunger matters more in childhood, while exposure to war events matters more in adolescence. Finally, we find that hardship episodes have stronger effects if they last longer.

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Table 1: Effects of WW1, the Spanish Flu and WW2 on mortality.

	Denmark	England & Wales	Finland	France	Italy	Netherlands	Norway	Spain	Sweden	Switzerland
					Females					
Aged 18–27	.319***	.311***	.417***	.471***	.465***	.280***	.391***	.460***	.407***	.498***
Aged 28–37	.366***	.346***	.410***	.424***	.488***	.369***	.357***	.504***	.345***	.422***
WW1	.013	.075***	.026	.073***	.098***	.095***	.049**	.083***	.031	.017
Spanish Flu	.064**	-.011	-.013	.023	.057**	.088***	.040	.060**	.018	.073***
WW2	.068***	.090***	.175***	.275***	.204***	.293***	.118***	.130***	.036**	.074***
Aged 18–27 during WW1	.394***	.164***	.241***	.176***	.307***	.354***	.496***	.101	.439***	.284***
Aged 18–27 during Spanish Flu	.428***	.263***	.292***	.288***	.337***	.327***	.524***	.166**	.360***	.210***
Aged 18–27 during WW2	.251***	.386***	.461***	.595***	.309***	.315***	.361***	.304***	.254***	.127**
Aged 28–37 during WW1	.299***	.134**	.229***	.182***	.287***	.280***	.368***	.135**	.373***	.288***
Aged 28–37 during Spanish Flu	.353***	.202***	.322***	.230***	.295***	.240***	.340***	.157*	.294***	.227***
Aged 28–37 during WW2	.066	.130**	.251***	.296***	.133**	.028	.114**	.177***	.080	.061
Born during WW1	-.070***	.065***	.064***	.012	.014	-.052***	-.056***	.010	-.017	-.030
Born during Spanish Flu	-.074***	.053**	.004	-.031	-.006	-.084***	-.111***	.007	-.064***	-.061**
Born during WW2	-.056***	-.123***	-.174***	-.119***	-.073***	-.044**	-.095***	-.084***	-.077***	-.096***
N	11391	11400	11396	11400	11400	11400	11390	9690	11396	11396
R_a^2	.962	.967	.964	.961	.964	.968	.963	.959	.968	.966
					Males					
Aged 18–27	.612***	.516***	.620***	.647***	.631***	.610***	.786***	.655***	.695***	.752***
Aged 28–37	.375***	.325***	.410***	.426***	.420***	.340***	.447***	.488***	.419***	.409***
WW1	.081***	.183***	.150***	.191***	.161***	.168***	.134***	.083***	.101***	.101***
Spanish Flu	.067**	.031	.085***	.041	.118***	.126***	.094***	.085***	.074***	.095***
WW2	.043**	.134***	.193***	.307***	.244***	.319***	.160***	.223***	.024	.066***
Aged 18–27 during WW1	.246***	1.769***	.280***	2.020***	1.485***	.183***	.357***	-.095	.352***	.001
Aged 18–27 during Spanish Flu	.300***	.153*	.212***	.328***	.332***	.118	.238***	-.030	.270***	-.117
Aged 18–27 during WW2	.002	1.121***	1.345***	.837***	.985***	.474***	.270***	.354***	.102**	-.077
Aged 28–37 during WW1	.332***	1.128***	.235***	1.680***	.844***	.239***	.339***	.052	.322***	.223***
Aged 28–37 during Spanish Flu	.337***	.310***	.190**	.283***	.627***	.148**	.241***	.058	.278***	.077
Aged 28–37 during WW2	-.071	.541***	.914***	.546***	.541***	.333***	.244***	.394***	-.033	-.066
Born during WW1	-.026	.040**	.056***	-.026	.015	.022	-.025	.014	-.011	-.018
Born during Spanish Flu	-.039	.005	-.005	-.063**	.018	-.002	-.052**	-.003	-.034	-.028
Born during WW2	-.083***	-.142***	-.177***	-.121***	-.101***	-.040**	-.089***	-.092***	-.049***	-.102***
N	11399	11400	11395	11400	11400	11400	11398	9690	11400	11399
R_a^2	.96	.96	.955	.951	.954	.967	.961	.952	.966	.963

Table 2: SHARE: Coefficients on hardship indicators by outcome and gender.

	Healthy	FewChronic	EuroD	EducYrs	Numeracy	Recall	LifeSat	Happy
				Females				
War	-.071***	-.048**	-.046**	.030	-.023	.018	-.293***	-.028
Hunger	-.060***	-.020	-.088***	-.277	.007	.011	-.207**	-.045*
Finhard	-.104***	-.058*	-.063**	-.672***	-.079***	-.088	-.435***	-.044
Stress	-.101***	.033	-.016	.321	-.022	-.046	-.151	-.053
Low SES	-.042***	-.015***	-.023***	-1.107***	-.058***	-.495***	-.143***	-.028***
Chronic dis	-.101***	-.102***	-.134***	.006	-.018	-.088	-.308***	-.074***
Father absent	-.043**	-.030*	-.033*	-.100	-.058***	-.212*	-.242***	-.058***
Constant	.553***	.368***	.639***	7.326***	.230***	7.634***	7.580***	.480***
N	11292	10171	10074	10148	10155	10143	10117	10041
R_a^2	.107	.103	.0775	.34	.144	.239	.135	.0554
				Males				
War	.012	.006	-.013	-.304*	-.041**	-.100	-.143**	.023
Hunger	-.066***	-.089***	-.068***	-.591***	-.012	-.083	-.155*	.002
Finhard	-.114***	-.101**	-.003	-1.441***	-.040	.316	-.139	-.004
Stress	-.011	-.030	.038	.486	-.015	.248	.097	.092**
Low SES	-.035***	-.012***	-.016***	-1.125***	-.062***	-.393***	-.088***	-.025***
Chronic dis	-.064***	-.074***	-.064***	.353*	-.012	-.174	-.140*	-.006
Father absent	-.033*	-.021	-.026*	-.233	-.044**	-.069	-.078	-.018
Constant	.623***	.504***	.861***	9.203***	.390***	7.290***	7.739***	.497***
N	9593	8457	8358	8440	8439	8402	8388	8324
R_a^2	.0965	.0574	.0437	.284	.142	.167	.0914	.0464

Table 3: SHARE: Coefficients on hardship duration by outcome and gender.

	Healthy	FewChronic	EuroD	EducYrs	Numeracy	Recall	LifeSat	Happy
				Females				
War dur	-.017 *	-.016	-.018 *	-.131 *	-.006	-.016	-.094 **	-.006
Hunger dur	-.009 **	-.004	-.014 ***	-.076 ***	-.001	.004	-.036 **	-.007 *
Finhard dur	-.010 **	-.005	-.007	-.104 ***	-.009 **	.008	-.027	-.004
Stress dur	-.009 *	.008	.001	.082 *	-.002	-.008	-.005	-.002
Low SES	-.042 ***	-.014 ***	-.022 ***	-1.103 ***	-.058 ***	-.494 ***	-.138 ***	-.028 ***
Chronic dis	-.102 ***	-.103 ***	-.136 ***	.002	-.018	-.094	-.310 ***	-.073 ***
Father absent	-.044 **	-.029	-.031 *	-.116	-.059 ***	-.215 *	-.239 ***	-.055 ***
Constant	.517 ***	.350 ***	.623 ***	7.574 ***	.221 ***	7.664 ***	7.475 ***	.467 ***
N	11211	10103	10009	10079	10086	10075	10049	9974
R_a^2	.104	.103	.0753	.339	.143	.239	.131	.0547
				Males				
War dur	.009	.007	-.016 *	-.304 ***	-.027 ***	-.041	-.048	.008
Hunger dur	-.010 **	-.014 ***	-.009 ***	-.130 ***	-.004	-.019	-.035 **	.001
Finhard dur	-.011 **	-.013 **	.001	-.167 ***	-.002	.040	.008	-.002
Stress dur	-.003	-.002	.010 **	.098	-.008	.004	.028	.022 ***
Low SES	-.034 ***	-.011 **	-.016 ***	-1.120 ***	-.062 ***	-.395 ***	-.089 ***	-.025 ***
Chronic dis	-.064 ***	-.074 ***	-.065 ***	.386 *	-.007	-.150	-.144 **	-.003
Father absent	-.035 *	-.018	-.029 *	-.211	-.041 **	-.063	-.088	-.021
Constant	.617 ***	.494 ***	.863 ***	9.332 ***	.386 ***	7.236 ***	7.659 ***	.506 ***
N	9549	8420	8321	8401	8400	8363	8350	8286
R_a^2	.095	.0569	.0438	.283	.143	.167	.0909	.0468

Table 4: SHARE: Coefficients on hardship at different ages by outcome and gender.

	Healthy	FewChronic	EuroD	EducYrs	Numeracy	Recall	LifeSat	Happy
				Females				
War 5–10	-.051 ***	-.034 *	-.035 **	-.086	-.001	.094	-.130 *	-.029
War 11–16	.005	.024	.015	.184	-.060 **	-.102	-.157	-.004
Hunger 5–10	-.074 **	-.044	-.094 ***	-.071	.014	-.119	-.276 **	-.000
Hunger 11–16	.019	.054	.008	-.471	-.024	.214	-.006	-.071 *
Finhard 5–10	-.141 **	-.085	-.061	-.482	-.045	.144	-.018	.018
Finhard 11–16	-.004	-.004	-.027	-.254	-.041	-.139	-.399 *	-.038
Stress 5–10	.042	-.110	.124 **	.470	-.065	-.733	.053	-.136 *
Stress 11–16	-.139 ***	.079 *	-.100 **	.021	.007	.381	-.224	.001
Low SES	-.042 ***	-.015 ***	-.023 ***	-1.106 ***	-.058 ***	-.495 ***	-.142 ***	-.028 ***
Chronic dis	-.101 ***	-.102 ***	-.135 ***	.010	-.018	-.087	-.308 ***	-.073 ***
Father absent	-.043 **	-.030 *	-.033 **	-.101	-.057 ***	-.209 *	-.241 ***	-.059 ***
Constant	.535 ***	.355 ***	.627 ***	7.396 ***	.217 ***	7.590 ***	7.465 ***	.478 ***
N	11292	10171	10074	10148	10155	10143	10117	10041
R_a^2	.107	.103	.0774	.34	.144	.239	.133	.0555
				Males				
War 5–10	.027	-.004	-.013	-.293 *	-.039 **	-.112	-.146 **	-.003
War 11–16	.013	.040	.001	-.082	-.059 **	.023	.140	.036
Hunger 5–10	-.021	-.082 ***	-.019	-.703 ***	-.025	-.143	-.013	-.011
Hunger 11–16	-.076 **	-.020	-.063 **	-.140	-.001	.097	-.265 **	.026
Finhard 5–10	.064	.065	.002	-.633	.054	-.542	-.022	.044
Finhard 11–16	-.151 ***	-.149 **	-.004	-.902 *	-.077	.772 **	-.094	-.032
Stress 5–10	-.043	-.003	.091 *	-.019	-.009	.272	.108	-.022
Stress 11–16	.008	-.016	-.007	.436	-.027	.083	.054	.112 **
Low SES	-.035 ***	-.011 ***	-.016 ***	-1.123 ***	-.062 ***	-.393 ***	-.087 ***	-.025 ***
Chronic dis	-.064 ***	-.075 ***	-.064 ***	.364 *	-.012	-.174	-.138 *	-.007
Father absent	-.034 *	-.021	-.027 *	-.221	-.043 **	-.067	-.079	-.019
Constant	.610 ***	.508 ***	.855 ***	9.193 ***	.389 ***	7.300 ***	7.716 ***	.516 ***
N	9593	8457	8358	8440	8439	8402	8388	8324
R_a^2	.0966	.0571	.043	.284	.142	.167	.0917	.0462

Table 5: ELSA: Coefficients on hardships by outcome and gender.

	Healthy	NotObese	NotDepressed	HigherEduc	Recall	LifeSat	Happy
				Females			
Witnessed war	-.089	-.138	-.148	-.041	-.225	.238	.058
Finhard	-.145***	-.090***	-.124***	-.033	-.058	-.739***	-.169***
Low SES	-.040***	-.017*	-.026***	-.151***	-.547***	-.013	-.026***
Bad health	-.162***	.012	-.058***	-.025	-.046	-.191**	-.049*
Father absent	.008	-.010	-.003	-.003	.273	.042	-.054
Constant	.834***	.696***	.955***	.510***	10.622***	5.552***	.693***
N	2706	1894	2703	2634	2704	2526	2532
R^2_a	.0613	.00302	.0396	.158	.0963	.0586	.0258
				Males			
Witnessed war	.060*	-.039	.045*	-.125***	.279	.083	.000
Finhard	-.127***	-.059*	-.111***	-.079***	-.053	-.560***	-.114***
Low SES	-.036***	-.007	-.022***	-.116***	-.425***	-.019	-.020**
Bad health	-.173***	-.009	-.056**	-.130***	-.755***	-.377***	-.071*
Father absent	-.010	.011	-.019	.018	-.029	-.088	-.067*
Constant	.744***	.839***	.875***	.494***	9.623***	5.573***	.788***
N	2255	1604	2254	2186	2254	2080	2070
R^2_a	.0463	.00401	.0251	.166	.103	.0494	.0206

Table 6: ELSA: Coefficients on hardships by outcome and gender (started age 5–16).

	Healthy	NotObese	NotDepressed	HigherEduc	Recall	LifeSat	Happy
				Females			
Witnessed war	-.016	-.168	-.036	.070	-.733	.353	.066
Finhard	-.117*	.172***	-.104*	.057	.309	-.718***	-.036
Low SES	-.046***	-.020**	-.028***	-.156***	-.570***	-.032	-.029***
Bad health	-.188***	-.004	-.078***	-.039	-.075	-.283***	-.067**
Father absent	-.010	-.019	-.007	-.008	.159	-.036	-.064*
Constant	.821***	.692***	.937***	.508***	10.622***	5.481***	.678***
N	2587	1812	2584	2516	2585	2425	2430
R^2_a	.0486	-.000221	.0196	.164	.0964	.0235	.00331
				Males			
Witnessed war	-.166	.100	.059	-.144	.896	-.104	.082
Finhard	.021	-.021	-.036	-.067	.637	-.147	-.066
Low SES	-.033***	-.007	-.021***	-.120***	-.435***	-.006	-.017*
Bad health	-.182***	-.011	-.069**	-.130***	-.789***	-.487***	-.090**
Father absent	-.014	-.019	-.026	.006	-.046	-.142	-.070*
Constant	.764***	.854***	.877***	.462***	9.637***	5.463***	.775***
N	2156	1537	2155	2089	2155	1990	1979
R^2_a	.0304	.00251	.00436	.159	.101	.026	.0123

Figure 1: Female mortality contours.

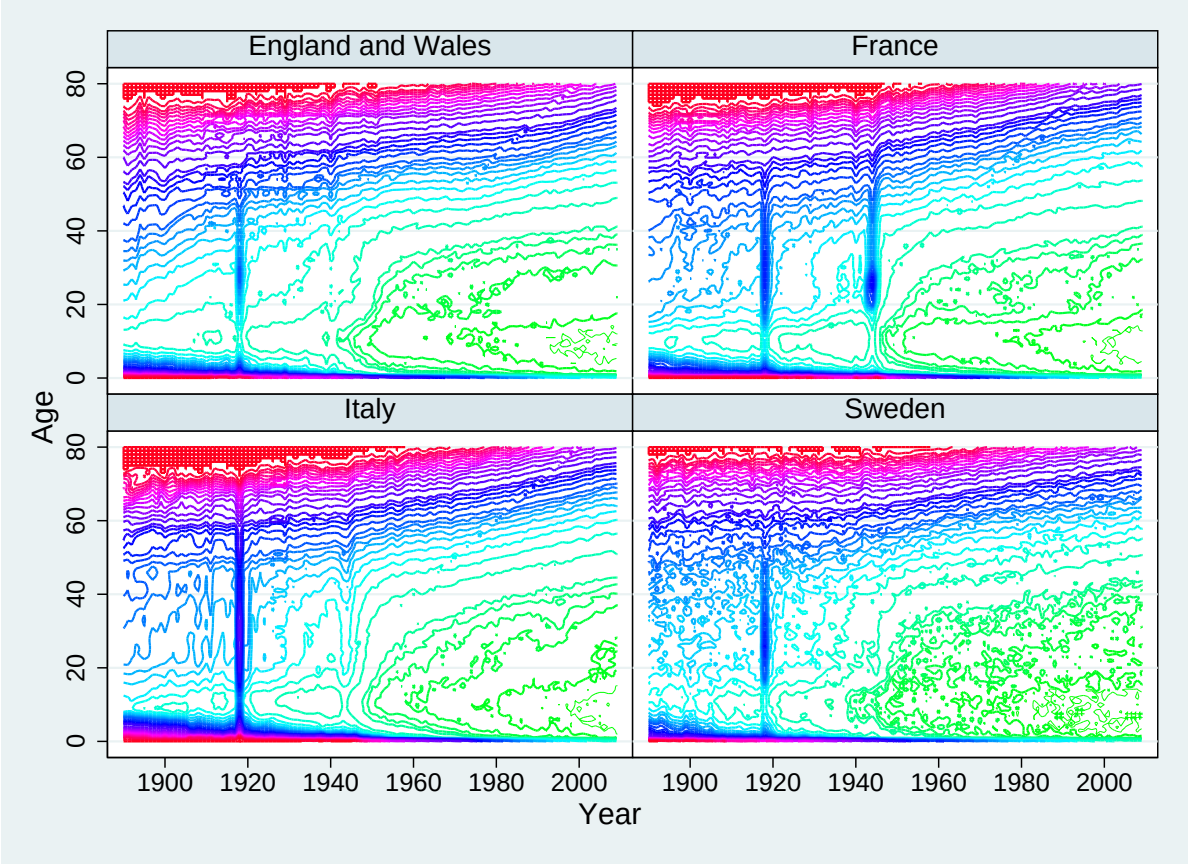


Figure 2: Male mortality contours.

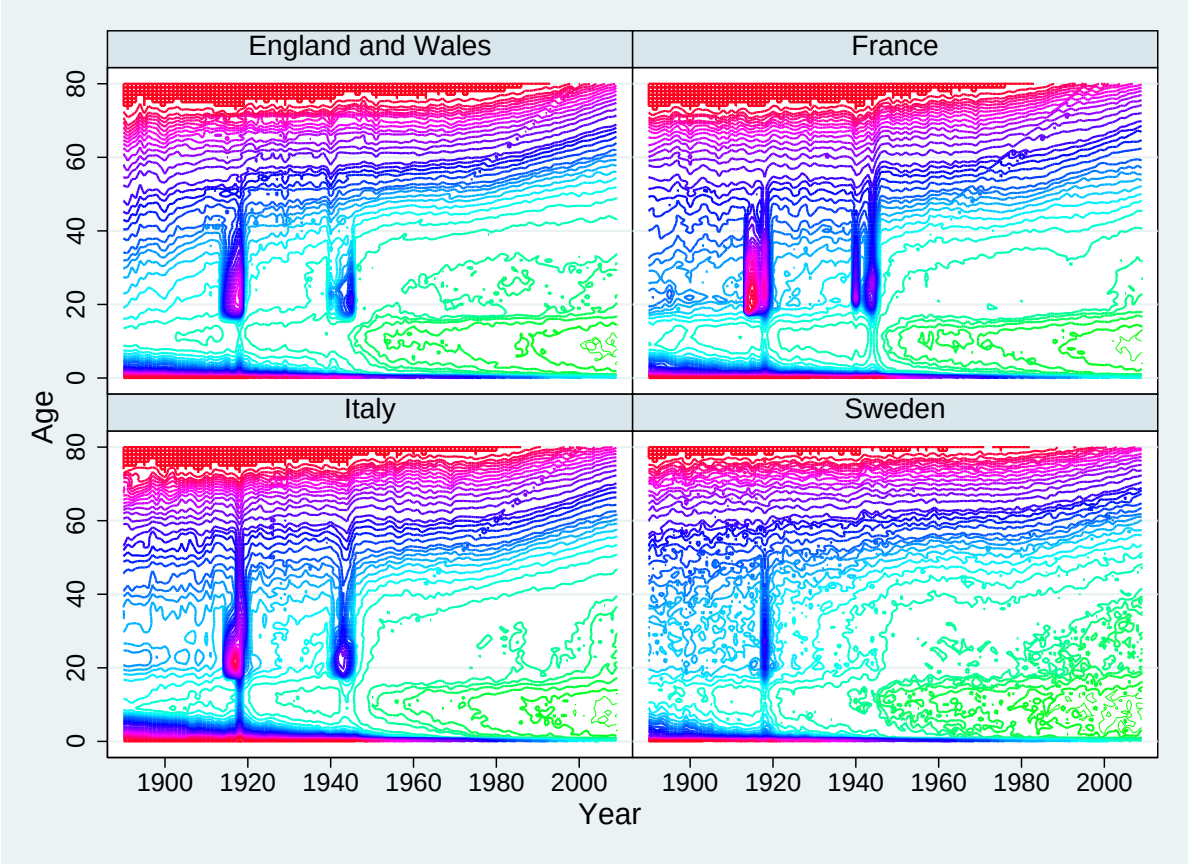


Figure 3: Percent reporting stress.

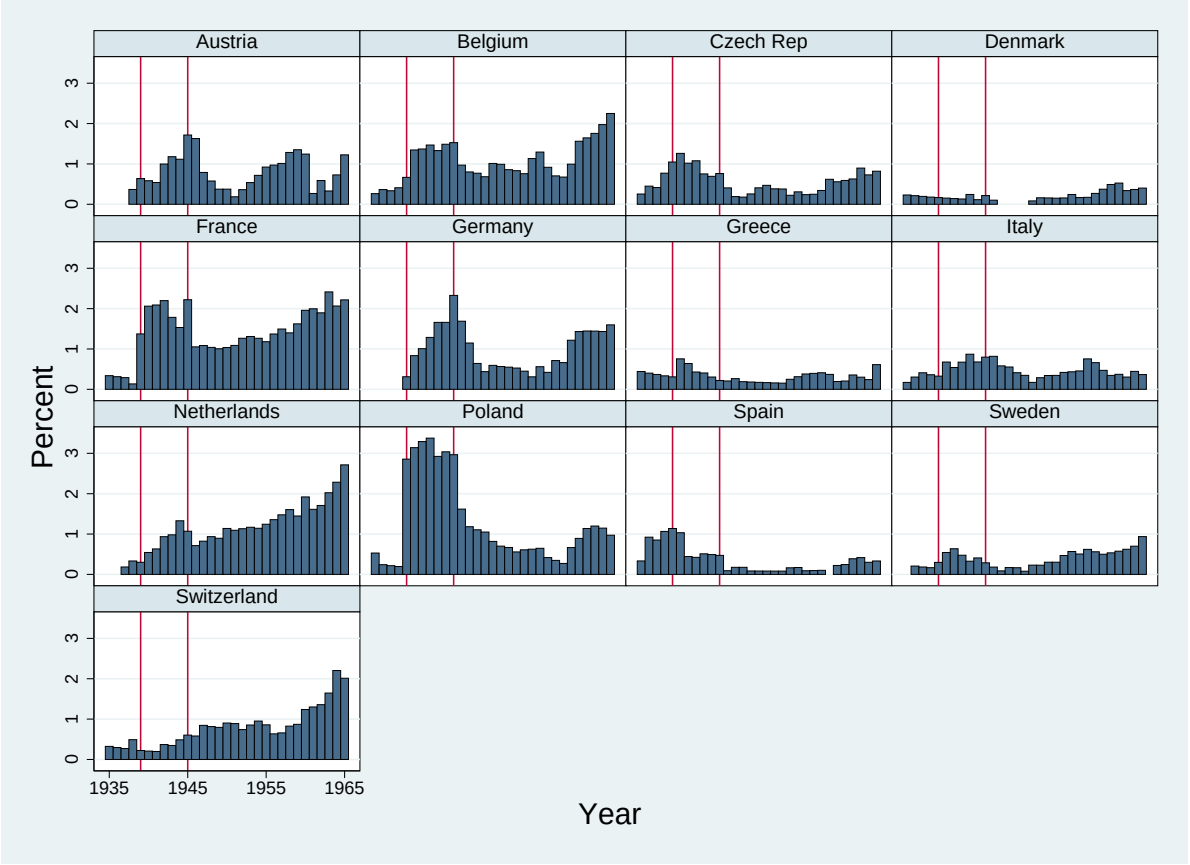


Figure 4: Distribution of the year when stress started and ended.

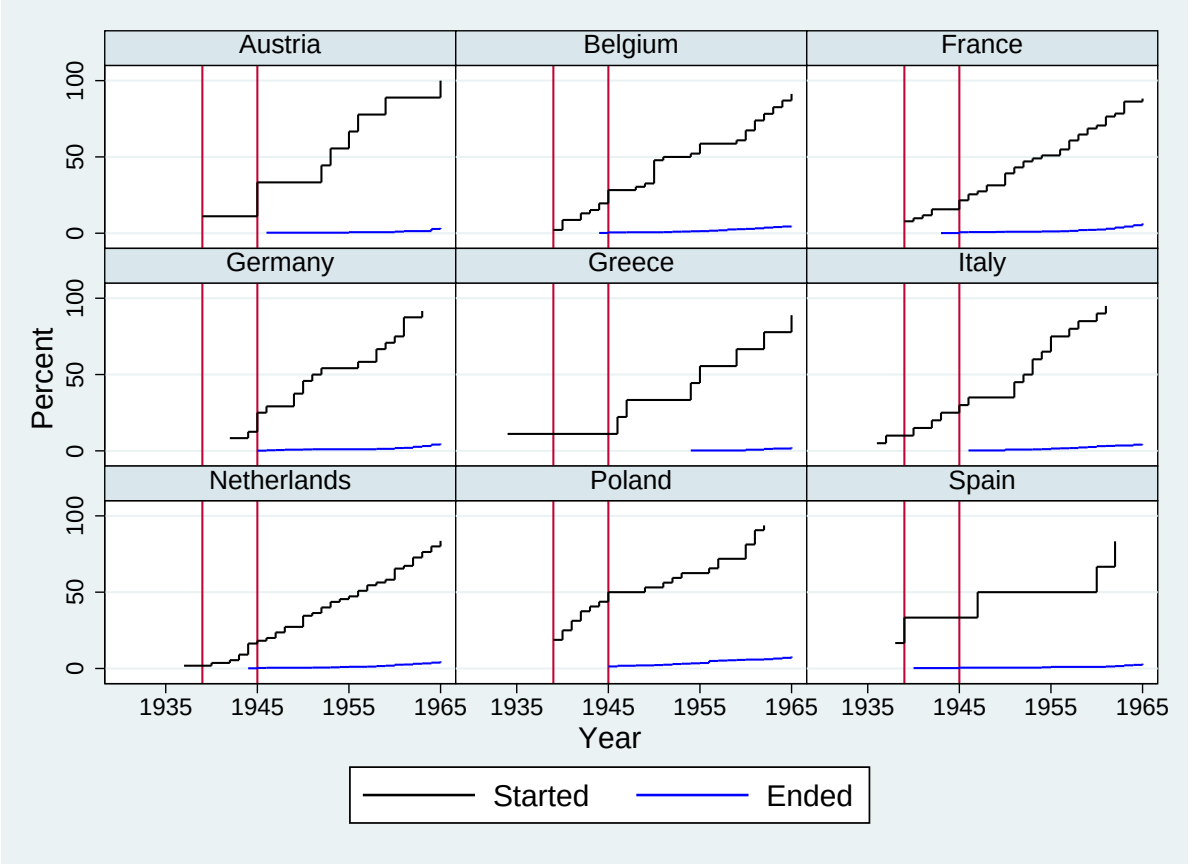


Figure 5: Percent reporting absence of the parents at age 10.

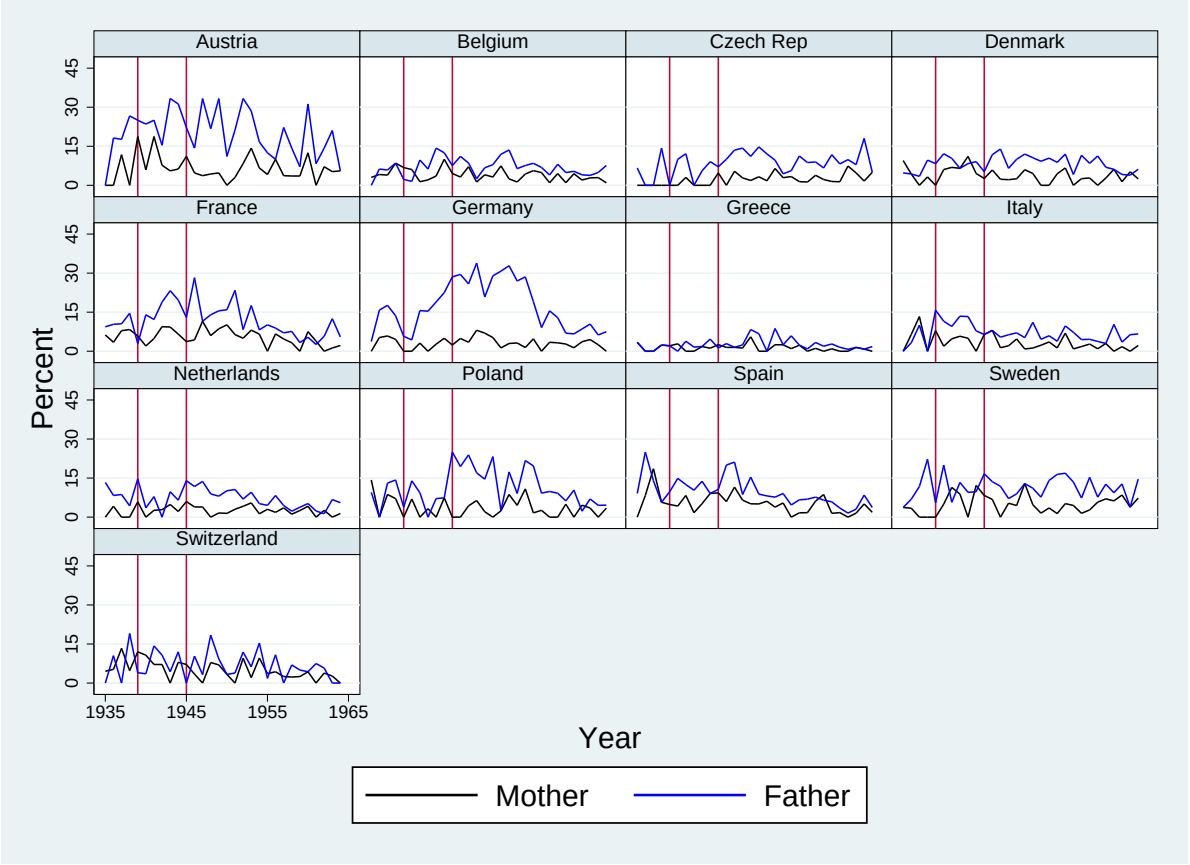


Figure 6: Percent reporting financial hardship.

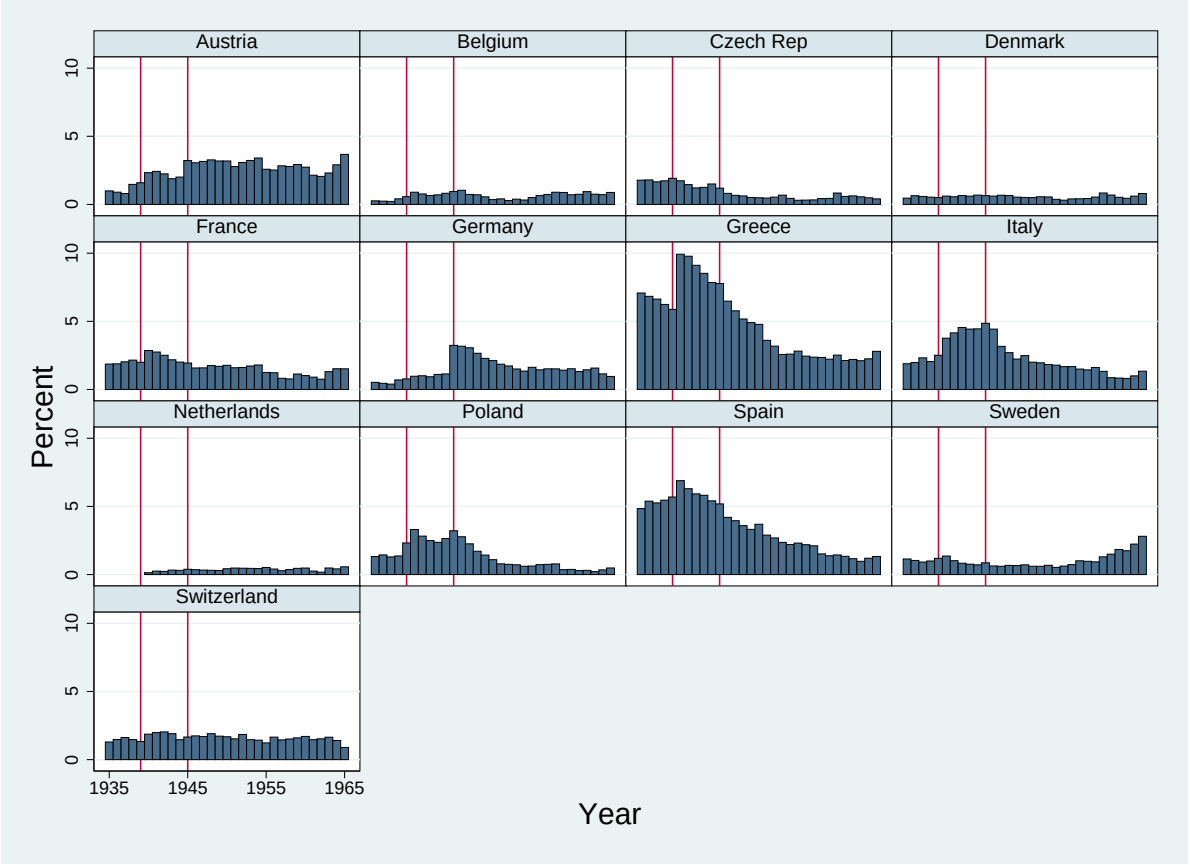


Figure 7: Distribution of the year when financial hardship started and ended.

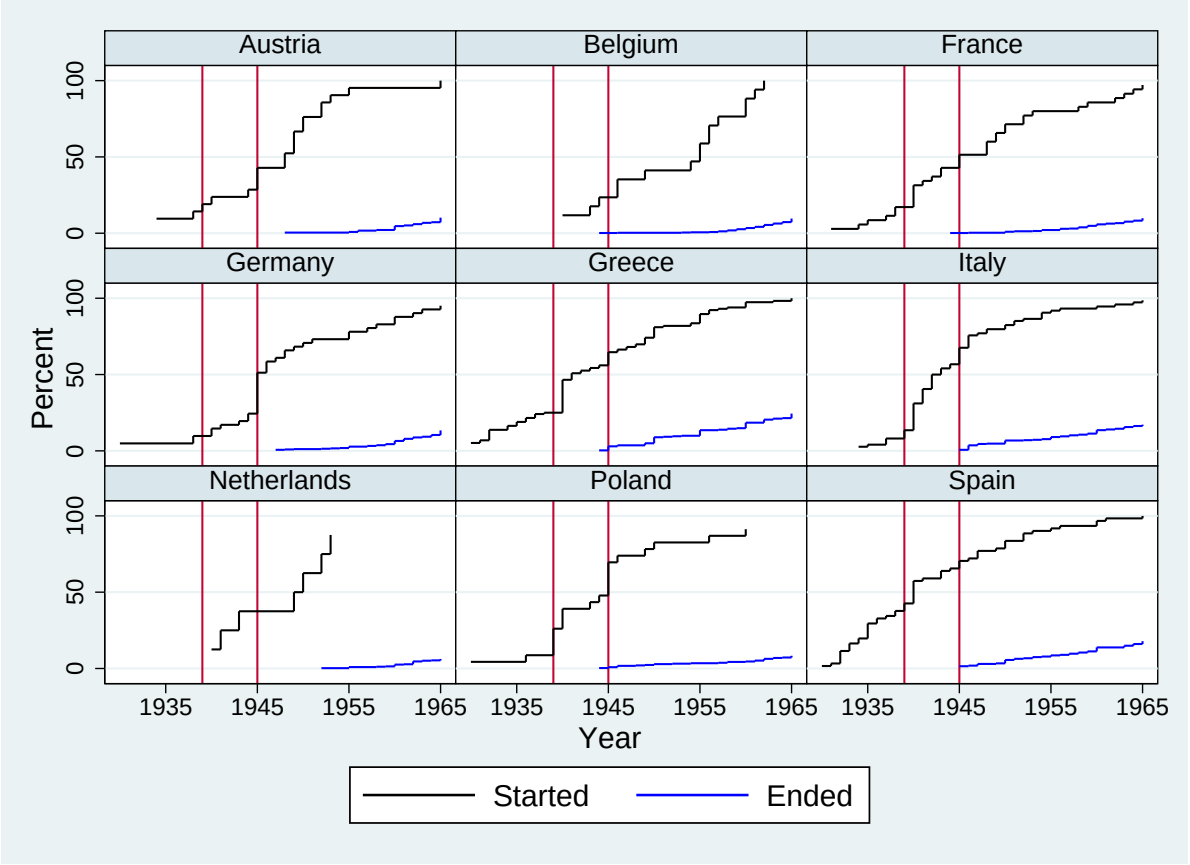


Figure 8: Percent reporting hunger.

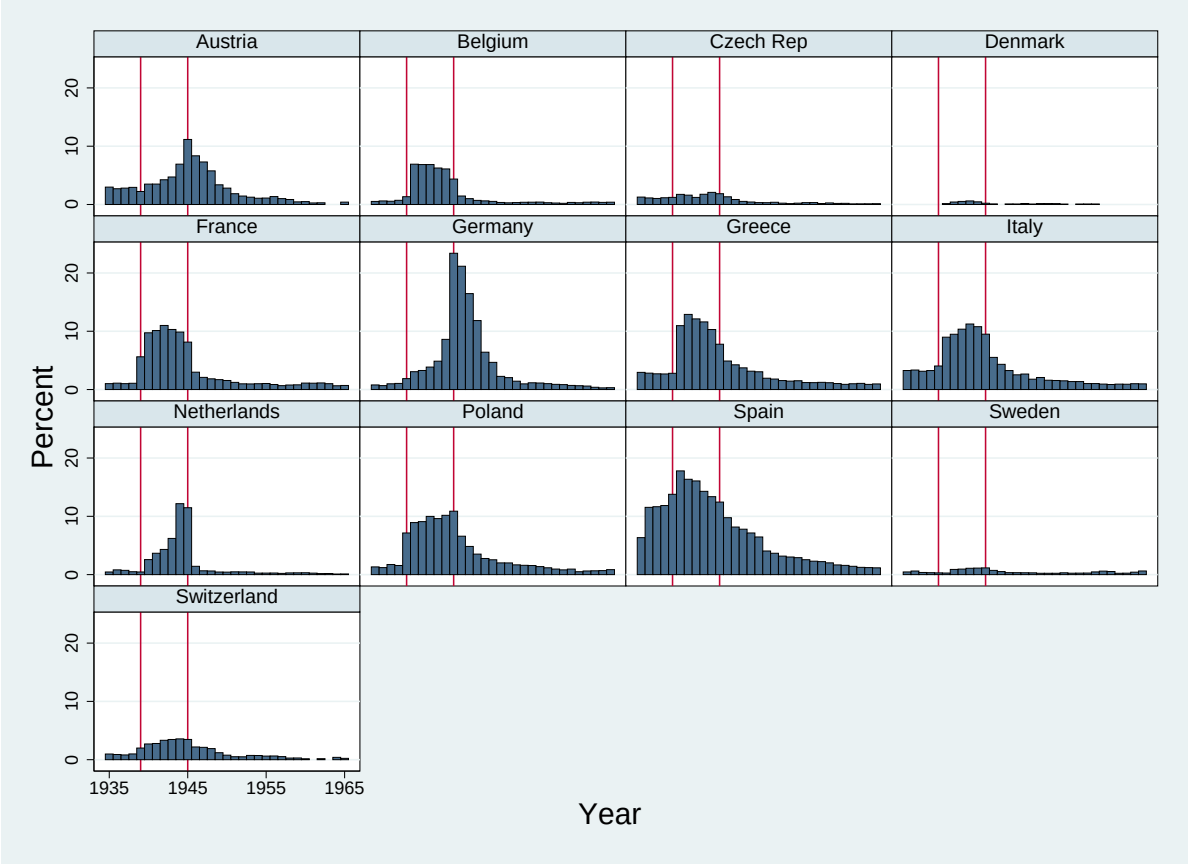


Figure 9: Distribution of the year when hunger started and ended.

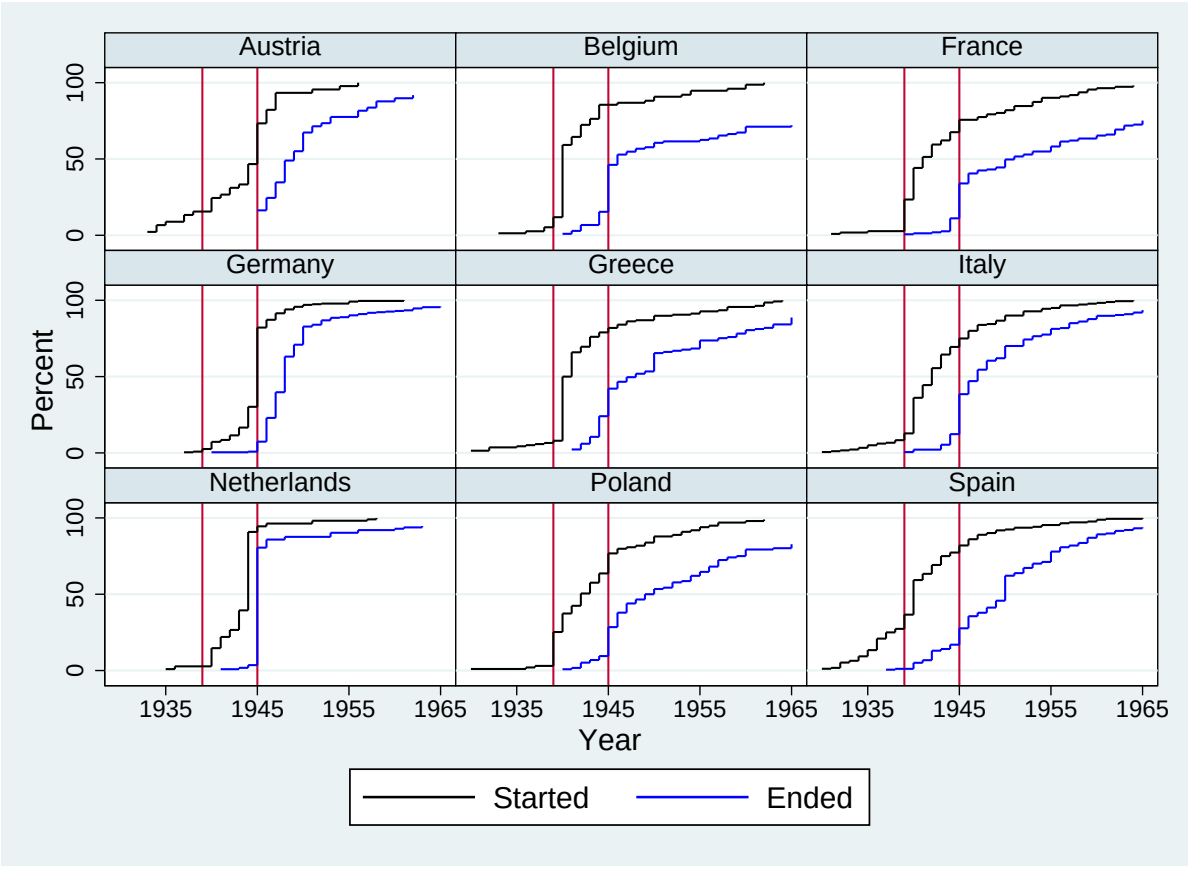


Figure 10: Geography of hunger and war.

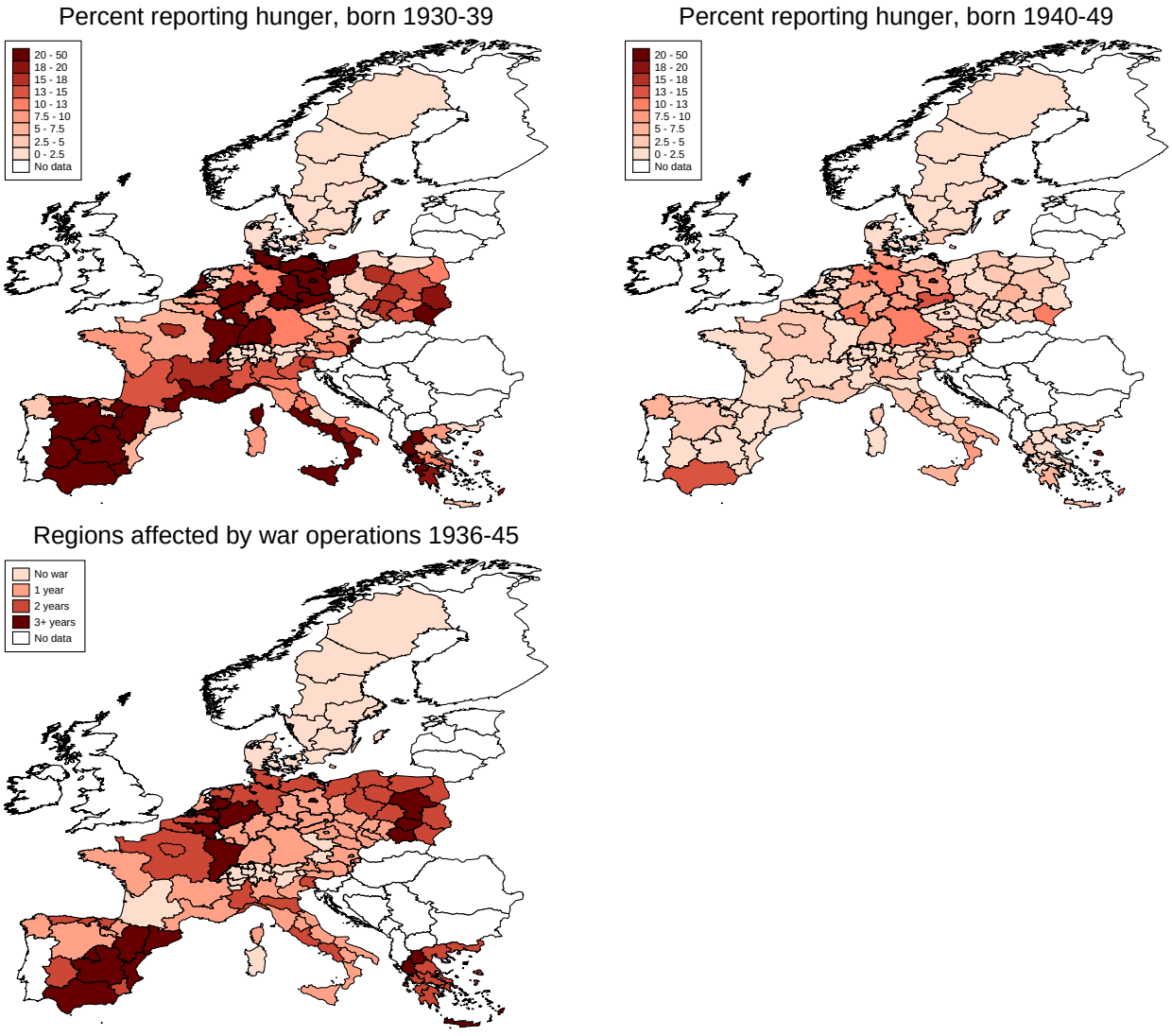


Figure 11: Distribution of the year when first witnessed war or experienced financial hardship.

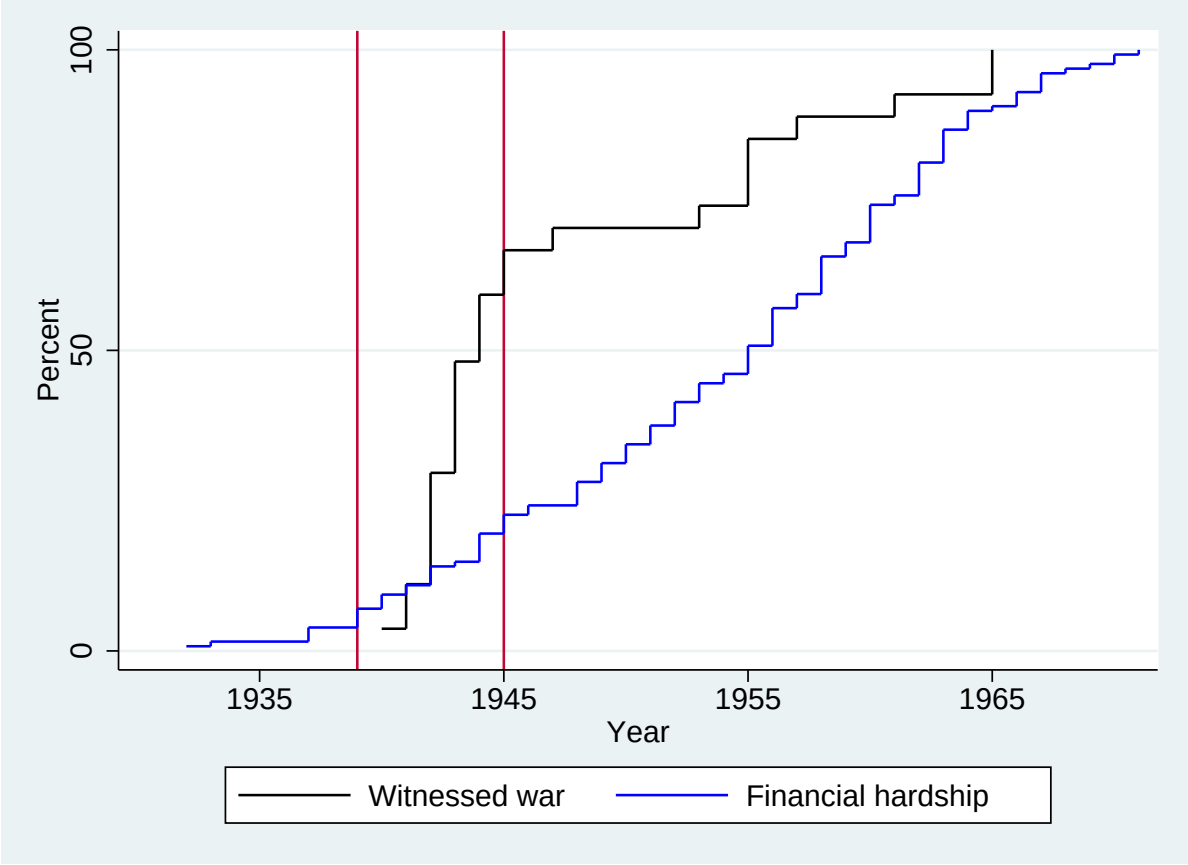
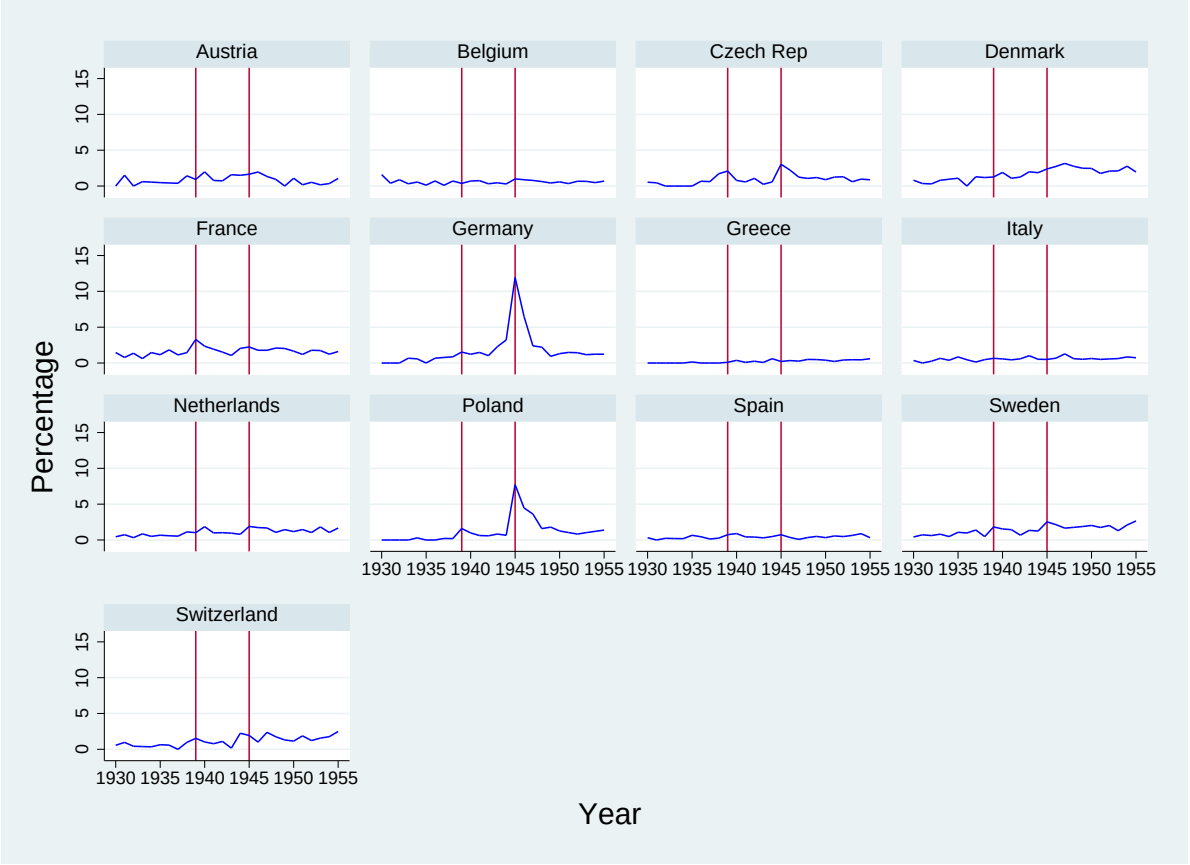


Figure 12: Fraction of migrants by country and year



A Details on SHARE and ELSA

This appendix provides some detail on the temporal and spatial information provided by SHARE and ELSA, and the information on childhood health and SES, hardship episodes in childhood, and adult outcomes.

A.1 Temporal and spatial information

A key feature of the public use version of SHARELIFE is the possibility of determining the country, region and area in which an individual was living in any given year. The basic information comes from Module AC (Accommodation), which collects information on the different places an individual lived in during her life. The module begins with a question on the residence the respondent lived in when was born, where by residence is meant an apartment or single house. It then collects information on each other residence the respondent lived in for more than 6 months, including the year the person started and stopped living at that residence, the country (at current boundaries), the region (at different level of geographically detail depending on the country) and the area of residence (big city, suburbs or outskirts of a big city, large town, small town, rural area or village).

As for the country of residence, two questions are asked. First, for each past residence the survey instrument asks whether it was within the current boundaries of the country in which the respondent is currently living. If the answer is no, a second question is asked using a showcard: *Which country, considering current boundaries, was this residence in?* The showcard reports the names of the main European countries, Russia, the USA, and two residual categories, namely other European country and other non-European country. The region of residence is asked only if the country of past residence coincides with that of current residence. This means that the region of residence cannot be determined for those who in a given year have changed their country of residence.

Since we know the starting and ending year and the country/region/area of each residency, we are able to construct a longitudinal data set with annual observations for each individual. An important problem is the fact that the level of regional disaggregation in SHARELIFE varies by country: it is at the coarse NUTS1 level for Belgium, Denmark, France and the Netherlands, at the fine NUTS3 level for the Czech Republic, and at the intermediate but not very detailed NUTS2 level for Austria, Germany, Greece, Italy, Poland, Spain, Sweden and Switzerland.

Unlike SHARELIFE, the public use version of ELSALIFE contains little information on past residence and no information that can be used to determine the country and region of residence in

a given year. Basically, we can only determine whether the respondent was living in the U.K. or abroad in a given year.

A.2 SES and health in childhood

Module CS (Childhood SES) of SHARELIFE collects information on the occupation of the main breadwinner (white collar, blue collar, farmer, etc.), the number of books at home, features of the accommodation (presence of fixed bath, running water, inside toilet, central heating, number of rooms available), the number of people living in the house when the respondent was aged 10, and whether parents, siblings and grandparents were living in the house when the respondent was aged 10. Module HS (Health status) of SHARELIFE contains information on both the self-reported health status in childhood (age 0–15) as well as experiences of distinct illnesses during childhood (infectious diseases, polio, asthma, allergies, heart trouble, etc.). Then, for each illness, it is asked the age-interval when it was experienced: between age 0–5, 6–10, 11–15. We construct a measure of childhood health that counts the number of chronic illnesses respondents experienced in the age interval 6–15, considering the following diseases: polio, asthma, allergies (other than asthma), epilepsy, psychiatric problems, diabetes, heart trouble, leukaemia or lymphoma and cancer.

ELSALIFE asks comparable questions regarding the number of books at home, features of the accommodation, the presence of distinct members of the family (all measured with reference to age 10) and health status in childhood. However, there are some differences with respect to SHARELIFE. In particular, ELSALIFE does not collect information on the occupation of the main breadwinner when the respondent was aged 10, but rather on the occupation of the father when the respondent was aged 14. Further, it does not include questions on the specific timing of the illnesses experienced during childhood. As for health status in childhood, we use a self-reported health measure, namely an indicator for being in fair or poor health.

A.3 Hardship episodes in childhood

Module GL (General Life) of SHARELIFE collects information on the experience of hardship episodes. This section first asks: *Looking back on your life, was there a distinct period during which you were under more stress compared to the rest of your life?* If the answer is yes, it asks *When did this period start?*, followed by *When did this period stop?* It then asks similar questions for poor health (*Looking back on your life, was there a distinct period during which your health was poor compared to the rest of your life?*), financial hardship (*Looking back on your life, was there a distinct period of financial hardship?*), and hunger (*Looking back on your life, was there a*

distinct period during which you suffered from hunger?). The formulation of these questions allows to determine the duration of the reported hardship episode, defined as the difference between the year when they ended and the year when they started, although we have no other information on their intensity. Notice that respondents are asked to report only one episode for each type of hardship, presumably the most salient (phrases such as "distinct period" or "compared to the rest of your life" are meant to capture this idea). Also notice that there may be heterogeneity in the perception of each hardship across individuals, which raises the issue of interpersonal comparability.

Unlike SHARELIFE, ELSALIFE gathers direct information on having witnessed serious injury or death of someone in war or military action, and having been evacuated during WW2. Specifically, the survey instrument asks: *Have you ever witnessed the serious injury or death of someone in war or military action?* If the answer is yes, it then asks: *How old were you when it first happened?* The next question is directly about WW2: *Have you ever been evacuated during World War II?*

As with SHARELIFE, ELSALIFE also gathers information on having experienced severe financial hardship and on the family's SES around age 10. Specifically, the survey instrument asks: *Have you ever experienced severe financial hardship?*. If the answer is yes, the interviewee is then asked: *How old were you when it first happened?*.

As for the family's SES around age 10, ELSALIFE includes questions that are very similar to those in SHARE, such as the number of books at home, accommodation features, the job of the main breadwinner, whether distinct members of the family were present in the house at the age of 10. The latter question is used to infer information on the absence of the father and the mother. Notice that financial hardship and absence of the father at age 10 are the only hardship episodes directly comparable with those recorded in SHARE. Further, we only know the age when financial hardship started, not its duration. This means that we can only estimate the long-term effects of financial hardship episodes that started at a given age, not of financial hardship experienced at different ages.

A.4 Adult outcomes

The adult outcomes that we consider are all collected in the regular waves of SHARE and ELSA. Some of these outcomes are directly comparable between the two surveys, but others are not.

The comparable outcomes are SRH, the test of memory (recall), life satisfaction and happiness. SRH is defined on a 1–5 scale for both surveys with a slight difference in the definition of the categories (for SHARE the available categories are "excellent", "very good", "good", "fair", "poor",

whereas for ELSA the available categories are "very good", "good", "fair", "bad" and "very bad"). For both SHARE and ELSA, the memory test consists of verbal registration and recall of a list of 10 words, carried out twice, first immediately after the encoding phase (immediate recall) and then some 5 minutes later (delayed recall). Our measure of recall is the sum of the scores on immediate and delayed recall, which ranges from a minimum of 0 to a maximum of 20. The numeracy test in SHARE consists of five questions involving simple arithmetical calculations based on real life situations and the test score ranges from a minimum of 1 to a maximum of 5. In ELSA, instead, the numeracy test was only administered in wave 1. As for life satisfaction, the precise wording of the question and its scale are different between the two surveys. SHARE respondents are asked to choose a value between 0 and 10, with 0 meaning "completely dissatisfied" and 10 meaning "completely dissatisfied", while ELSA respondents are asked to choose a value between 1 and 7, with 1 meaning "strongly agree" and 7 meaning "strongly disagree". Happiness is instead defined in the same way in both surveys.

Important differences between SHARE and ELSA arise for BMI, education and depression. As for BMI, height and weight are self-reported in SHARE, while in ELSA they are objectively measured during the nurse visit. As for education, ELSA does not ask the number of years of completed schooling but instead the age at which the respondent left full time education. As for depression, SHARE uses the Euro-D index, which summarizes a series of conditions related to mental health (depression, anxiety, suicidality, etc.), while ELSA only asks whether the respondent was feeling depressed in the past week.

B Additional tables

Table B1: Survival rates up to year 2006 by birth cohort and country. Females.

	Country								
Birth cohort	BE	CH	DK	ES	EW	FR	IT	NL	SW
1918	.229	.298	.217	.229	.221	.291	.244	.239	.268
1919	.292	.342	.258	.273	.269	.360	.315	.295	.323
1920	.282	.371	.277	.293	.264	.360	.293	.319	.348
1921	.360	.441	.327	.352	.326	.428	.378	.375	.410
1922	.399	.478	.358	.393	.362	.466	.403	.415	.442
1923	.449	.525	.396	.439	.401	.511	.456	.460	.492
1924	.485	.564	.428	.480	.434	.544	.485	.499	.528
1925	.520	.609	.463	.516	.472	.580	.524	.532	.570
1926	.562	.635	.489	.554	.504	.617	.559	.569	.605
1927	.591	.665	.520	.584	.540	.642	.592	.603	.629
1928	.624	.694	.552	.618	.575	.668	.622	.630	.671
1929	.655	.720	.577	.638	.612	.698	.655	.663	.694
1930	.686	.745	.603	.663	.641	.721	.678	.689	.717
1931	.710	.763	.629	.691	.671	.739	.702	.712	.738
1932	.734	.783	.657	.720	.703	.761	.731	.737	.757
1933	.759	.800	.682	.738	.730	.779	.746	.760	.779
1934	.774	.815	.704	.758	.754	.795	.761	.782	.797
1935	.790	.828	.730	.772	.773	.809	.782	.796	.810
1936	.807	.845	.755	.778	.793	.823	.787	.816	.826
1937	.821	.856	.782	.792	.812	.836	.811	.828	.847
1938	.831	.864	.798	.810	.825	.846	.820	.839	.856
1939	.840	.872	.816	.837	.838	.852	.837	.849	.866
1940	.852	.883	.833	.824	.851	.862	.843	.861	.873
1941	.862	.893	.847	.849	.870	.879	.853	.869	.891
1942	.871	.899	.857	.874	.880	.880	.865	.876	.892
1943	.881	.902	.867	.875	.890	.889	.875	.886	.902
1944	.887	.913	.875	.886	.900	.892	.879	.892	.908
1945	.897	.919	.893	.894	.909	.905	.891	.903	.919
1946	.908	.927	.896	.905	.920	.913	.906	.919	.923
1947	.916	.932	.911	.916	.920	.922	.915	.923	.931
1948	.920	.936	.919	.916	.931	.926	.923	.928	.937
1949	.926	.942	.923	.923	.937	.931	.930	.932	.942
1950	.931	.947	.927	.930	.940	.934	.936	.937	.945
1951	.935	.949	.933	.937	.945	.938	.941	.941	.950
1952	.939	.954	.939	.944	.950	.942	.947	.945	.955
1953	.944	.957	.943	.946	.953	.946	.952	.949	.957
1954	.949	.959	.946	.952	.956	.949	.955	.952	.960
1955	.953	.962	.953	.956	.961	.953	.959	.955	.965
1956	.957	.964	.955	.958	.963	.955	.961	.958	.967

Table B2: Survival rates up to year 2006 by birth cohort and country. Males.

	Country								
Birth cohort	BE	CH	DK	ES	EW	FR	IT	NL	SW
1918	.086	.133	.089	.100	.090	.103	.098	.083	.118
1919	.120	.158	.110	.129	.126	.148	.139	.115	.160
1920	.112	.178	.126	.142	.117	.143	.118	.125	.169
1921	.164	.232	.161	.174	.163	.199	.179	.171	.223
1922	.195	.263	.185	.202	.191	.228	.194	.200	.251
1923	.230	.303	.217	.242	.225	.262	.235	.233	.301
1924	.263	.335	.259	.276	.253	.292	.259	.268	.337
1925	.298	.382	.293	.312	.292	.326	.297	.304	.376
1926	.333	.421	.326	.351	.326	.364	.337	.346	.410
1927	.371	.452	.364	.378	.371	.392	.376	.388	.448
1928	.405	.491	.397	.420	.414	.423	.408	.423	.488
1929	.446	.528	.437	.446	.459	.459	.455	.466	.524
1930	.485	.556	.472	.477	.498	.488	.485	.504	.554
1931	.517	.590	.495	.507	.533	.514	.518	.536	.586
1932	.553	.621	.529	.546	.570	.547	.558	.578	.617
1933	.584	.655	.560	.566	.606	.574	.584	.608	.646
1934	.621	.675	.596	.598	.639	.601	.607	.642	.671
1935	.644	.696	.629	.621	.664	.628	.643	.670	.698
1936	.671	.720	.661	.629	.693	.653	.660	.698	.721
1937	.697	.745	.690	.650	.719	.677	.693	.722	.747
1938	.717	.764	.713	.685	.741	.695	.712	.745	.770
1939	.735	.777	.737	.729	.757	.714	.737	.764	.786
1940	.745	.797	.752	.708	.775	.732	.751	.785	.797
1941	.769	.813	.777	.741	.803	.762	.768	.801	.823
1942	.781	.824	.790	.782	.817	.768	.788	.815	.833
1943	.794	.839	.806	.782	.832	.781	.800	.827	.845
1944	.808	.846	.820	.794	.848	.792	.811	.839	.857
1945	.827	.861	.832	.812	.861	.810	.831	.854	.870
1946	.840	.872	.849	.826	.880	.824	.851	.879	.879
1947	.850	.877	.863	.848	.882	.837	.864	.885	.889
1948	.865	.887	.869	.845	.896	.847	.877	.895	.897
1949	.876	.892	.877	.860	.903	.857	.888	.901	.903
1950	.882	.899	.882	.873	.908	.863	.897	.908	.912
1951	.887	.906	.891	.884	.915	.870	.903	.915	.918
1952	.897	.914	.895	.892	.920	.879	.912	.921	.922
1953	.901	.918	.900	.899	.925	.885	.919	.927	.926
1954	.909	.921	.906	.906	.931	.892	.924	.930	.932
1955	.916	.925	.915	.912	.936	.897	.927	.935	.937
1956	.922	.929	.919	.917	.941	.903	.931	.940	.942