INEQUALITY OF OPPORTUNITIES IN HEALTH AND THE PRINCIPLE OF NATURAL REWARD: EVIDENCE FROM EUROPEAN COUNTRIES

Damien Bricard, Florence Jusot, Alain Trannoy and Sandy Tubeuf

ABSTRACT

This chapter aims to quantify and compare inequalities of opportunity in health across European countries considering two alternative normative ways of treating the correlation between effort, as measured by lifestyles, and circumstances, as measured by parental and childhood characteristics, championed by Brian Barry and John Roemer. This study relies on regression analysis and proposes several measures of inequality of opportunity. Data from the Retrospective Survey of SHARELIFE, which focuses on life histories of European people aged 50 and over, are used.

In Europe at the whole, inequalities of opportunity stand for almost 50% of the health inequality due to circumstances and efforts in Barry

Health and Inequality
Research on Economic Inequality, Volume 21, 335–370

ISSN: 1049-2585/doi:10.1108/S1049-2585(2013)0000021016

scenario and 57.5% in Roemer scenario. The comparison of the magnitude of inequalities of opportunity in health across European countries shows considerable inequalities in Austria, France, Spain and Germany, whereas Sweden, Poland, Belgium, the Netherlands and Switzerland present the lowest inequalities of opportunity. The normative principle on the way to treat the correlation between circumstances and efforts makes little difference in Spain, Austria, Greece, France, Czech Republic, Sweden and Switzerland, whereas it would matter the most in Belgium, the Netherlands, Italy, Germany, Poland and Denmark.

In most countries, inequalities of opportunity in health are mainly driven by social background affecting adult health directly, and so would require policies compensating for poorer initial conditions. On the other hand, our results suggest a strong social and family determinism of lifestyles in Belgium, the Netherlands, Italy, Germany, Poland and Denmark, which emphasises the importance of inequalities of opportunity in health within those countries and calls for targeted prevention policies.

Keywords: Equality of opportunity; principle of natural reward; Europe; inequality decomposition; efforts; circumstances

JEL classifications: D63; I14; N30

INTRODUCTION

Inspired by the philosophical concept of equality of opportunity developed by Dworkin (1981), Arneson (1989), Cohen (1989), Roemer (1998) and Fleurbaey (2008), a number of recent publications in health economics have focused on drawing the line between legitimate and illegitimate causes of health inequalities (Fleurbaey, 2006; Fleurbaey & Schokkaert, 2009, 2012; Garcia Gomez, Schokkaert, Van Ourti, & Bago d'Uva, 2012; Jusot, Tubeuf, & Trannoy, 2013; Rosa-Dias, 2009, 2010; Rosa-Dias & Jones, 2007; Sen, 2002; Tubeuf, Jusot, & Bricard, 2012; Trannoy, Tubeuf, Jusot, & Devaux, 2010). The main argument is that differences in observed health outcomes are explained by factors for which the individual can be held responsible, called effort, such as healthy lifestyles, and by factors for which the individual should not be held responsible, called circumstances, such as social and family background. The distinction between efforts and

circumstances is at the core of the implementation of equality of opportunity policies and is based on the concept of individual responsibility. Equality of opportunity principles recommend first to respect the impact of individual responsibility, namely effort, on the outcome; this is the principle of natural reward, and second to compensate the impact of characteristics independent of individual responsibility, namely circumstances; this is the principle of compensation (Fleurbaey, 1995). One requires therefore distinguishing the respective contributions of efforts and circumstances to overall health inequalities, so that policy-makers are able to identify the effort which should be rewarded and the circumstances that should be compensated. The challenge when doing so is that the two components cannot be assumed to be independent and one needs to decide how the correlation between efforts and circumstances should be treated. Two main alternative views have been debated in the literature within this context (for a more extensive presentation of debates on the distinction between legitimate and illegitimate inequalities in health, see Fleurbaey & Schokkaert, 2012). According to Roemer (1998) effort should be respected inasmuch as effort is disembodied from the impact of circumstances; in other words the correlation between efforts and circumstances is considered as circumstances and is independent from individual responsibility. On the other hand, according to Barry (transcription of Barry position according to Roemer, 1998, p. 21; Barry, 2005) effort should be entirely rewarded and the correlation of effort and circumstances does not require to be acknowledged. To illustrate the debate, let us consider the case of smokers; would we hold sons of smokers less responsible to smoke than sons of non-smokers? From Roemer viewpoint, sons of smokers are less responsible than sons of non-smokers; from Barry viewpoint, parental circumstances are not relevant and sons of smokers are as responsible as sons of non-smokers for smoking. According to the viewpoint adopted, the magnitude of inequalities of opportunity in smoking will differ and this will have important implications on the implementation of the principle of natural reward and the principle of compensation. Empirical applications of this debate remain scarce (Jusot et al., 2013) and this issue has never been considered at the European level. In the case of France, Jusot et al. (2013) have shown that inequalities of opportunity represent about 46% of observed health inequalities regardless of the normative viewpoint adopted. They concluded that the philosophical view on the correlation between efforts and circumstances does not matter empirically and the share of inequality related to circumstances is very large in comparison with the share of inequalities related to efforts in France.

This chapter quantifies and compares inequality of opportunity in health in different European countries and assess whether it empirically matters to adopt Barry or Roemer view on the magnitude of inequalities of opportunity in each of these countries. In particular, the chapter investigates whether the correlation between effort and circumstances differ from one country to another. We use data from the Retrospective Survey of SHARELIFE, which focuses on life histories of European people aged 50 and over in 2008/2009.

A large strand of recent European studies have shown persistent socioeconomic health inequalities on general population data (Hernandez-Quevedo, Jones, Lopez, & Rice, 2007; Mackenbach, Stirbu, & Roskam, 2008; van Doorslaer & Koolman, 2004), as well as on sample of older adults (Crimmins & Cambois, 2003; Masseria, Mossialos, & Allin, 2006). Most of them have highlighted the importance of social aspects in the explanation of systematic differences in health status using various contemporary socioeconomic indicators, such as education, income, occupation, wealth, etc. and only one study has investigated the contribution of family and social background to socioeconomic inequalities in health in Europe (Tubeuf & Jusot, 2011). Based on the first wave of the Survey of Health Ageing and Retirement Survey, Jusot, Tubeuf, and Trannoy (2009, 2010) have compared inequalities of opportunity in health due to a small set of circumstances across European countries. As effort variables were not considered, this study only provided a partial picture of inequalities of opportunity in health and did not allow disentangling illegitimate and legitimate sources of inequalities.

Our results show differences in inequalities of opportunity across European countries with larger inequalities in Austria, France, Spain and Germany, and lower inequalities in Sweden, Poland, Belgium, the Netherlands and Switzerland. The share of inequalities of opportunity in health inequalities due to circumstances and efforts varies from 30% in the less unequal countries to 80% in the most unequal countries, whereas it represents 50% at the aggregate level. The way the correlation between efforts and circumstances is changing the measure of inequalities of opportunity also varies between countries where the difference between the alternative scenarios is not significant such as Switzerland and Sweden and countries where adopting a Roemerian approach matters more and induces a maximum of about 20% increase of the measurement of inequalities of opportunity. At the aggregate level, the difference between the alternative scenarios represents an increase of 16.8% in the Roemer measure of inequalities of opportunity comparing to the Barry measure.

The remainder of the chapter is as follows. The second section presents the methods and in particular the econometric model, the third section describes the data, the fourth section presents results on the explanatory factors of overall health inequalities in Europe and focuses on the findings on inequalities of opportunity in health between European countries. A discussion and concluding remarks form the final section.

METHODS

We empirically assess how Roemer and Barry respective viewpoints matter for the measurement of inequalities of opportunity in health in Europe using a regression-based methodology as suggested in Jusot et al. (2013). In the first step, reduced-form models are estimated in each country to measure the association between health status and respectively circumstances and efforts.[1] In the second step, predicted variables are used to measure the magnitude of health inequalities and to compare inequality of opportunity in health between European countries.

Estimation Strategy

Let us assume that individual health status H is a function of circumstances C, efforts E, demographic variables D and an error term u

$$H = f(C, E, D, u) \tag{1}$$

The vector of circumstances C consists of a set of variables beyond individual control related to health status in adulthood such as childhood conditions and family background. The vector of efforts E captures individual responsibility for health, such as lifestyles. Circumstances are considered as a source of illegitimate inequalities and efforts are considered as a source of legitimate inequalities.

The vector of demographic variables D captures biological determinants such as age and sex. Controlling for demographics is essential for international comparisons in order to control for differences in population composition. These biological determinants are circumstances in the very sense of the word. It could also be argued that health differences by age classes reflect the human destiny and everyone will experiment them soon or later

over the life cycle. The error term u represents unobserved variables such as unobserved efforts or circumstances as well as luck. If we assume that we have a complete description of all factors, the residual term appeals to pure luck and others random factors (accident for example) which cannot be captured by the other determinants. In a regression, the residual term will be uncorrelated to other factors and its distribution will be even-handed with respect to circumstances as required for equality of opportunity (see Lefranc, Pistolesi, & Trannoy, 2009).[2] Whether this makes health differences due to biological factors as well as any unobserved variables a legitimate source of health inequality is not straightforward, and we therefore consider that demographics and the error term are two other sources of health inequality.

According to Barry, individual effort has to be fully respected whatever the influence of past circumstances on effort decisions. This position allows directly regressing circumstances and effort variables on health status to measure the correlation between health status and individual effort in health capital investment on the one hand, and the correlation between health status and circumstances on the other. The health status H_{ij} of individual i in country j within Barry context can then be written as follows

$$H_{ij} = \lambda_j^B + \alpha_j^B C_{ij} + \beta_j^B E_{ij} + \gamma_j^B D_{ij} + u_{ij} \tag{2}$$

Eq. (2) allows us to test the condition of equality of opportunity in Barry view by testing the equality of $\hat{\alpha}_j^B$ to zero. Independence between C_{ij} and E_{ij} is not required.

According to Roemer (1998), equality of opportunity requires that effort is purged from any contamination coming from circumstances so that it represents pure individual effort. This concept leads us to estimate an auxiliary equation regressing the effort E_{ij} of individual i in country j against their circumstances C_{ij}. It allows isolating a residual term e_{ij}, the relative efforts, which represent individual efforts purged from any circumstances

$$E_{ij} = \lambda_j + \delta_j \cdot C_{ij} + e_{ij} \tag{3}$$

We then substitute the vector of actual efforts E_{ij} for the estimated relative efforts $\hat{e}_{ij}$ in the equation of health status (Eq. (2)) and the health status H_{ij}^R of individual i in country j within Roemer context can be written in as follows

$$H_{ij} = \lambda_j^R + \alpha_j^R C_{ij} + \beta_j^R \hat{e}_{ij} + \gamma_j^R D_{ij} + u_{ij} \tag{4}$$

Eq. (4) allows us to test the condition of equality of opportunity in Roemer view by testing the equality of $\hat{\alpha}_j^R$ to zero since C_{ij} and e_{ij} are independent.

We estimate both health equations (Eqs. (2) and (4)) and the auxiliary equation (Eq. (3)) using linear probability models. These models allow us to have a perfect orthogonalisation of the auxiliary equations and to obtain comparable models in Eqs. (2) and (4) according to the Frisch−Waugh−Lowell theorem. It provides us with $\hat{\beta}_j^B$ in the first health equation (Eq. (2)) being the same as $\hat{\beta}_j^R$ in the second health equation (Eq. (4)). However $\hat{\beta}_j^R$ and $\hat{\alpha}_j^B$ remain different because in Roemer approach the coefficient of circumstances additionally incorporates the indirect effect of circumstances on efforts, which corresponds to the product of the coefficient of efforts in Barry approach and the coefficient of circumstances in the auxiliary equation ($\alpha_j^R = \alpha_j^B + \beta_j^B \delta_j$). We can note that predicted health is the same in the alternative specifications according to Barry or to Roemer as the set of regressors of both models contains the same information.

Inequality Measurement

We are interested in quantifying and decomposing the magnitude of health inequality into its components and for this purpose we use the variance. The variance presents a natural decomposition and has properties of consistency, symmetry and independence of the level of disaggregation (Shorrocks, 1982).

Using the previous estimation strategy, we can isolate the four main components of health namely circumstances $\hat{H}_C^k$, efforts $\hat{H}_E^k$, demographics $\hat{H}_D^k$, and residual $\hat{H}_{\text{res}}^k$ in each context $k = \{\text{B (Barry); R (Roemer)}\}$.

The decomposition of the variance of health status $\sigma^2(H)$ is therefore given by

$$\sigma^2(H) = \text{cov}(\hat{H}_C^k, H) + \text{cov}(\hat{H}_E^k, H) + \text{cov}(\hat{H}_D^k, H) + \text{cov}(\hat{H}_{\text{res}}^k, H) \tag{5}$$

We use this decomposition to measure inequalities of opportunities IOP^k and inequalities related to efforts IEF^k. We also propose another measure of inequalities of opportunities as a share of inequalities related to circumstances and efforts SOP^k.

The measure of inequality of opportunities in health IOP^k is simply equal to the component of health inequality related to illegitimate factors, namely circumstances and is written as follows

$$\text{IOP}_k = \text{cov}(\hat{H}_C^k, H) \text{ with } k = B, R \tag{6}$$

Similarly, the measure of health inequality related to efforts IEF^k is equal to the component of health inequality related to legitimate factors, namely efforts and is written as follows

$$IEF_k = \text{cov}(\hat{H}_E^k, H) \text{ with } k = B, R \tag{7}$$

The second measure of inequality of opportunities in health SOP^k assesses the magnitude of inequalities of opportunity in health as a share of health inequality explained by the two main sources of interest from a normative point of view, namely efforts and circumstances.

$$SOP_k = \frac{IOP_k}{IOP^k + IEF^k} = \frac{\text{cov}(\hat{H}_C^k, H)}{\text{cov}(\hat{H}_C^k, H) + \text{cov}(\hat{H}_E^k, H)} \text{ with } k = B, R \tag{8}$$

In order to compare the extent to which the inequality of opportunity in health varies between Barry and Roemer approaches, we rely on a measure of the difference between the alternative scenarios as follows

$$Diff^{R-B} = \frac{IOP^R - IOP^B}{IOP^B} \tag{9}$$

We note that $Diff^{R-B}$ will be the same regardless of the measure of inequality of opportunities (IOP_k or SOP_k) being considered.

Statistical Inference and Empirical Strategy for the International Comparison

A bootstrap procedure is implemented to calculate standard errors for the estimated coefficients within the two health equation of each scenario and standard errors for the various inequality measures taking into account the whole process of estimation using 1,000 replications. This is particularly relevant for the two-step estimation needed for the Roemer scenario as estimated residuals from the auxiliary equations introduced in the main health equation are likely to introduce uncertainty.

Before we undertake the health regression models for each country and each viewpoint, we carry out a pooled health regression at the European level including country dummies. Comparisons of inequality of opportunity in health across countries are made using IOP^k, IEF^k and SOP_k as computed

separately in each country. The calculation of standard errors allows us to test all inequality measures within each country being equal to zero and to make pairwise comparisons across countries. In particular, unilateral *t*-tests are undertaken to test the ranking across countries and allow distinguishing three groups of countries: countries having high inequality measure which are never dominated by another country; countries with low inequality measure which never dominate another country; and countries with an intermediate level of inequality measure.

DATA

For the purpose of this study, we mainly use the third wave of the Survey of Health, Ageing and Retirement in Europe (SHARE) which was collected in 2008/2009. This wave is called SHARELIFE – the Retrospective Survey – as it focuses on people's life histories and thus provides a unique set of information on circumstances and health status for several European countries. We also use additional information on lifestyles and circumstances collected at wave 1 in 2004 and wave 2 in 2006/2007. SHARE is a multidisciplinary database representative of the European population aged 50 and over in Scandinavia (Denmark and Sweden), Western Europe (Austria, France, Germany, Switzerland, Belgium and the Netherlands) and the Mediterranean countries (Spain, Italy and Greece), as well as two transition countries (the Czech Republic and Poland). Additional information about the dataset is available in Börsch-Supan et al. (2005).

We consider a sample of 20,946 individuals (9,447 men and 11,499 women) aged between 50 and 80 years. The variable of interest is health in adulthood as measured by self-assessed health (SAH) in wave 3. Respondents were asked to rate their own health on a five-point categorical scale ranging from poor to excellent health status. We used SAH as a binary variable taking the value one if the individuals rate their health as 'good' or better, and zero if they rate their health less than 'good'. On the one hand, self-assessed health has been shown to be a good predictor of mortality, morbidity, and subsequent use of health care (Idler & Benyamini, 1997) and has largely been used in cross-country comparisons (Jusot et al., 2009, 2010; Mackenbach et al., 2008; Masseria et al., 2006; Tubeuf & Jusot, 2011; van Doorslaer & Koolman, 2004). On the other hand, Jürges (2007) found large cross-country variation in SAH using the 2004 wave of SHARE, with the healthiest respondents living in the Scandinavian countries and the least healthy in Southern Europe. He

concluded that differences are partly explained by differences in health status and the remaining part come from reporting styles. Danish and Swedish respondents are found to overrate their health whereas Germans are found to underrate. These results suggest a bias on comparing average health across countries. If we assume that this bias on national average health is not linked to circumstances and efforts, then we can assume that there is no bias on the estimation of the covariances between health and circumstances and efforts, respectively.

Table 1 provides the distribution of the sample according to self-assessed health. 62.5% of the European sample reports a good, very good or excellent self-assessed health status. The proportion of individuals reporting a good health status varies from 34% in Poland to 79.7% in Switzerland. Health status also varies within countries; the variance of self-assessed health is significantly different from zero in each country and ranges from 0.162 in Switzerland to 0.249 in Spain (first row in Table 4).[3]

Three sets of variables are considered in the study: circumstances, efforts and demographics. The set of circumstances includes variables related to parents' characteristics that have been shown to matter for health (Jusot et al., 2013; Rosa-Dias, 2009, 2010; Trannoy et al., 2010; Tubeuf et al., 2012). Effort is proxied by health-related behaviours that are available at wave 1 and wave 2 in SHARE. Table 2 presents the descriptive statistics of the sample at European level.

Table 1. Distribution of 'Good' Health Status Across European Countries (20,946 Observations).

	Percentage
Europe	62.5
Austria (AT)	58.0
Germany (DE)	56.7
Sweden (SW)	70.2
Netherlands (NL)	68.9
Spain (SP)	46.7
Italy (IT)	56.1
France (FR)	62.1
Denmark (DK)	72.3
Greece (GR)	73.3
Switzerland (CH)	79.7
Belgium (BE)	69.4
Czech Republic (CZ)	56.4
Poland (PL)	34.0

Table 2. Descriptive Statistics at European Level (20,946 Observations).

	Percentage
Sex	
Men	45.1
Women	54.9
Age	
50–54	11.5
55–59	21.1
60–64	21.0
65–69	17.9
70–74	15.0
75–80	13.5
Main breadwinner occupation	
Senior managers and professionals	8.1
Technicians, associate professionals and armed forces	6.1
Office clerks, service workers and sales workers	13.5
Skilled agricultural and fishery workers	26.8
Craftsmen and skilled workers	26.2
Elementary occupations and unskilled workers	17.7
No main breadwinner	1.6
Number of books at home	
None or very few (0–10 books)	43.2
Enough to fill one shelf (11–25 books)	22.6
Enough to fill one bookcase (26–100 books)	21.5
Enough to fill two or more bookcases (more than 100 books)	12.7
Number of rooms per household member (mean)	0.7
Number of facilities at home	
None	26.7
One	19.7
Two or three	29.0
Four or five	24.6
Period of difficulties during childhood	
Economic hardships	2.3
Hunger	5.9
Parent's longevity	
Mother prematurely deceased	38.6
Mother deceased in later ages	35.2
Mother alive	26.3
Father prematurely deceased	47.6
Father deceased in later ages	42.0
Father alive	10.4
Parent's health-related behaviours	
No regular dentist visits for their children	47.9

Table 2. (*Continued*)

	Percentage
Parents' smoking	63.6
Parents' alcohol consumption	8.4
Lifestyle/Effort variables	
Reported smoking status at least once in the past waves	21.3
Obesity at least once in the past waves	18.9
Reported sedentary lifestyles at least once in the past waves	8.7

The vector of circumstances includes a number of social conditions in childhood, parents' longevity and parents' health-related behaviours. Social conditions include the occupation of the main breadwinner during childhood, which is described with the ISCO classification (International Standard Classification of Occupations) into six groups (i) 'senior managers and professionals', (ii) 'technicians and associate professionals and armed forces', (iii) 'office clerks, service and sales workers', (iv) 'skilled agricultural and fishery workers', (v) 'craftsmen and skilled workers', (vi) 'elementary occupations and unskilled workers' and an additional category is added if individuals reported no breadwinner at home during their childhood. Most of the respondents in Europe have a parent who was a skilled agricultural or fishery worker (26.8%) or craftsman or skilled worker (26.2%) whereas only 8.1% of the sample is born from a father who was manager or professional. Social conditions also include the number of books at home when the respondent was a child; this could be used as a proxy of parents' educational level. The number of books at home is a four categories variable starting from a first category with individuals declaring to have none or very few books (0−10 books) to a last category with individuals describing to have enough to fill two or more bookcases (more than 100 books). We also use information on living conditions at home; this included the number of rooms per household member at home when the respondent was 10, the number of facilities available in the accommodation when the respondent was 10 such as having cold running water supply or central heating for example. Finally, social conditions include two indicators of financial difficulties during childhood: individual report of economic hardships and report of hunger episodes before the respondent was aged 16. Parental health is also considered and a variable of the longevity of each parent is created using their vital status at the time of the survey in 2008/2009 or their age at death when applicable. For deceased parents, we use the national median age at death on the basis of SHARELIFE data and the age at death to divide those parents into two groups: those who

died earlier and those who died at the median age or later. As expected on a cohort of respondents aged 50 and over, only 10.4% of the fathers and 26.3% of the mothers are still alive. In addition, we used three parental health-related lifestyles when the respondent was 10: smoking, alcohol problem and particular aspects of health care use. The smoking indicator takes the value one if at least one of the two parents was reported to be a smoker; the alcohol variable takes the value one if at least one of the two parents was reported to have a problem with alcohol; the health care behaviour variable indicates the lack of regular visits to the dentist for their children.

The vector of efforts includes three past lifestyles variables reported in waves 1 or 2: smoking status, obesity status[4] and sedentary lifestyles (defined as binary variables). Smoking status variable takes the value one if the respondent reported to be a current smoker in at least one of the past waves and zero otherwise. Obesity status is constructed using reported height and weight and calculating the body mass index (BMI); it takes the value one if the respondent is obese (BMI higher than 30) in at least one of the past waves and zero otherwise. Sedentary lifestyles are measured using respondent's reported involvement in activities requiring a moderate level of physical energy; it equals one if the respondent reports engaging hardly ever or not at all in activities in one of the past waves and zero otherwise.

RESULTS

The main results of interest of the chapter are the cross-country comparisons of the magnitude of inequality of opportunity and of the differences observed by alternative normative viewpoints. We primarily give an overview of the determinants of health inequalities in Europe and in each country commenting the regression analysis results for the health equations in the two alternative viewpoints. We then focus on the results of cross-country differences in inequality of opportunity in health.

Regression Analysis

The results of both linear probability models are presented in Table 3 and are provided as coefficients[5] associated to circumstances and efforts on the probability of reporting excellent, very good or good health at the European level within each scenario (columns 2 and 3). Results of auxiliary equations at the European level are available in Table A1. Findings of

Table 3. Regressions Coefficients of the Probability of Reporting Good Health Status from Barry and Roemer Specifications at the European Level (with Bootstrapped Standard Errors).

	Barry Specification		**Roemer Specification**	
Sex (ref: Female)				
Male	0.042***	(0.006)	0.042***	(0.006)
Age (ref: 50–54)				
55–59	−0.025**	(0.011)	−0.025**	(0.010)
60–64	−0.061***	(0.012)	−0.061***	(0.011)
65–69	−0.094***	(0.013)	−0.094***	(0.012)
70–74	−0.140***	(0.014)	−0.140***	(0.013)
75–80	−0.215***	(0.015)	−0.215***	(0.014)
Main breadwinner (ref: Elementary occupations and unskilled workers)				
Senior managers and professionals	0.054***	(0.014)	0.061***	(0.014)
Technicians, associate professionals and armed forces	0.019	(0.015)	0.025	(0.016)
Office clerks, service workers and sales workers	0.029**	(0.012)	0.033***	(0.012)
Skilled agricultural and fishery workers	0.006	(0.010)	0.013	(0.010)
Craftsmen and skilled workers	0.010	(0.010)	0.012	(0.010)
No main breadwinner	0.028	(0.026)	0.027	(0.027)
Number of books at home (ref: None or very few (0–10 books))				
Enough to fill one shelf (11–25 books)	0.049***	(0.009)	0.056***	(0.009)
Enough to fill one bookcase (26–100 books)	0.060***	(0.010)	0.071***	(0.010)
Enough to fill two or more bookcases (more than 100 books)	0.050***	(0.013)	0.058***	(0.013)
Number of room/household member	0.026***	(0.009)	0.037***	(0.009)
Number of facilities (ref: None)				
One	0.005	(0.010)	0.015	(0.010)
Two or three	0.025**	(0.010)	0.032***	(0.010)
Four or five	0.037***	(0.012)	0.046***	(0.012)
Period of difficulties during childhood				
Economic hardships	−0.117***	(0.022)	−0.119***	(0.022)
Hunger	−0.056***	(0.015)	−0.057***	(0.015)
Mother's longevity (ref: mother prematurely deceased)				
Mother deceased in later ages	0.018**	(0.007)	0.024***	(0.008)
Mother alive	0.029***	(0.008)	0.036***	(0.008)
Father's longevity (ref: father prematurely deceased)				
Father deceased in later ages	0.035***	(0.007)	0.041***	(0.007)
Father alive	0.038***	(0.012)	0.047***	(0.011)
Parents' health-related behaviours				
No regular dentist visits for their children	−0.029***	(0.008)	−0.035***	(0.008)
Parents' smoking	−0.017***	(0.007)	−0.019***	(0.007)
Parents' alcohol consumption	−0.066***	(0.012)	−0.072***	(0.012)

Table 3. (*Continued*)

	Barry Specification		Roemer Specification	
Lifestyle variables/Residuals				
Smoking	−0.056***	(0.008)	−0.056***	(0.008)
Obesity	−0.130***	(0.008)	−0.130***	(0.008)
Sedentarity	−0.206***	(0.012)	−0.206***	(0.011)
Country (ref: Austria (AT))				
Germany (DE)	−0.064***	(0.022)	−0.064***	(0.022)
Sweden (SW)	0.025	(0.023)	0.025	(0.022)
Netherlands (NL)	0.038*	(0.022)	0.038*	(0.021)
Spain (SP)	−0.076***	(0.023)	−0.076***	(0.022)
Italy (IT)	0.013	(0.022)	0.013	(0.021)
France (FR)	−0.002	(0.022)	−0.002	(0.020)
Denmark (DK)	0.054**	(0.022)	0.054**	(0.021)
Greece (GR)	0.154***	(0.021)	0.154***	(0.020)
Switzerland (CH)	0.129***	(0.023)	0.129***	(0.022)
Belgium (BE)	0.076***	(0.021)	0.076***	(0.020)
Czech Republic (CZ)	−0.069***	(0.022)	−0.069***	(0.023)
Poland (PL)	−0.202***	(0.023)	−0.202***	(0.022)
Constant	0.655***	(0.025)	0.576***	(0.025)
Obs	20946		20946	
R^2	0.143		0.143	

Standard errors in parenthesis and significance levels of test of rejecting the hypothesis of the nullity of the coefficient from 1,000 bootstrapped replications: ***1%, **5%, *10%.

health equations separately carried out for each country are presented in Table A2 and auxiliary equations for each country are available in Bricard, Jusot, Trannoy, and Tubeuf (forthcoming).

There are clear differences in the magnitude of the coefficients of circumstance variables in both scenarios in Europe; the coefficients of circumstances being in average 31% larger in Roemer scenario than in Barry scenario (Table 3). However results remain similar in terms of signs and relatively close in terms of significance levels in both specifications. It appears that any circumstances included in the model are significantly associated with the probability of reporting good health in Europe.

Higher social background is strongly and significantly associated with the probability of reporting a good health status. Individuals born in a family where the main breadwinner was a senior manager or professional worker have a probability 5.4 percentage points higher to report a better health status than individuals born of an elementary occupation or an

unskilled worker in Barry model. The coefficient reaches 6.1 percentage points in Roemer scenario because of the strong correlation between self-assessed health and obesity indicated in the related auxiliary equation (Table A1). The number of books at home during childhood is also found to be strongly related to a better health status in adulthood as individuals reporting to have had enough books to fill at least one shelf significantly reported a better health status than those reporting none or very few books at home. Moreover, we note a significant and positive effect of housing characteristics during childhood; the probability of reporting a good health status is increasingly associated with the number of rooms per household members and the number of facilities at home. The coefficients associated with parental education proxy and housing conditions are noticeably higher in Roemer context than in Barry context, which suggest their strong correlation with lifestyles in auxiliary equations (Table A1). Periods of difficulties during childhood also significantly contribute to the probability of reporting a good health status with an 11.7 percentage points decrease in the case of economic hardships and a 5.6 percentage points decrease in the case of hunger episodes. However, despite their strong association with health status, we note a weaker difference in the magnitude of the coefficient across scenarios, due to contradictory correlations with the various lifestyles. Parents' health also drives health disparities: having a father or a mother who died in older ages or who is still alive at the time of the survey is associated with a higher probability of good health status in adulthood. Those associations are particularly large in Roemer scenario due to their strong negative correlation with all lifestyles. For instance, the coefficient associated to having a father died in older age increases from 3.5 percentage points in Barry scenario to 4.1 percentage points in Roemer scenario. Finally, we find a negative and significant effect of parents' poor health-related behaviours such as the lack of regular visits to the dentist for their children, parents' smoking and parents' alcoholic consumption during childhood. As expected, we note an increase in their coefficients in Roemer scenario, parents' poor health-related behaviours being positively correlated to individual poor health-related behaviours.

If we now turn our attention to the coefficients of the three past efforts variables, smoking, being obese and lack of activity are found significantly and negatively associated with good health. The coefficient of sedentary lifestyles is particularly striking as compared to other effort variables. Individuals with weak involvement in physically demanding activities are 20.6 percentage points less likely to report good health. Similarly, obesity is significantly associated with a decrease of 13 percentage points in the probability of being in good health. Finally, smoking is an important

determinant of health but the marginal effect is considerably smaller than the previous ones, with a magnitude of 5.6 percentage points.

Table A2 shows the findings of health equations separately conducted in each country in both contexts. Lifestyles are significantly associated with health in most countries. Obesity is significant in all countries except Denmark; adopting sedentary behaviour is significantly associated with poorer health in all countries except Austria and smoking is significant for health in most of the European countries. Conversely, significant circumstances differ from one country to the other and there are also countries where circumstances are not significantly related to health. It is particularly noticeable in Poland and in Switzerland where most of the coefficients of the circumstances are not significantly different from zero. In Barry context, social background matters in most of the countries except in Poland and Switzerland. The association between SAH and parental longevity is found weaker than the association between SAH and social background in most of the countries except in the Netherlands, Denmark and France where parental longevity is strongly related to SAH. We found a weak association between SAH and parental behaviours, excepted in Belgium, Denmark, Greece, Spain and Poland. It is important to be cautious with those results as the lack of significance in the regression models might also come from a limited statistical power. Consistently with the results found at the European level, coefficients associated with circumstances are higher in Roemer model than in Barry model and this coefficients' increase varies across countries. The increase is particularly large in Germany where the coefficient associated with parental longevity is not significant in Barry context but reaches 5% level significance in Roemer context. We also find a large increase in Belgium and the Netherlands where coefficients associated with the number of books at home are particularly higher in Roemer context than in Barry context.

Inequalities Measurement

Using the estimated coefficients of the health equations, we can assess how the magnitude of legitimate health inequalities and illegitimate health inequalities, namely inequalities of opportunity in health, differs between the alternative views. Roemer's view is expected to amplify the magnitude of inequalities of opportunities in health if circumstances associated with poor health status are also associated to unhealthy lifestyles.

Table 4 gives the magnitude of health inequalities using the variance of health status and provides then various insights on the differences in

Table 4. Inequalities of Opportunity in Health and Inequalities Related to Efforts According to Barry and Roemer Scenario Across European Countries.

	Europe	AT	DE	SW	NL	ES	IT	FR	DK	GR	CH	BE	CZ	PL
Variance	0.234***	0.244***	0.246***	0.209***	0.214***	0.249***	0.246***	0.236***	0.200***	0.196***	0.162***	0.212***	0.246***	0.225***
	(0.001)	(0.003)	(0.002)	(0.005)	(0.004)	(0.001)	(0.001)	(0.003)	(0.005)	(0.004)	(0.007)	(0.004)	(0.002)	(0.004)
Barry scenario														
IOP^B	0.009***	0.023***	0.013***	0.009***	0.006***	0.014***	0.009***	0.014***	0.011***	0.010***	0.004**	0.007***	0.013***	0.007***
	(0.001)	(0.006)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
IEF^B	0.009***	0.013***	0.016***	0.007***	0.011***	0.006***	0.013***	0.008***	0.011***	0.004***	0.006***	0.015***	0.004**	0.006***
	(0.001)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
SOP^B	49.172***	63.733***	44.395***	54.944***	33.902***	70.044***	42.219***	65.597***	50.727***	71.542***	40.908***	31.111***	78.252***	56.579***
	(2.730)	(8.461)	(6.598)	(9.147)	(7.166)	(7.349)	(6.543)	(6.735)	(7.134)	(6.669)	(11.829)	(6.192)	(7.104)	(9.246)
Roemer scenario														
IOP^R	0.010***	0.025***	0.015***	0.009***	0.007***	0.015***	0.011***	0.015***	0.013***	0.011***	0.004**	0.008***	0.013***	0.008***
	(0.001)	(0.006)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
IEF^R	0.007***	0.011***	0.014***	0.007***	0.010***	0.005***	0.011***	0.007***	0.010***	0.003***	0.006***	0.014***	0.003**	0.005***
	(0.001)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
SOP^R	57.424***	69.804***	50.691***	57.029***	40.093***	76.824***	48.650***	69.584***	57.192***	77.849***	42.480***	37.179***	82.921***	64.520***
	(2.579)	(7.785)	(6.535)	(8.645)	(7.212)	(6.456)	(6.446)	(6.278)	(6.976)	(5.725)	(11.592)	(6.423)	(6.219)	(8.456)
Difference between Roemer and Barry														
$Diff^{R-B}$	16.782***	9.526**	14.181***	3.796	18.261***	9.680***	15.233***	6.078**	12.744***	8.816***	3.843	19.505***	5.967***	14.035***
	(1.570)	(4.314)	(4.118)	(4.167)	(4.828)	(2.926)	(4.127)	(2.405)	(3.532)	(2.617)	(5.407)	(4.617)	(2.172)	(4.610)
N	20946	648	1550	1193	1794	1439	2094	1800	1746	2466	1032	2250	1514	1420

Standard errors in parenthesis and significance levels of test of rejecting the hypothesis of the nullity of the coefficient from 1,000 bootstrapped replications: ***1%, **5%, *10%.

magnitude of inequalities of opportunities in health and inequalities related to lifestyles within each scenario for all countries separately as well as for Europe as a whole. We find inequalities of opportunity in health in all countries. When we consider IOP_k regardless of the scenario, inequalities of opportunity are significantly different from zero in all countries. Moreover, the inequality of opportunity in inequalities due to circumstances and efforts (SOP_k) is significantly different from zero in all countries in both scenarios as are the inequalities related to efforts (IEF_k). However there are some differences between countries in the magnitude of these inequalities according to the scenario and the measure being used.

Figs. 1 and 2 respectively show the magnitude of the inequalities of opportunity IOP_k and of the inequalities related to efforts IEF_k according to Barry and Roemer scenarios in the European countries with confidence intervals obtained from bootstrapped standard errors; the countries are ranked from the most to the least unequal. Fig. 3 shows the ranking of countries according to the magnitude of the inequalities of opportunity in health inequalities due to circumstances and efforts SOP_k in both scenarios. Differences between countries are calculated using unilateral *t*-tests (tables of results are available in Bricard et al., forthcoming). For each inequality measure, *t*-tests allow distinguishing three groups of countries separated by the dashed lines in the figures: countries with a high inequality measure which are never dominated by another country; countries with a low inequality measure which never dominate another country; and countries with an intermediate inequality measure.

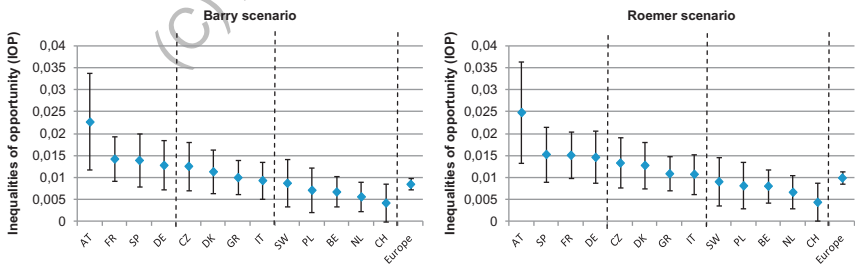

Fig. 1. Inequalities of Opportunity According to Barry and Roemer Scenario Across European Countries (IOP), with 95% Confidence Intervals. *Note*: The dashed lines are based on the *t*-tests values; they divide countries into countries with a high inequality measure which are never dominated by another country, countries with a low inequality measure which never dominate another country, countries with an intermediate inequality measure and finally inequality at European level.

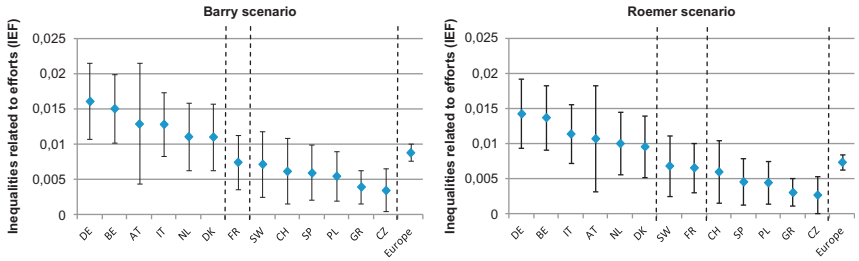

Fig. 2. Inequalities Related to Efforts According to Barry and Roemer Scenario Across European Countries (IEF), with 95% Confidence Intervals. *Note*: The dashed lines are based on the *t*-tests values; they divide countries into countries with a high inequality measure which are never dominated by another country, countries with a low inequality measure which never dominate another country, countries with an intermediate inequality measure and finally inequality at European level.

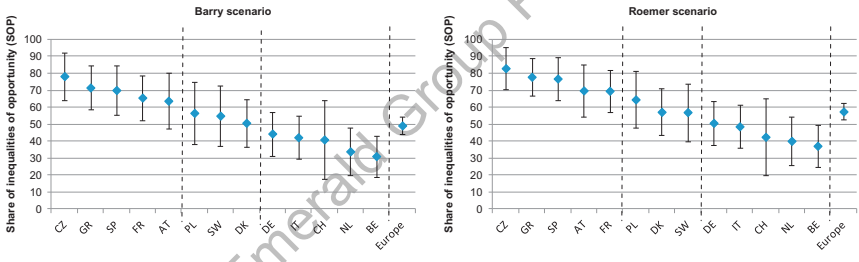

Fig. 3. Share of Inequalities of Opportunity in Health Inequalities Due to Circumstances and Efforts Across European Countries According to Barry and Roemer Scenario (SOP), with 95% Confidence Intervals. *Note*: The dashed lines are based on the *t*-tests values; they divide countries into countries with a high inequality measure which are never dominated by another country, countries with a low inequality measure which never dominate another country, countries with an intermediate inequality measure and finally inequality at European level.

According to the Barry scenario, we find that inequalities of opportunity in health when measured with IOP^B are significantly the largest in Austria, France, Spain and Germany whereas they are the lowest in Sweden, Poland, Belgium, the Netherlands and Switzerland. Czech Republic, Denmark, Greece and Italy show an intermediate position. Inequalities of opportunity represent a quite small proportion of the total health inequality; IOP_B as a share of total variance varying from 2.7% in Switzerland and

the Netherlands to 9.3% in Austria. Considering inequalities related to efforts (IEF_B), they also vary across countries and are the highest in Germany, Belgium, Austria, Italy, the Netherlands and Denmark whereas they are the lowest in Sweden, Switzerland, Spain, Poland, Greece and Czech Republic. France has an intermediate position in this ranking.

If we now turn our attention to the magnitude of inequalities of opportunity in health relative to the sole inequalities which can be classified from a normative point of view, namely circumstances and effort, as measured by SOP_B, the ranking of countries is considerably changing. Inequalities of opportunity in health measured as SOP_B are now significantly larger in Czech Republic, Greece, Spain, France and Austria; intermediate in Poland, Sweden and Denmark; and lower in Germany, Italy, Switzerland, the Netherlands and Belgium. SOP_B equals 30% in Belgium and the Netherlands whereas it equals more than 70% in Spain, Greece and Czech Republic. We can remark that there are two potential explanations for the high level of SOP_B : either having a high value for IOP_B such as in Austria and in France and Spain, or having a small share of inequalities related to efforts IEF_B as observed in Czech Republic and Greece. On the contrary, SOP^B is particularly low in Switzerland, Belgium, the Netherlands because of the small value of IOP_B, and also in Germany because of a large share of inequalities related to efforts (IEF_B).

If we turn to the Roemer scenario, results are very similar in terms of the ranking of countries for the two measures of inequalities of opportunity and for the measure of inequalities related to efforts. The magnitude of inequalities of opportunity is higher in Roemer scenario in most countries, which can be illustrated when computing the difference between the measures between Roemer and Barry scenarios ($Diff^{R-B}$). Fig. 4 shows the ranking of the countries according to $Diff^{R-B}$providing confidence intervals constructed using bootstrapped standard errors. The difference between the Roemer and Barry scenarios is found significant within most countries, except in Sweden and in Switzerland where the difference is not significantly different from zero and in France and Austria, the difference is only significant at the 10% level. Using unilateral *t*-tests of the magnitude of the differences, we can distinguish two groups of countries: countries which are never dominated by another country and countries which never dominate another country. The first group is composed of countries where the difference between normative scenarios is particularly important, for example Belgium, the Netherlands, Italy, Germany, Poland and Denmark; in those countries, adopting the Roemer viewpoint leads to an increase of the extent of inequalities of opportunity of more than 10% with comparison to the

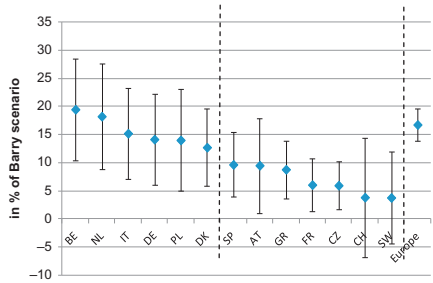

Fig. 4. Relative Difference between Barry and Roemer Measure of Inequalities of Opportunity in Health Across European Countries (Diff^{R-B}), with 95% Confidence Intervals. *Note*: The dashed lines are based on the *t*-tests values; they divide countries into countries with a high inequality measure which are never dominated by another country, countries with a low inequality measure which never dominate another country and finally inequality at European level.

Barry approach. On the other hand, the second group gathers countries where the difference between scenarios is small or non-significant as it is the case in Spain, Austria, Greece, France, Czech Republic, Switzerland and Sweden.

Those findings illustrate the strong link between efforts and circumstances within the countries where the difference across scenarios is large, that is individuals' efforts (lifestyles) are likely to be strongly determined by circumstances (family and social background). Conversely, the small difference within other countries is either due to a weak correlation between efforts and circumstances or a weak influence of efforts on health status.

If we now turn to the results in Europe as a whole, we find significant inequalities of opportunity in both Barry and Roemer scenarios and for both IOP_k and SOP_k inequality of opportunities indicators. Concerning their magnitude, inequalities of opportunity represent a small proportion of total health inequality; $\text{IOP}_B = 3.7\%$ of the total variance in Barry and $\text{IOP}_R = 4.3\%$ in Roemer scenario. However, when we compare illegitimate inequalities to the sole inequalities which can be classified from a normative point of view as measured by SOP_k, inequalities in opportunity stand for almost 50% of the health inequality due to circumstances and efforts in the Barry scenario and 57.5% in the Roemer scenario. The difference between Roemer and Barry Diff^{R-B} is significant and represents 16.8% of the health inequality measured in Barry scenario.

DISCUSSION

The aim of this chapter is to quantify and compare inequalities of opportunity in health in Europe and to assess whether it matters empirically to adopt Barry or Roemer viewpoint on the treatment of the correlation between efforts and circumstances. Our results firstly attest the existence of inequalities of opportunity in health in Europe. Moreover, the comparison of the magnitude of inequalities of opportunity in health across European countries and across scenarios provides interesting results. Inequalities of opportunities are the largest in Austria, France, Spain and Germany and the lowest in Sweden, Poland, Belgium, the Netherlands and Switzerland. The share of inequalities of opportunity in health inequalities due to circumstances and efforts varies from 30% in the less unequal countries to 70% in the most unequal countries, whereas it represents 50% at the aggregate level. The way the correlation between efforts and circumstances matters for the assessment of inequalities of opportunity also varies across countries. The difference between scenarios is negligible in Switzerland and Sweden but is particularly important in Belgium and the Netherlands where taking into account the indirect effect of circumstances through lifestyles induces a 20% increase in inequalities of opportunity.

We have to bear in mind that our study is based on a subjective indicator of health status. As mentioned before, reporting styles will not be problematic for the assessment and the comparison of inequalities of opportunity across countries if reporting biases are orthogonal to circumstances and to efforts. However, we cannot exclude the existence of such reporting bias. Moreover, our empirical model specification suffers from potential unobserved circumstances and effort variables. It is therefore important to underline that our study is likely to assess only the lower bound of inequality of opportunity in health.

Inequalities of opportunity in Europe represent on average half of the health inequalities due to circumstances and efforts and there are large variations across countries. Moreover, inequalities of opportunity are found to be more correlated to the magnitude of health inequalities than legitimate inequalities. Fig. 5 explores the relationship between overall health inequality and respectively inequalities of opportunity in health and inequalities related to efforts. It shows a positive correlation between inequalities of opportunity in health and health inequality with a coefficient of correlation of about 0.39. The correlation between inequalities related to efforts and health inequalities is relatively small and is about 0.06. This result is in line

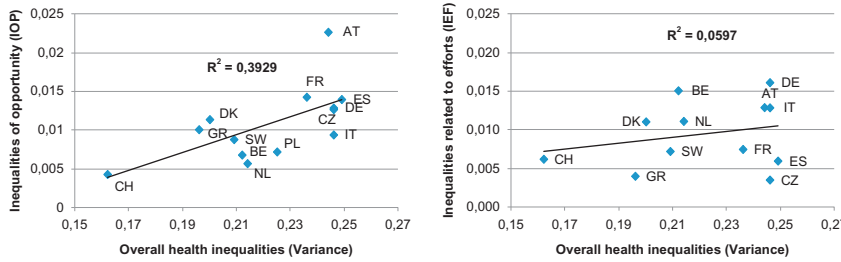

Fig. 5. Relationship between Inequalities of Opportunity (IOP) and Inequalities Related to Efforts (IEF) with Overall Health Inequalities (Variance).

with a recent paper that has provided evidence of a positive link between inequalities of opportunity and inequalities of outcomes in the case of income inequalities (Lefranc, Pistolesi, & Trannoy, 2008).

The difference induced by the adopted normative viewpoint is more important in countries with high inequalities due to efforts. Conversely, we do not find a general pattern on the relationship between the extent of inequalities of opportunities and the way the correlation between efforts and circumstances matters for the assessment of inequalities of opportunity. Sweden and Switzerland combine low inequalities of opportunities in health and weak differences between Roemer and Barry's viewpoints whereas Germany, Italy, Spain and Denmark combine high inequalities of opportunity in health and strong differences between Roemer and Barry's viewpoints. However, some countries do not fit with these patterns; Austria, France and Czech Republic show high inequalities of opportunity in health but the two alternative normative viewpoints do not appear to matter much. Finally, Belgium, the Netherlands and Poland do not show very important inequalities of opportunity in health but differences between the two scenarios are considerable.

These results contribute to the debate on whether it is individual health-related behaviours (efforts) or poor past conditions (circumstances) that should be tackled to reduce effectively inequalities of opportunity in health and health inequalities in general. Social background, parents' health and parents' health-related behaviours represent factors beyond the realm of individual responsibility (Fleurbaey, 2008; Fleurbaey & Schokkaert, 2009; Roemer, 1998; Trannoy et al., 2010), they are socially or morally unacceptable sources of inequality and they legitimate public interventions. The recent report of the World Health Organization's Commission on the Social Determinants of Health (Marmot et al., 2008) highlights the role of

childhood conditions as primary sources of unfair inequality in health. Causal estimates of the effect of circumstances and efforts on health are required to define precisely the policy interventions that matter to tackle inequality of opportunity and our chapter does not explore causality inference. However, given the magnitude of the inequalities of opportunity in health and the strong correlation between social background and health that are observed in each country, our research work recommends improving childhood conditions and equality of opportunity in education and in income acquisition to reduce inequality of opportunity in health.

According to Roemer's viewpoint, targeting determinants of health-related behaviours which are beyond individual responsibility would be also normatively justified. Empirically, the choice between the alternative normative viewpoints about the legitimacy of the correlation between efforts and circumstances seems to matter more in some European countries than in others. This suggests differences in the underlying public health policies that could be put in place to fight against inequalities of opportunity in health. Even if this analysis does not provide causal findings, it suggests a strong social and family determinism of lifestyles in Belgium, the Netherlands, Italy, Germany, Poland and Denmark which emphasised the importance of inequalities of opportunity in health within those countries according to the Roemerian approach. In terms of public health and social policies, reducing social reproduction and the intergenerational transmission of unhealthy lifestyles would be appropriate in those countries if they endorse the Roemerian ethical viewpoint on equality of opportunity. On the other hand, Austria, France, Spain and Czech Republic show high inequalities of opportunities in health mainly driven by social and family background affecting adult health directly, and so those countries would require policies compensating for poorer initial conditions mainly, regardless of the normative point of view adopted.

NOTES

1. We rely on a reduced form model because we are primarily interested in capturing correlations between health and effort, health and circumstances and finally effort and circumstances. In particular, we do not include contemporary socioeconomic characteristics among the regressors because they are endogenous and may be correlated with past health, parental characteristics as well as individual effort (see Jusot et al., 2013 for more details).
2. See Fleurbaey and Schokkaert (2012) for a more consideration on the role of luck.

3. In the case of a binary indicator, the variance is directly derived from the proportion of individuals who report good health status and is bounded from 0 to 0.25.

4. There might be a debate on whether obesity can be considered as an individual effort or as an outcome because of its link with nature and nurture. We consider that obesity status captures aggregated effects of lifestyles in our context. This view is supported by public health decision makers such as the NICE. In the NICE guideline (2006) with respect regard to the treatment of obesity, it is stated that '*People choose whether or not to change their lifestyle or agree to treatment. Assessing their readiness to make changes affects decisions on when or how to offer any intervention*' (p. 6).

5. It is important to remind that effort variables are different from a mathematical point of view in each scenario. Actual efforts are measured as dummy variables in Barry model whereas relative efforts are measured as continuous variables in Roemer model. However, according to Frisch–Waugh–Lowell theorem and because we use linear probability models in the auxiliary equation, the coefficients of effort variables are identical in both scenarios. Conversely, circumstances variables are introduced in the same mathematical form in both models but their coefficients differ in Roemer scenario according to the extent to which circumstances are correlated to efforts.

ACKNOWLEDGEMENTS

We gratefully acknowledge the financial support of the Health Chair, a joint initiative by PSL, Université Paris-Dauphine, ENSAE and MGEN under the aegis of the Fondation du Risque (FDR). Damien Bricard also benefited from a PhD studentship from the *Régime Social des Indépendants* (RSI).

We thank Bénédicte Apouey, Andrew Clark, Martin Karlsson, Erik Schokkaert and the participants to the 2013 PhD Seminar on Health Economics and Policy (Grindelwald, Switzerland) and to the 12th Journées Louis-André Gérard-Varet Conference in Public Economics for their helpful comments. We would like to thank the editors of this special issue for valuable remarks.

This chapter uses data from wave 1 and 2 release 2.5.0, as of 24 May 2011 and SHARELIFE release 1, as of 24 November 2010. The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (projects SHARE-I3, RII-CT-2006-062193, COMPARE, CIT5-CT-2005-028857 and SHARELIFE, CIT4-CT-2006-028812) and through

the 7th Framework Programme (SHARE-PREP, No. 211909, SHARE-LEAP, No. 227822 and SHARE M4, No. 261982). Additional funding from the U.S. National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see www.share-project.org for a full list of funding institutions).

REFERENCES

Arneson, R. J. (1989). Equality and equal opportunity of welfare. *Philosophical Studies*, *56*, 77–93.

Barry, B. (2005). *Why social justice matters*. Cambridge: Polity Press.

Börsch-Supan, A., Brugiavini, A., Jürges, H., Mackenbach, J. P., Siegrist, J., & Weber, G. (2005). *Health, ageing and retirement in Europe – First results from the Survey of Health, Ageing and Retirement in Europe*. Mannheim: Mannheim Research Institute for the Economics of Aging (MEA).

Bricard, D., Jusot, F., Trannoy, A., & Tubeuf, S. (forthcoming). Inequality of opportunity in health and the principle of natural reward: Evidence from European countries. *Cahiers de la chaire santé*.

Cohen, G. A. (1989). On the currency of egalitarian justice. *Ethics*, *99*, 906–944.

Crimmins, E., & Cambois, E. (2003). Social inequalities in health expectancy. In J.-M. Robine, C. Jagger, C. Mathers, E. Crimmins, & R. Suzman (Eds.), *Determining health expectancies* (pp. 111–126). Chichester: John Willey & Sons.

Dworkin, R. (1981). What is equality? Part I: Equality of welfare. *Philosophy and Public Affairs* 10, 185–246.

Fleurbaey, M. (1995). Equality and responsibility. *European Economic Review*, *39*, 683–689.

Fleurbaey, M. (2006). Health, equity, and social welfare. *Annales d'Économie et de Statistique*, *83/84*, 21–59.

Fleurbaey, M. (2008). *Fairness, responsibility, and welfare*. Oxford: Oxford University Press.

Fleurbaey, M., & Schokkaert, E. (2009). Unfair inequalities in health and health care. *Journal of Health Economics*, *28*(1), 73–90.

Fleurbaey, M., & Schokkaert, E. (2012). Equity in health and health care. *Handbook of Health Economics*, *2*, 1003–1092.

Garcia Gomez, P., Schokkaert, E., Van Ourti, T., & Bago d'Uva, T. (2012). *Inequity in the face of death*. CORE Discussion Paper No. 2012/24. Louvain-la-Neuve, Université Catholique de Louvain.

Hernandez-Quevedo, C., Jones, A., Lopez, A. N., & Rice, N. (2007). Socio-economic inequalities in health: A comparative longitudinal analysis using the European Community Household Panel. *Social Science and Medicine*, *63*, 1246–1262.

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behaviour*, *38*, 21–37.

Jürges, H. (2007). True health vs response styles: Exploring cross-country differences in self-reported health. *Health Economics*, *16*(2), 163–178.

Jusot, F., Tubeuf, S., & Trannoy, A. (2009). Tel père, tel fils: l'influence de l'origine sociale et familiale sur la santé des descendants en Europe. *Retraite et Société*, *58*(2), 63–85.

Jusot, F., Tubeuf, S., & Trannoy, A. (2010). *Inequality of opportunities in health in Europe: Why so much difference across countries?* HEDG Working Paper No. 10/26. University of York.

Jusot, F., Tubeuf, S., & Trannoy, A. (2013). Circumstances and efforts: How important is their correlation for the measurement of inequality of opportunity in health? *Health Economics*. doi:10.1002/hec.2896

Lefranc, A., Pistolesi, N., & Trannoy, A. (2008). Inequality of opportunities vs inequality of outcomes: Are Western societies all alike? *Review of Income and Wealth*, *54*(4), 513–546.

Lefranc, A., Pistolesi, N., & Trannoy, A. (2009). Equality of opportunity and luck: Definitions and testable conditions, with an application to income in France. *Journal of Public Economics*, *93*(11–12), 1189–1208.

Mackenbach, J. P., Stirbu, I., Roskam, A.-J., & et al. (2008). Socioeconomic inequalities in health in 22 European countries. *The New England Journal of Medicine*, *358*(23), 2468–2481.

Marmot, M., Friel, S., Bell, R., Houweling, T., Taylor, S., & the Commission on Social Determinants of Health (2008). Closing the gap in a generation: Health equity through action on the social determinants of health. *The Lancet*, *372*, 1661–1669.

Masseria, C., Mossalios, E., & Allin, S. (2006). *Measurement of socioeconomic inequality of health in 10 European countries: An exploratory analysis of SHARE using three approaches*. European Commission – Research Note, LSE.

NICE. (2006). *Obesity guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children*. NICE clinical guideline 43. Retrieved from http://www.nice.org.uk/CG043

Roemer, J. (1998). *Equality of opportunity*. Cambridge: Harvard University Press.

Rosa-Dias, P. (2009). Inequality of opportunity in health: Evidence from the UK cohort study. *Health Economics*, *18*(9), 1057–1074.

Rosa-Dias, P. (2010). Modelling opportunity in health under partial observability of circumstances. *Health Economics*, *19*(3), 252–264.

Rosa-Dias, P., & Jones, A. (2007). Giving equality of opportunity a fair innings. *Health Economics*, *16*, 109–112.

Sen, A. K. (2002). Why health equity? *Health Economics*, *11*, 659–666.

Shorrocks, A. F. (1982). Inequality decomposition by factor components. *Econometrica*, *50*(1), 193–211.

Trannoy, A., Tubeuf, S., Jusot, F., & Devaux, M. (2010). Inequality of opportunities in health in France: A first pass. *Health Economics*, *19*(8), 921–938.

Tubeuf, S., & Jusot, F. (2011). Social health inequalities among older Europeans: The contribution of social and family background. *European Journal of Health Economics*, *12*(1), 61–77.

Tubeuf, S., Jusot, F., & Bricard, D. (2012). Mediating role of education and lifestyles in the relationship between early-life conditions and health: Evidence from the 1958 British cohort. *Health Economics*, *21*(Suppl. S1), 129–150.

van Doorslaer, E., & Koolman, X. (2004). Explaining the differences in income-related health inequalities across European countries. *Health Economics*, *13*(7), 609–628.

APPENDIX

Table A1. Regressions Coefficients of Auxiliary Equations at the European Level (with Bootstrapped Standard Errors).

	Smoking		Obesity		Sedentarity	
Main breadwinner (ref: Elementary occupations and unskilled workers)						
Senior managers and professionals	0.008	(0.013)	−0.055***	(0.013)	−0.001	(0.009)
Technicians, associate professionals and armed forces	−0.002	(0.014)	−0.034**	(0.013)	−0.007	(0.009)
Office clerks, service workers and sales workers	0.015	(0.011)	−0.027***	(0.010)	−0.003	(0.007)
Skilled agricultural and fishery workers	−0.019**	(0.009)	−0.029***	(0.008)	−0.009	(0.006)
Craftsmen and skilled workers	0.009	(0.009)	−0.020**	(0.009)	0.001	(0.006)
No main breadwinner	−0.009	(0.023)	0.003	(0.022)	0.005	(0.016)
Number of books at home (ref: None or very few (0−10 books))						
Enough to fill one shelf (11−25 books)	−0.012	(0.008)	−0.013*	(0.007)	−0.023***	(0.005)
Enough to fill one bookcase (26−100 books)	−0.015*	(0.009)	−0.020**	(0.008)	−0.037***	(0.006)
Enough to fill two or more bookcases (more than 100 books)	0.005	(0.011)	−0.018*	(0.011)	−0.030***	(0.008)
Number of room/household member	−0.020***	(0.007)	−0.035***	(0.007)	−0.027***	(0.005)
Number of facilities (ref: None)						
One	0.002	(0.009)	−0.018**	(0.008)	−0.040***	(0.006)
Two or three	0.036***	(0.008)	−0.034***	(0.008)	−0.022***	(0.006)
Four or five	0.056***	(0.010)	−0.052***	(0.010)	−0.026***	(0.007)
Period of difficulties during childhood						
Economic hardships	−0.025	(0.019)	−0.020	(0.018)	0.029**	(0.013)
Hunger	−0.071***	(0.012)	−0.003	(0.012)	0.024***	(0.008)
Mother's longevity (ref: mother prematurely deceased)						
Mother deceased in later ages	−0.028***	(0.007)	−0.018***	(0.006)	−0.007	(0.005)
Mother alive	0.040***	(0.007)	−0.031***	(0.007)	−0.021***	(0.005)
Father's longevity (ref: father prematurely deceased)						
Father deceased in later ages	−0.036***	(0.006)	−0.016***	(0.006)	−0.011**	(0.004)
Father alive	−0.013	(0.010)	−0.021**	(0.010)	−0.023***	(0.007)
Parents' health-related behaviours						
No regular dentist visits for their children	0.027***	(0.006)	0.006	(0.006)	0.019***	(0.004)

Table A1. (*Continued*)

	Smoking		Obesity		Sedentarity	
Parents' smoking	0.075***	(0.006)	−0.006	(0.006)	−0.007*	(0.004)
Parents' alcohol consumption	0.043***	(0.010)	0.029***	(0.010)	0.000	(0.007)
Constant	0.164***	(0.012)	0.296***	(0.012)	0.154***	(0.008)
Obs	20946		20946		20946	
R^2	0.024		0.015		0.019	

Standard errors in parenthesis and significance levels of test of rejecting the hypothesis of the nullity of the coefficient from 1,000 bootstrapped replications: ***1%, **5%, *10%.

Table A2. Regressions Coefficients of the Probability of Reporting Good Health Status from Barry and Roemer Scenario Across European Countries (with Bootstrapped Standard Errors).

	Austria (AT)				Germany (DE)				Sweden (SW)				Netherlands (NL)			
Sex (ref : Female)	Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification	
Male	−0.014	(0.038)	−0.014	(0.039)	0.001	(0.024)	0.001	(0.025)	0.060**	(0.027)	0.060**	(0.025)	−0.018	(0.022)	−0.018	(0.021)
Age (ref : 50−54)																
55−59	−0.049	(0.089)	−0.049	(0.090)	0.050	(0.047)	0.050	(0.047)	−0.127**	(0.057)	−0.127**	(0.059)	0.105**	(0.041)	0.105**	(0.042)
60−64	−0.131	(0.088)	−0.131	(0.089)	−0.002	(0.051)	−0.002	(0.053)	−0.145**	(0.058)	−0.145**	(0.058)	0.094**	(0.042)	0.094**	(0.043)
65−69	−0.112	(0.089)	−0.112	(0.093)	−0.008	(0.053)	−0.008	(0.056)	−0.109*	(0.061)	−0.109*	(0.062)	0.016	(0.048)	0.016	(0.048)
70−74	−0.145	(0.092)	−0.145	(0.097)	−0.028	(0.057)	−0.028	(0.060)	−0.151**	(0.066)	−0.151**	(0.068)	0.052	(0.053)	0.052	(0.055)
75−80	−0.266***	(0.098)	−0.266***	(0.097)	−0.110*	(0.060)	−0.110*	(0.062)	−0.215***	(0.070)	−0.215***	(0.073)	0.025	(0.055)	0.025	(0.055)
Main breadwinner (ref : Elementary occupations and unskilled workers)																
Senior managers and professionals	0.200**	(0.085)	0.218**	(0.090)	0.081	(0.064)	0.123**	(0.063)	−0.018	(0.060)	0.004	(0.062)	0.064	(0.046)	0.077	(0.048)
Technicians, associate professionals and armed forces	0.178*	(0.097)	0.198**	(0.098)	−0.040	(0.062)	−0.015	(0.063)	0.037	(0.065)	0.067	(0.064)	0.045	(0.049)	0.049	(0.053)
Office clerks, service workers and sales workers	0.139*	(0.073)	0.139*	(0.071)	0.095*	(0.052)	0.125**	(0.054)	−0.073	(0.057)	−0.045	(0.058)	0.021	(0.047)	0.035	(0.047)
Skilled agricultural and fishery workers	0.013	(0.065)	0.011	(0.070)	−0.004	(0.052)	0.017	(0.054)	−0.025	(0.052)	0.003	(0.053)	0.082*	(0.044)	0.101**	(0.044)
Craftsmen and skilled workers	0.030	(0.062)	0.046	(0.063)	0.015	(0.047)	0.037	(0.048)	0.020	(0.049)	0.037	(0.051)	0.020	(0.039)	0.023	(0.040)
No main breadwinner	0.034	(0.103)	0.044	(0.103)	0.127	(0.078)	0.138*	(0.080)	0.076	(0.120)	0.081	(0.139)	−0.038	(0.087)	−0.027	(0.092)
Number of books at home (ref: None or very few (0−10 books))																
Enough to fill one shelf (11−25 books)	0.135***	(0.048)	0.126***	(0.047)	−0.037	(0.034)	−0.027	(0.035)	0.084*	(0.046)	0.083*	(0.045)	0.067**	(0.029)	0.082***	(0.029)
Enough to fill one bookcase (26−100 books)	0.157***	(0.054)	0.142**	(0.059)	−0.017	(0.036)	−0.000	(0.037)	0.106**	(0.045)	0.123***	(0.045)	0.061**	(0.030)	0.083***	(0.032)
Enough to fill two or more bookcases (more than 100 books)	0.052	(0.087)	0.039	(0.090)	0.037	(0.044)	0.046	(0.045)	0.102**	(0.050)	0.110**	(0.051)	−0.039	(0.038)	−0.026	(0.041)
Number of room/household member	−0.016	(0.044)	−0.022	(0.045)	0.020	(0.035)	0.024	(0.035)	0.029	(0.030)	0.028	(0.032)	0.030	(0.033)	0.027	(0.033)
Number of facilities (ref: None)																
One	−0.002	(0.055)	0.029	(0.054)	0.110***	(0.041)	0.111***	(0.041)	0.109*	(0.056)	0.095*	(0.055)	0.023	(0.056)	0.030	(0.065)
Two or three	0.060	(0.055)	0.095*	(0.055)	0.116***	(0.041)	0.126***	(0.041)	0.127**	(0.060)	0.130**	(0.062)	0.041	(0.055)	0.048	(0.062)
Four or five	0.024	(0.063)	0.036	(0.065)	0.182***	(0.046)	0.185***	(0.048)	0.122**	(0.053)	0.119**	(0.054)	0.048	(0.065)	0.061	(0.070)
Period of difficulties during childhood																
Economic hardships	0.118	(0.090)	0.111	(0.088)	−0.132*	(0.077)	−0.134*	(0.079)	0.044	(0.140)	0.023	(0.150)	0.007	(0.133)	−0.029	(0.172)
Hunger	0.077	(0.079)	0.072	(0.078)	−0.073*	(0.038)	−0.067*	(0.039)	−0.017	(0.133)	0.033	(0.135)	−0.049	(0.051)	−0.030	(0.051)

Table A2. (*Continued*)

Sex (ref : Female)	Austria (AT)				Germany (DE)				Sweden (SW)				Netherlands (NL)			
	Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification	
Mother's longevity (ref: mother prematurely deceased)																
Mother deceased in later ages	0.047	(0.043)	0.043	(0.044)	0.044	(0.028)	0.059**	(0.029)	0.032	(0.033)	0.043	(0.032)	0.050*	(0.026)	0.064**	(0.025)
Mother alive	0.048	(0.058)	0.059	(0.061)	0.028	(0.034)	0.043	(0.035)	0.015	(0.035)	0.009	(0.035)	0.055*	(0.029)	0.064**	(0.029)
Father's longevity (ref: father prematurely deceased)																
Father deceased in later ages	0.054	(0.042)	0.062	(0.041)	0.035	(0.026)	0.057**	(0.028)	0.033	(0.028)	0.036	(0.028)	0.044*	(0.024)	0.051**	(0.024)
Father alive	0.134*	(0.074)	0.128	(0.080)	0.066	(0.045)	0.088*	(0.047)	0.059	(0.045)	0.050	(0.045)	0.084**	(0.038)	0.098**	(0.037)
Parents' health-related behaviours																
No regular dentist visits for their children	−0.019	(0.041)	−0.016	(0.042)	−0.002	(0.026)	0.003	(0.027)	−0.048	(0.046)	−0.058	(0.048)	0.022	(0.027)	0.016	(0.027)
Parents' smoking	−0.008	(0.039)	−0.028	(0.037)	0.020	(0.025)	0.019	(0.026)	0.011	(0.027)	0.012	(0.027)	−0.032	(0.030)	−0.044	(0.031)
Parents' alcohol consumption	−0.117*	(0.067)	−0.162**	(0.067)	−0.029	(0.046)	−0.072	(0.045)	−0.054	(0.048)	−0.054	(0.050)	0.046	(0.050)	0.020	(0.053)
Lifestyles variables/residuals																
Smoking	0.010	(0.049)	0.010	(0.051)	−0.137***	(0.033)	−0.137***	(0.033)	−0.127***	(0.039)	−0.127***	(0.036)	−0.101***	(0.028)	−0.101***	(0.027)
Obesity	−0.242***	(0.045)	−0.242***	(0.046)	−0.256***	(0.031)	−0.256***	(0.031)	−0.182***	(0.041)	−0.182***	(0.041)	−0.207***	(0.033)	−0.207***	(0.035)
Sedentarity	−0.097	(0.059)	−0.097	(0.061)	−0.234***	(0.051)	−0.234***	(0.051)	−0.206**	(0.086)	−0.206**	(0.091)	−0.211***	(0.046)	−0.211***	(0.049)
R^2	0.169		0.169		0.130		0.130		0.096		0.096		0.087		0.087	

Sex (ref : Female)	Spain (SP)				Italy (IT)				France (FR)			
	Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification	
Male	0.103***	(0.027)	0.103***	(0.026)	0.100***	(0.021)	0.100***	(0.021)	0.034	(0.022)	0.034	(0.021)
Age (ref : 50−54)												
55−59	−0.019	(0.049)	−0.019	(0.047)	−0.026	(0.041)	−0.026	(0.043)	−0.041	(0.039)	−0.041	(0.039)
60−64	−0.125**	(0.051)	−0.125**	(0.050)	−0.103**	(0.043)	−0.103**	(0.043)	0.002	(0.041)	0.002	(0.041)
65−69	−0.056	(0.055)	−0.056	(0.052)	−0.154***	(0.046)	−0.154***	(0.044)	−0.115**	(0.046)	−0.115**	(0.046)
70−74	−0.103*	(0.055)	−0.103*	(0.055)	−0.230***	(0.049)	−0.230***	(0.048)	−0.173***	(0.047)	−0.173***	(0.050)
75−80	−0.197***	(0.058)	−0.197***	(0.055)	−0.305***	(0.051)	−0.305***	(0.051)	−0.253***	(0.048)	−0.253***	(0.049)
Main breadwinner (ref : Elementary occupations and unskilled workers)												
Senior managers and professionals	−0.006	(0.084)	−0.001	(0.084)	0.093	(0.058)	0.082	(0.061)	0.031	(0.045)	0.036	(0.047)
Technicians, associate professionals and armed forces	−0.012	(0.069)	0.003	(0.067)	−0.001	(0.056)	−0.001	(0.056)	−0.015	(0.048)	−0.005	(0.048)

Office clerks, service workers and sales workers	−0.033	(0.046)	−0.031	(0.047)	0.048	(0.036)	0.025	(0.038)	−0.050	(0.042)	−0.053	(0.042)
Skilled agricultural and fishery workers	0.006	(0.033)	0.012	(0.032)	0.015	(0.026)	0.016	(0.026)	−0.011	(0.034)	0.004	(0.035)
Craftsmen and skilled workers	−0.010	(0.038)	−0.008	(0.037)	0.063**	(0.032)	0.061*	(0.033)	−0.062*	(0.034)	−0.060*	(0.035)
No main breadwinner	0.001	(0.134)	0.011	(0.137)	0.053	(0.112)	0.051	(0.107)	0.011	(0.130)	−0.018	(0.139)
Number of books at home (ref: None or very few (0−10 books))												
Enough to fill one shelf (11−25 books)	0.087**	(0.035)	0.085**	(0.035)	0.082**	(0.033)	0.103***	(0.033)	0.045	(0.030)	0.054*	(0.031)
Enough to fill one bookcase (26−100 books)	0.079	(0.049)	0.087*	(0.048)	0.027	(0.043)	0.048	(0.042)	0.093***	(0.032)	0.108***	(0.035)
Enough to fill two or more bookcases (more than 100 books)	0.143**	(0.061)	0.151**	(0.061)	0.106*	(0.056)	0.131**	(0.057)	0.094**	(0.041)	0.102**	(0.041)
Number of room/household member	0.047	(0.030)	0.057*	(0.031)	0.051	(0.040)	0.070	(0.043)	0.036	(0.030)	0.039	(0.031)
Number of facilities (ref: None)												
One	0.016	(0.035)	0.024	(0.036)	−0.001	(0.031)	0.004	(0.031)	0.026	(0.036)	0.022	(0.036)
Two or three	0.065*	(0.035)	0.073**	(0.036)	0.013	(0.028)	0.005	(0.029)	0.077**	(0.037)	0.076**	(0.038)
Four or five	0.083	(0.054)	0.089*	(0.054)	0.043	(0.040)	0.038	(0.039)	0.065	(0.041)	0.059	(0.042)
Period of difficulties during childhood												
Economic hardships	−0.014	(0.061)	−0.019	(0.061)	−0.127***	(0.049)	−0.146***	(0.052)	−0.194**	(0.084)	−0.175**	(0.077)
Hunger	0.002	(0.042)	−0.001	(0.042)	−0.076*	(0.042)	−0.072*	(0.040)	−0.020	(0.048)	−0.028	(0.048)
Mother's longevity (ref: mother prematurely deceased)												
Mother deceased in later ages	0.008	(0.029)	0.014	(0.029)	0.027	(0.024)	0.034	(0.024)	0.056**	(0.028)	0.062**	(0.028)
Mother alive	0.083**	(0.039)	0.091**	(0.037)	0.005	(0.030)	0.021	(0.029)	0.052*	(0.029)	0.052*	(0.029)
Father's longevity (ref: father prematurely deceased)												
Father deceased in later ages	0.035	(0.027)	0.035	(0.026)	0.030	(0.021)	0.038*	(0.021)	0.049*	(0.026)	0.059**	(0.026)
Father alive	−0.011	(0.052)	−0.006	(0.050)	0.002	(0.040)	0.011	(0.041)	0.058*	(0.034)	0.071**	(0.035)
Parents' health-related behaviours												
No regular dentist visits for their children	−0.021	(0.043)	−0.034	(0.040)	−0.037	(0.029)	−0.049*	(0.028)	−0.042*	(0.024)	−0.047*	(0.025)
Parents' smoking	−0.039	(0.027)	−0.040	(0.027)	−0.027	(0.021)	−0.029	(0.022)	−0.007	(0.023)	−0.001	(0.022)
Parents' alcohol consumption	−0.148***	(0.044)	−0.151***	(0.046)	0.011	(0.033)	0.013	(0.035)	−0.065*	(0.038)	−0.063*	(0.036)
Lifestyles variables/residuals												
Smoking	0.009	(0.036)	0.009	(0.038)	−0.025	(0.026)	−0.025	(0.028)	−0.091***	(0.031)	−0.091***	(0.031)
Obesity	−0.114***	(0.028)	−0.114***	(0.029)	−0.090***	(0.027)	−0.090***	(0.027)	−0.124***	(0.031)	−0.124***	(0.032)
Sedentarity	−0.116***	(0.039)	−0.116***	(0.038)	−0.256***	(0.027)	−0.256***	(0.027)	−0.184***	(0.038)	−0.184***	(0.040)
R^2	0.116		0.116		0.147		0.147		0.139		0.139	

Table A2. *(Continued)*

Sex (ref : Female)	Danemark (DK)				Greece (GR)				Switzerland (CH)			
	Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification	
Male	0.039*	(0.020)	0.039*	(0.021)	0.074***	(0.017)	0.074***	(0.018)	0.031	(0.025)	0.031	(0.025)
Age (ref : 50–54)												
55–59	−0.022	(0.031)	−0.022	(0.032)	−0.053**	(0.024)	−0.053**	(0.024)	−0.033	(0.038)	−0.033	(0.038)
60–64	0.010	(0.035)	0.010	(0.035)	−0.121***	(0.029)	−0.121***	(0.029)	−0.045	(0.042)	−0.045	(0.043)
65–69	−0.031	(0.039)	−0.031	(0.042)	−0.174***	(0.032)	−0.174***	(0.032)	−0.026	(0.045)	−0.026	(0.046)
70–74	−0.046	(0.047)	−0.046	(0.047)	−0.293***	(0.035)	−0.293***	(0.035)	−0.086*	(0.050)	−0.086*	(0.050)
75–80	−0.137***	(0.049)	−0.137***	(0.050)	−0.409***	(0.036)	−0.409***	(0.037)	−0.212***	(0.054)	−0.212***	(0.053)
Main breadwinner (ref : Elementary occupations and unskilled workers)												
Senior managers and professionals	0.054	(0.040)	0.059	(0.043)	−0.017	(0.041)	−0.015	(0.043)	0.022	(0.060)	0.027	(0.063)
Technicians, associate professionals and armed forces	0.057	(0.054)	0.058	(0.054)	−0.057	(0.051)	−0.048	(0.053)	−0.067	(0.069)	−0.057	(0.068)
Office clerks, service workers and sales workers	0.008	(0.038)	0.018	(0.039)	−0.050*	(0.029)	−0.043	(0.029)	0.022	(0.052)	0.022	(0.052)
Skilled agricultural and fishery workers	0.047	(0.032)	0.077**	(0.034)	−0.117***	(0.026)	−0.121***	(0.025)	0.013	(0.054)	0.011	(0.054)
Craftsmen and skilled workers	0.002	(0.034)	0.014	(0.036)	−0.054*	(0.030)	−0.048	(0.030)	−0.023	(0.049)	−0.022	(0.051)
No main breadwinner	0.016	(0.190)	0.003	(0.199)	−0.051	(0.070)	−0.058	(0.074)	0.151	(0.113)	0.128	(0.110)
Number of books at home (ref: None or very few (0–10 books))												
Enough to fill one shelf (11–25 books)	0.107***	(0.036)	0.111***	(0.035)	0.001	(0.022)	0.002	(0.021)	−0.003	(0.037)	−0.002	(0.037)
Enough to fill one bookcase (26–100 books)	0.112***	(0.034)	0.115***	(0.034)	0.001	(0.030)	0.002	(0.030)	0.012	(0.035)	0.014	(0.035)
Enough to fill two or more bookcases (more than 100 books)	0.069*	(0.037)	0.072*	(0.037)	−0.015	(0.055)	−0.019	(0.056)	−0.010	(0.041)	0.002	(0.041)
Number of room/household member	0.040	(0.026)	0.048*	(0.026)	0.094***	(0.036)	0.099***	(0.038)	−0.016	(0.037)	−0.034	(0.038)
Number of facilities (ref: None)												
One	0.003	(0.045)	0.021	(0.045)	−0.014	(0.021)	−0.015	(0.020)	0.042	(0.075)	0.050	(0.077)
Two or three	−0.014	(0.045)	0.003	(0.047)	−0.040*	(0.024)	−0.040*	(0.023)	0.099	(0.073)	0.115	(0.074)
Four or five	0.029	(0.045)	0.044	(0.048)	−0.045	(0.034)	−0.048	(0.034)	0.150**	(0.074)	0.159**	(0.074)
Period of difficulties during childhood												
Economic hardships	−0.274**	(0.133)	−0.267**	(0.131)	−0.101**	(0.045)	−0.105**	(0.046)	0.081	(0.092)	0.100	(0.099)
Hunger	−0.129	(0.173)	−0.190	(0.161)	−0.123***	(0.044)	−0.129***	(0.043)	−0.089	(0.086)	−0.118	(0.096)
Mother's longevity (ref: mother prematurely deceased)												
Mother deceased in later ages	0.028	(0.025)	0.030	(0.026)	−0.002	(0.022)	−0.007	(0.021)	−0.023	(0.030)	−0.024	(0.031)
Mother alive	0.032	(0.027)	0.041	(0.028)	0.012	(0.021)	0.016	(0.022)	−0.050	(0.031)	−0.045	(0.033)
Father's longevity (ref: father prematurely deceased)												
Father deceased in later ages	0.055**	(0.023)	0.063***	(0.024)	0.031*	(0.018)	0.032*	(0.019)	0.012	(0.028)	0.018	(0.029)
Father alive	0.093***	(0.032)	0.089***	(0.032)	0.051**	(0.024)	0.056**	(0.023)	0.005	(0.040)	0.013	(0.039)

Parents' health-related behaviours												
No regular dentist visits for their children	−0.081***	(0.028)	−0.094***	(0.029)	−0.040**	(0.019)	−0.041**	(0.020)	−0.038	(0.031)	−0.027	(0.032)
Parents' smoking	−0.011	(0.028)	−0.023	(0.029)	−0.037**	(0.018)	−0.036**	(0.016)	0.010	(0.027)	0.005	(0.026)
Parents' alcohol consumption	−0.028	(0.038)	−0.041	(0.039)	−0.090**	(0.038)	−0.093**	(0.037)	−0.009	(0.043)	−0.021	(0.046)
Lifestyles variables/residuals												
Smoking	−0.122***	(0.025)	−0.122***	(0.025)	0.042**	(0.017)	0.042**	(0.018)	−0.109***	(0.035)	−0.109***	(0.034)
Obesity	−0.036	(0.033)	−0.036	(0.032)	−0.085***	(0.022)	−0.085***	(0.022)	−0.120***	(0.043)	−0.120***	(0.043)
Sedentarity	−0.380***	(0.056)	−0.380***	(0.056)	−0.115***	(0.039)	−0.115***	(0.039)	−0.278***	(0.082)	−0.278***	(0.083)
R^2	0.129		0.129		0.186		0.186		0.095		0.095	

	Belgium (BE)				Czech Republic (CZ)				Poland (PL)			
Sex (ref : Female)	Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification	
Male	0.055***	(0.019)	0.055***	(0.019)	0.007	(0.026)	0.007	(0.024)	0.004	(0.025)	0.004	(0.025)
Age (ref : 50–54)												
55–59	−0.043	(0.032)	−0.043	(0.033)	−0.086**	(0.041)	−0.086**	(0.041)	−0.066	(0.044)	−0.066	(0.043)
60–64	−0.079**	(0.033)	−0.079**	(0.036)	−0.086*	(0.044)	−0.086**	(0.043)	−0.167***	(0.047)	−0.167***	(0.046)
65–69	−0.138***	(0.038)	−0.138***	(0.041)	−0.106**	(0.048)	−0.106**	(0.048)	−0.213***	(0.052)	−0.213***	(0.052)
70–74	−0.134***	(0.039)	−0.134***	(0.040)	−0.158***	(0.054)	−0.158***	(0.053)	−0.259***	(0.055)	−0.259***	(0.053)
75–80	−0.170***	(0.042)	−0.170***	(0.043)	−0.276***	(0.057)	−0.276***	(0.055)	−0.254***	(0.058)	−0.254***	(0.056)
Main breadwinner (ref : Elementary occupations and unskilled workers)												
Senior managers and professionals	0.007	(0.038)	0.024	(0.042)	0.257***	(0.072)	0.269***	(0.073)	0.155*	(0.081)	0.165**	(0.083)
Technicians, associate professionals and armed forces	0.012	(0.038)	0.014	(0.042)	0.147**	(0.063)	0.154**	(0.064)	0.049	(0.083)	0.069	(0.079)
Office clerks, service workers and sales workers	−0.012	(0.033)	−0.014	(0.035)	0.183***	(0.059)	0.186***	(0.058)	0.078	(0.072)	0.100	(0.069)
Skilled agricultural and fishery workers	0.059**	(0.029)	0.071**	(0.030)	0.055	(0.053)	0.058	(0.057)	0.049	(0.043)	0.053	(0.044)
Craftsmen and skilled workers	0.036	(0.026)	0.029	(0.027)	0.076	(0.048)	0.077	(0.051)	0.075	(0.047)	0.083*	(0.046)
No main breadwinner	−0.072	(0.071)	−0.075	(0.073)	0.157	(0.103)	0.159	(0.106)	0.011	(0.205)	0.069	(0.208)
Number of books at home (ref: None or very few (0–10 books))												
Enough to fill one shelf (11–25 books)	0.044*	(0.026)	0.059**	(0.026)	0.029	(0.042)	0.034	(0.042)	0.037	(0.034)	0.042	(0.033)
Enough to fill one bookcase (26–100 books)	0.067***	(0.026)	0.090***	(0.027)	0.083*	(0.042)	0.085*	(0.044)	−0.043	(0.042)	−0.039	(0.042)
Enough to fill two or more bookcases (more than 100 books)	0.095***	(0.034)	0.109***	(0.035)	0.021	(0.053)	0.024	(0.052)	0.031	(0.063)	0.036	(0.062)
Number of room/household member	−0.009	(0.020)	−0.006	(0.021)	0.070	(0.049)	0.080	(0.050)	−0.028	(0.054)	−0.025	(0.055)

Table A2. *(Continued)*

Sex (ref : Female)	Belgium (BE)				Czech Republic (CZ)				Poland (PL)			
	Barry specification		Roemer specification		Barry specification		Roemer specification		Barry specification		Roemer specification	
Number of facilities (ref: None)												
One	−0.063**	(0.027)	−0.069**	(0.028)	−0.058	(0.045)	−0.063	(0.046)	0.005	(0.051)	0.017	(0.051)
Two or three	−0.010	(0.029)	−0.017	(0.029)	−0.043	(0.039)	−0.054	(0.039)	0.008	(0.046)	0.016	(0.047)
Four or five	−0.044	(0.034)	−0.056*	(0.035)	−0.035	(0.043)	−0.041	(0.046)	0.088	(0.062)	0.085	(0.060)
Period of difficulties during childhood												
Economic hardships	−0.298***	(0.110)	−0.358***	(0.105)	0.162	(0.156)	0.177	(0.151)	−0.063	(0.082)	−0.077	(0.083)
Hunger	−0.088	(0.055)	−0.088	(0.054)	−0.172	(0.128)	−0.148	(0.126)	−0.040	(0.047)	−0.043	(0.048)
Mother's longevity (ref: mother prematurely deceased)												
Mother deceased in later ages	−0.001	(0.022)	0.003	(0.023)	0.012	(0.030)	0.015	(0.029)	−0.026	(0.027)	−0.022	(0.027)
Mother alive	−0.007	(0.025)	−0.003	(0.027)	0.044	(0.035)	0.056	(0.034)	0.010	(0.037)	0.019	(0.038)
Father's longevity (ref: father prematurely deceased)												
Father deceased in later ages	0.038**	(0.019)	0.050**	(0.020)	0.023	(0.027)	0.027	(0.027)	−0.024	(0.025)	−0.023	(0.025)
Father alive	−0.025	(0.034)	−0.015	(0.036)	0.031	(0.048)	0.039	(0.049)	0.041	(0.059)	0.061	(0.058)
Parents' health-related behaviours												
No regular dentist visits for their children	−0.024	(0.020)	−0.033	(0.021)	−0.062	(0.043)	−0.070*	(0.039)	−0.041	(0.028)	−0.048*	(0.029)
Parents' smoking	−0.002	(0.021)	−0.005	(0.021)	−0.060**	(0.026)	−0.063**	(0.025)	−0.052**	(0.026)	−0.045*	(0.026)
Parents' alcohol consumption	−0.111***	(0.034)	−0.123***	(0.035)	−0.047	(0.057)	−0.042	(0.056)	−0.086**	(0.041)	−0.081*	(0.045)
Lifestyles variables/residuals												
Smoking	−0.135***	(0.027)	−0.135***	(0.027)	−0.016	(0.032)	−0.016	(0.031)	−0.027	(0.030)	−0.027	(0.030)
Obesity	−0.151***	(0.026)	−0.151***	(0.026)	−0.066**	(0.029)	−0.066**	(0.029)	−0.073***	(0.027)	−0.073***	(0.026)
Sedentarity	−0.334***	(0.040)	−0.334***	(0.039)	−0.131***	(0.040)	−0.131***	(0.043)	−0.140***	(0.030)	−0.140***	(0.031)
R^2	0.120		0.120		0.096		0.096		0.108		0.108	