Disability costs and equivalence scales in the older population

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Outline

Motivations

- Significant additional costs associated with disability.
- Social security benefits designed to compensate for consumption costs associated with disability.
- Distributive analysis should make some allowance for the additional living costs induced by disability by:
  1. disregarding disability benefits from the income indicator;
  2. identifying (in)directly the extra costs induced by disability.

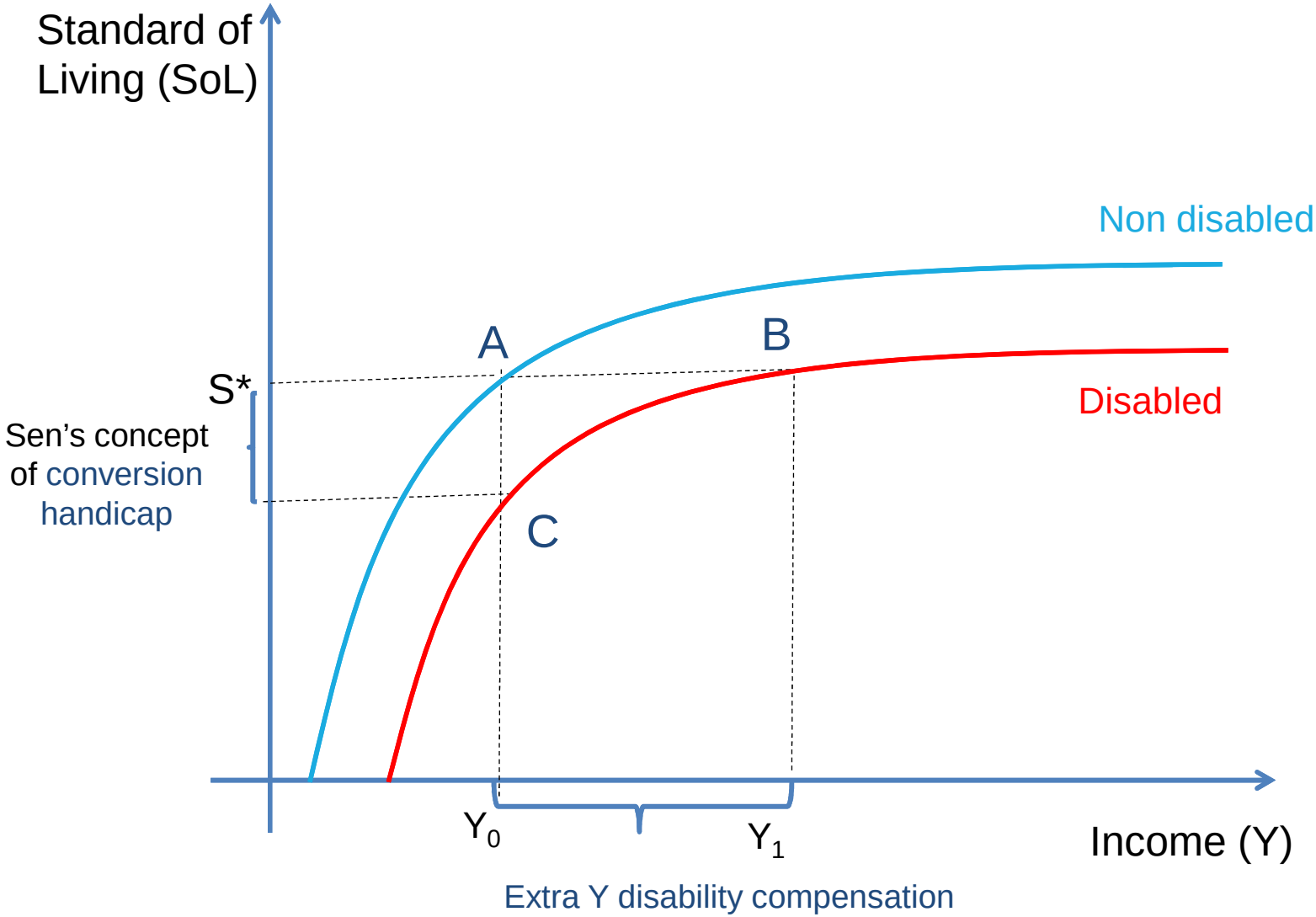
Quantify The Monetary Costs Associated With Disability

Different approaches have been proposed:

- DIRECT APPROACHES: asking disabled people to identify the costs they face as a direct consequence of their disability *(Martin and White, 1988; Thompson et al., 1990)*;
- INDIRECT APPROACHES: comparing the living standards of disabled *vs* non disabled people, ceteris paribus and developing disability-specific equivalence scales[1].
  - Pragmatic approach;
  - Objective approach *(Jones and O'Donell, 1995 for the UK)*;
  - Subjective approach *(Stewart, 2009 for the UK)*;
  - Standard of Living approach *(Berthoud et al., 1993; Zaidi and Burchardt, 2005 for the UK)*.

[1] A vector of coefficients which standardize heterogeneities in non-income dimensions of one's living standards according a reference category

The Standard of Living (SoL) approach



The Standard of Living (SoL) approach

$$S = f(Y) - g(D) + h(X, \varepsilon)$$

What additional income Δ would a person with disability D and income Y require to become as well-off as he or she would be with disability reduced to the reference level D_0?

$$min\ \Delta\ subject to: f(Y+\Delta) - g(D) = f(Y) - g(D_0)$$

Δ and the associated proportional equivalence scale $\sigma = \frac{Y+\Delta}{Y}$ depend on the levels of both Y and D.

- if $f(Y) = \gamma_1 Y$ then $\sigma = [g(D) - g(D_0)]$
- if $f(Y) = \gamma_1 ln(Y)$ then $\sigma = exp[g(D) - g(D_0)]$
- if $f(Y) = \gamma_1 ln(Y) + \gamma_2 [ln(Y)]^2$ then $\sigma = Y^{-1} exp\left[\frac{-\gamma_1 - \sqrt{\gamma_1^2 - 4\gamma_2 C}}{2\gamma_2}\right]$

How measuring S, D and Y ?

- Estimates depend "crucially on the choice of a suitable S indicator and its elasticity with respect to income and disability status" *(Zaidi and Burchardt, 2005 pg. 122)*;
- Disability is a multidimensional phenomenon *(Manton et al., 2000)*; Set of (self-reported) indicators used in the analysis matters *(Van Brakel and Officer, 2008)*;
- Income definition in use matters *(Stapleton et al., 2008)*.

A two-latent variable structural equation framework

$$S_{iq} = 1(\lambda_q \varphi_i + \zeta_i q)$$

$$D_{ik} = 1(\mu_k \eta_i + \xi_i k)$$

$$\eta_i = \beta z_i + \varepsilon_{2i}$$

$$\varphi_i = f(Y_i; \gamma) + \alpha_1 \eta_i + \alpha_2 x_i + \varepsilon_{1i}$$

2007-08 Family Resource Survey (FRS)

- produced by the Department for Work and Pensions in UK;
- Collects detailed information on:
  - income;
  - difficulty in domain of life (disability);
  - Household deprivation ("can't afford" or "don't have" a set of 'necessities').

Sample selection: Households of pensioners in the Great Britain (8,183 individuals).

SoL indicators

Sample means, Factor loadings λ_q and squared correlations of SoL indicators with φ

Indicator(s):	Sample mean (SD)	Factor Loading	R^2
enough money to keep your home in a decent state of decoration	*0.083 (0.276)*	1.229***	*0.710*
hobby or leisure activity	*0.036 (0.187)*	0.86***	*0.545*
holidays away from home one week a year	*0.162 (0.368)*	1.139***	*0.677*
household contents insurance	*0.049 (0.217)*	0.864***	*0.547*
friends/family round for drink or meal at least once a month	*0.068 (0.252)*	0.972***	*0.604*
make savings of £10 a month or more	*0.214 (0.41)*	1.001***	*0.618*
two pairs of all weather shoes for each person in the HH	*0.022 (0.146)*	0.895***	*0.564*
replace any worn out furniture	*0.153 (0.36)*	1.789***	*0.838*
replace or repair broken electrical goods such as fridge, washing machine	*0.104 (0.306)*	1.615***	*0.809*
money to spend each week on yourself, not on your family	*0.079 (0.27)*	1.08***	*0.654*

Significance: * = 10%; ** = 5%; *** = 1%; R^2 is the squared correlation between *Sq* (*Can afford to do/have things or goods indicators*) and φ. Estimates are obtained using the quadratic in ln(Y) model specification over a sample of 8,183 FRS 2007-8 respondents.

Disability indicators

Sample means, Factor loadings μ_k and squared correlations of SoL indicators with η

Indicator(s):	Sample mean (SD)	Factor Loading	R^2
difficulty in mobility (moving about)	*0.327 (0.469)*	2.138***	*0.840*
difficulty with lifting, carrying or moving objects	*0.301 (0.459)*	2.435***	*0.872*
difficulty with manual dexterity using hands for daily tasks	*0.12 (0.325)*	1.327***	*0.669*
difficulty - continence (bladder/bowel control)	*0.071 (0.256)*	0.766***	*0.402*
difficulty with communication (speech, hearing or eyesight)	*0.089 (0.285)*	0.656***	*0.330*
difficulty with memory/concentration/learning/understanding	*0.063 (0.242)*	0.813***	*0.431*
difficulty with recognising when in physical danger	*0.013 (0.114)*	0.737***	*0.384*
difficulty with your physical co-ordination	*0.109 (0.312)*	1.382***	*0.686*
difficulty in other area of life	*0.123 (0.328)*	0.465***	*0.198*

Significance: * = 10%; ** = 5%; *** = 1%; R^2 is the squared correlation between D_k and η. Estimates in the table are obtained using the quadratic in ln(Y) model specification over a sample of 8,183 FRS 2007-8 respondents.

The disability equation

Structural parameters

Covariate(s):	Coeff.	S.E.
Spline age 73	0.033***	*0.002*
Spline age 73 and over	0.033***	*0.003*
Female	-0.005	*0.028*
Post-compulsory schooling	-0.036***	*0.009*
(ln) pre-disability benefit income	-0.114***	*0.028*
Home ownership	-0.299***	*0.034*
(ln) financial wealth	-0.029***	*0.004*

Note: Significance: * = 10%; ** = 5%, *** = 1%; [1] Cut-off set to 73, the median age in the sample. Model also includes controls for region of residence and marital status. R^2=0.127. Estimates are obtained using the quadratic in ln(Y) model specification.

The standard of living equation

Structural parameters α and γ for latent disability and income, respectively

Parameter(s):	linear in Y		linear in ln(Y)		quadratic in ln(Y)	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
α_1	-0.233***	0.016	-0.254***	0.016	-0.236***	0.016
γ_1	0.003***	0.001	0.631***	0.026	-2.61***	0.201
γ_2					0.307***	0.019
K	74		74		75	
L	-38718.413		-38759.401		-38694.623	
CF	1.004		0.992		0.994	
AIC	77584.826		77666.803		77539.247	
BIC	78103.552		78185.529		78064.983	

Notes: Significance: * = 10%; ** = 5%, *** = 1%. Models also include regional dummy variables and controls for socio-economic characteristics which are reported in Appendix B of the paper (see reference in the last slide). R^2 of model (1), (2) and (3) are 0.384; 0.334; and 0.382, respectively.

The extra cost of Disability

Mean income, equivalence scale and extra cost of disability by deciles of η

Decile of $\hat{\eta}$	Mean Y £s pw, 2007 prices		Model (1) linear in Y		Model (2) linear in ln(Y)		Model (3) quadratic in ln(Y)	
	Per capita	Unadjusted for household composition	Δ £s pw, 2007 prices	σ	Δ £s pw, 2007 prices	σ	Δ £s pw	σ
1	263.90	442.90						
2	206.00	353.10						
3	187.40	309.10						
4	162.80	257.70						
5	141.30	203.80						
6	148.70	221.50	17.40	1.11	23.10	1.10	22.10	1.21
7	172.20	264.10	62.00	1.35	95.10	1.38	67.80	1.40
8	175.50	263.80	91.00	1.50	149.60	1.60	98.00	1.54
9	174.10	255.50	116.30	1.72	193.10	1.83	126.10	1.78
10	181.70	264.10	163.70	2.06	307.50	2.36	179.90	2.17
Mean for deciles 6 to 10	*170.40*	*253.80*	*90.0*	*1.55*	*153.60*	*1.65*	*98.70*	*1.62*

Notes: Δs are expressed in £s pw, 2007 prices. Estimates of Δ are unadjusted for household composition.
All monetary values are rounded to the nearest 10p.
Reference disability level for computing Δ and σ is the median.

Discussion and Conclusions

- We derive a disability equivalence scale taking into account:
  - the latent nature of the constructs "disability" and "standard of living";
  - base-independence assumption is not supported by our data.
- Main findings:
  - log-quadratic function on income is preferable;
  - extra costs of disability are substancial and rise with severity.

Reference

Morciano M., Hancock R. and Pudney S. (2012)
'Disability costs and equivalence scales in the older population'
ISER working paper 2012-09. Colchester: Institute for Economic and Social Research, University of Essex (under review with *Review of Income and Wealth*)