<1>**Estimating the extra costs of disability in European countries: Implications for poverty measurement and disability-related decommodification**

<Authors>**Zachary A. Morris**
ORCiD 0000-0003-3593-3911

School of Social Welfare, Stony Brook University, Health Sciences Center Level 2, Room 093, Stony Brook, New York 11794, USA

Asghar Zaidi
ORCiD 0000-0003-3004-6387

1 College of Social Sciences, Department of Social Welfare, Seoul National University, South Korea
2 Oxford Institute of Population Ageing, University of Oxford, the UK
3 Centre for Analysis of Social Exclusion (CASE) London School of Economics and Political Science, the UK
4 Government College University, Lahore, Pakistan

<2>**Abstract**
It is widely accepted that people with disabilities incur additional expenditures on transport, heating, equipment and other items. In this paper, we estimate the magnitude of these extra costs of living for adults with disabilities aged 50–65 across 15 countries of Europe using the SHARE data. Drawing on the Standard of Living approach of Zaidi and Burchardt (2005), we compare the incomes required by households with and without adults with disabilities to obtain an equivalent standard of living. We advance upon this research by drawing on the cross-nationally harmonized data of adults aged 50+ from the Survey of Health, Aging, and Retirement in Europe (SHARE). The results suggest that there are substantial extra costs of disability in these countries, around 44 percent of income for a household with an adult reporting a work-related disability and somewhat less, 30 percent of income, for a household with an adult who receives disability benefits. Applying an equivalization scale based on these figures increases the overall poverty incidence rate, especially for households with disabled adult members. These findings thus have implications for analysing the entitlement and benefit levels for disability support programmes and for devising accurate poverty estimates concerning persons with disabilities.

<2>**Introduction**

Households containing persons with disabilities experience many forms of extra costs that those without disabilities do not encounter. These costs include paying for aids and adaptations, charges for support services and assistance, higher fuel costs due to spending more time at home or needing to keep it warmer, additional costs for pharmaceutical drugs, higher

costs of food for special diets, and higher transport costs. These extra costs can be offset by social benefits, tax relief, independent living allowances and other policies and transfer payments that are made available to meet extra needs of persons with disabilities. However, prior research suggests that public support programmes do not do enough to account for the extra costs associated with a disability (Newacheck et al., 2004; Saunders, 2007; She and Livermore, 2007; Wilkinson-Meyers et al., 2010; Schimmel and Stapleton, 2012; Braithwaite and Mont, 2009; Morciano et al., 2012; Loyalka et al., 2014). Estimating the extra costs of disabilities that remain once these programmes are accounted for can thus form a 'basis for devising eligibility and benefit levels for disability support programmes and in assessing the adequacy of supports' (Mitra et al., 2017, 6).

In this paper, we provide the first harmonized cross-national estimates of the extra costs of living associated with a disability, following the approach of Berthoud et al. (1993), which was extended by Zaidi and Burchardt (2005; 2009). Although studies of the extra costs of disabilities have been conducted in many countries, prior research has drawn on disparate datasets with varying indicators of disability and of standard of living, which make cross-national comparisons difficult (see, Mitra et al., 2017 for a review of the recent literature). We advance upon this research by drawing on the ex-ante cross-nationally harmonized data of adults aged 50 and over from the Survey of Health, Aging, and Retirement in Europe (SHARE). The objective of the research reported here is two-fold. First, we provide descriptive evidence of the extra costs of disability pooled across all countries, as well as according to individual countries and welfare state regimes. We find that the extra costs of disability are substantial and that even those who receive benefits on account of their disabilities require considerable additional income in order to achieve a suitable standard of living, a finding which has implications for the analysis

of disability-related decommodification as per Esping-Andersen (1990). Second, we examine the sensitivity of poverty measurement to the adjustment for the extra costs of disability and demonstrate that by 'equivalising' household incomes after accounting for needs arising due to disability, the poverty risks for people with disabilities are considerably higher. These findings thus have considerable implications for not just in the measurement of poverty across subgroups with and without disabilities but also in analysing the adequacy of social welfare programmes.

Background

The Standard of Living Approach

The reason for investigating the extra costs involved with a disability is that people with disabilities are likely to experience a lower standard of living than their non-disabled counterparts with the same level of income as a result of the diversion of scarce resources to goods and services required because of the disability. This substitution in favour of disability-related consumption items and away from items which improve the general standard of living arises out of the income constraint. Prior research shows there to be many ways to calculate the financial costs of disability (see, Berthoud, 1991; Zaidi and Burchardt, 2005; Mitra et al., 2017). Stapleton et al. (2008) review these approaches and view the 'expenditure equivalence' approach, or what we will refer to as the Standard of Living (SOL) approach, to be a most reliable method.

The standard of living in the SOL approach can be assessed by an independent metric of material hardship such as the ability to make ends meet or the ownership of consumer durables. The extra costs are calculated by way of a regression-based approach that accounts for other potential sources of variation as the additional amount of income a household with a member with disabilities would need to achieve the same standard of living (e.g. the ability to make ends meet)

as an equivalent household without a member with a disability. The strengths of the SOL approach are that it does not require the direct measurement of expenditures on a basket of goods and services or rely on a subjective evaluation of the additional costs (Mitra et al., 2017). The SOL approach identifies the extra costs indirectly by examining how individuals can translate income into utility as measured by a standard of living. Cullinan et al. (2011) further observe that the SOL approach is ideally suited for large-scale micro data analysis as it is less likely to be vulnerable to adaptive response behaviour among those surveyed.

A clear limitation of the SOL approach is that the results are sensitive to the measure of standard of living that is selected. The estimation results are also likely to vary according to the disability definition that is used. Mitra and colleagues (2017) identified 20 studies in 10 countries estimating the costs of disability but with heterogeneous estimates of the costs of disability. These authors further conclude that more quantitative evidence is needed, particularly rigorous research that uses internationally comparable data measuring disability and standard of living of persons with disabilities. The research reported in this paper is based on the cross-nationally harmonized SHARE data allowing application of the same standard of living, income and disability definitions across countries.

We summarize recent literature using the SOL approach in Table 1. Despite the variation in the definitions and contexts of these studies, a consistent picture emerges of sizeable extra costs associated with disability. The results from the US study suggest greater costs than the European and Australian studies, but it is difficult to know to what extent this is due to methodological differences and to what extent to the higher level of co-payments for medical care and other care services in the US. For the other studies, estimates for medium-severity disability range from 18 to 62 per cent in developed countries. Research calculating the extra

costs of disability in developing countries, such as in Vietnam (Minh et al., 2015) and Cambodia

(Palmer et al., 2016), report lower extra costs estimates than for the advanced economic

countries.

<Insert Table 1 near here>

<Table head>Table 1: Some recent estimates of the extra costs of disability, using the standard of living or 'expenditure equivalence' approach

Study	Country and data source	Population and disability definition	Standard of living indicators	Extra costs estimate
Zaidi and Burchardt (2005)	UK: 1996/7 Family Resources Survey	Household population; OPCS severity categories of disability	Ownership of consumer durables; ability to save	40% for single non-pensioner medium severity disability; 69% for pensioner
Cullinan and colleagues (2011)	Ireland: 1995–2001 Living in Ireland Survey	Household population; any chronic health problem	Consumer durables; holiday	44% for severely disabled; 25% for pensioners
Saunders (2007)	Australia: 1998/9 Household Expenditure Survey	Household population; Severity of activity restrictions	Inverse of count of positive responses to series of hardship questions	37% to 40-49% for the most severe
She and Livermore (2007)	US: 1996–99 SIPP panel	Age 25–61 at first interview. Condition that limits type or amount of work	Ability to meet expenditures; material deprivation	165% to 288% of poverty threshold income
Loyalka, Liu, Chen and Zheng (2014)	China: 2006 National Survey of Disabled Persons	Household population; medical impairments.	Index of ownership of consumer durables	31% for single adult household.
Morciano, Hancok and Pudney (2015)	UK: 2007/8 Family Resources Survey	Older people above the state pension age; Latent factor model for disability	Ten indicators of ability to afford items or activities constructed into a latent index	62% for an older adult with a median level of disability.
Minh and Collegues (2015)	Vietnam: 2011 8 cities and 6 provinces	Household population; Functional impairments.	Savings and index of household assets	8 to 9.5% of annual household income
Palmer, Williams, and	Cambodia: 2009–14 Cambodian Socio-	Household population; Functioning impairments.	Asset index combining durable goods and housing characteristics	18% to 34% for households with at least one

McPake (2016)	Economic Survey			disabled member.

The theoretical relationship between standard of living, income and disability pertinent to the SOL approach is highlighted using Figure 1.

<insert Figure 1 near here>

As shown, the standard of living is assumed to rise with income for all households, but for a household with greater needs – for example, one containing a person with disabilities – the same income results in lower standard of living, as is shown by the shift to the bold line for a disabled person that is lower than the line for a non-disabled person. Conversely, the same standard of living can be achieved by a household with greater needs if it also has a higher income. Thus, in Figure 1, income B for a disabled household translates into the same standard of living as income A for a non-disabled household, and B minus A gives an estimate of the extra costs of disability. The underlying econometric theory is that the latent variable S is measured by U, a sum index, for example, of the number of material deprivation indicators experienced by a household. Algebraically, the method can be stated as:

<Equ>

[1] $S = \alpha Y + \beta D + \gamma X + k$

</Equ>

where S is an indicator of standard of living, Y is household income, D is disability status, X is a vector of other characteristics, including household composition, and k is the intercept term expressing a constant absolute minimum level of standard of living. Following equation [1], the extra costs of disability, E, is given by:

 <Equ>

[2] $E = dY / dD = -\beta / \alpha$

</Equ>

This can also be verified graphically. β gives the distance BC between the two lines in Figure 1, while α gives their slope, or BC over AB. Thus β / α = BC / (BC/AB) = AB, which is the extra cost of disability. Figure 1, and equation [1], illustrate the simple case where the extra costs of disability are independent of level of income, with a linear relationship between income and standard of living. However, it is possible that extra disability costs will rise with income, since those on higher incomes might require more than low-income households to maintain their standard of living. In other words, there are diminishing returns to income in terms of standard of living, as shown in Figure 2. In that case the Y, a component of equation [1] will be log income. The relationship between income and extra costs has important implications: the standard equivalisation for household size, for example, implies that an additional child costs more in a rich family than a poor one. By contrast, social security benefits for children, and for the extra costs of disability, are typically set at or near a flat rate, reflecting an assumption that extra costs are not related to income at all.

<insert Figure 2 near here>

<3>Disability-related decommodification

One of the core purposes of the modern welfare state is to protect against the social risks associated with disability. Indeed, disability was one of the original 'categories of need' (Stone, 1984) that societies developed to solve the problem who should be eligible for need-based aid and who must work to make ends meet (Stone, 1984); de Swann, 1988; Berkowitz, 1987). In *The Three Worlds of Welfare Capitalism*, Esping-Andersen (1990, 37) formalized the concept of decommodification as a measure of the adequacy of the need-based aid provided by the welfare

state, which he defined as 'the degree to which individuals, or families, can uphold a socially acceptable standard of living independently of market participation'. To assess the capacity of welfare states to achieve decommodification, Esping-Andersen (1990) created an index that incorporated several indicators, including the benefit replacement rate, the duration required to receive a full benefit, and the share of the population covered by the benefit. With this index, a typology of three welfare state regimes was identified based on the level of achieved decommodification: a Liberal welfare state regime (Anglo-Saxon countries), a Conservative welfare state regime (mostly Central European countries), and a Social Democratic welfare state regime (mostly Nordic countries).[1]

In the decades since *The Three Worlds of Welfare Capitalism* was published, welfare state regime analysis has extended to many other countries not included in the original analysis with the identification of additional regimes in East Asia, the Mediterranean, and post-Socialist countries, among others (Ferragina and Seeleib-Kaiser, 2011). The decommodification index has also been criticized along several dimensions. Feminist scholars have argued that the decommodification index overlooks the role of unpaid work and thus requires modification by including a broader definition of welfare state supports that accounts for the unpaid provision of care for dependent citizens (Orloff, 1996). Scholars of the so-called 'new social risks' have also argued for a broader view of welfare state effort. In response to the declining wages of low-skilled workers that has occurred in the post-industrial economy, they argue that the welfare state should now include both decommodification and 'recommodification' as major goals (Taylor-Gooby, 2004). Recommodification efforts include active labour market policies that seek to support the needs of workers by, for example, increasing wages or providing opportunities to re-train or upskill.

A critique of the decommodification index can also be made taking the perspective of disabled people. The decommodification index of Esping-Andersen, in its assessment of the generosity of the benefit replacement rate, does not account for the challenges disabled people experience translating income replacements into a suitable standard of living. Thus, in order to evaluate the extent of disability-related decommodification achieved, one needs to assess the degree to which benefit programmes adequately compensate for the extra costs of disability. In addition, if we were to evaluate the success of recommodification efforts, we should also examine the extra costs that remain for a household with an adult member with work disabilities who is also working and whether their labour market participation reduces the extra costs of living.

<3>Sensitivity of poverty estimates after accounting for the extra costs of disability

As per one of our objectives, accounting for the extra costs of disability may further assist in developing more accurate poverty estimates that adjust for the fixed expenses required of those living with a disability. Health impairments that limit an adult's ability to partake in employment can result in substantial financial repercussions. Schimmel and Stapleton (2012) find, for example, that older adults experiencing a work disability onset in the US experienced earnings 50 percent lower and poverty rates nearly double when compared to a matched comparison group who did not experience a disability onset. They further identify that various social welfare benefits, including unemployment and disability insurance, did little to offset this earnings decline. In 2018, about 29 percent of the EU population aged 16 or more with an activity limitation was at risk of poverty, compared with 19 percent of those with no limitations (Eurostat, 2019).[2] Yet, as these figures do not equivalize for the extra costs of living with a

disability, they may undercount the true level of poverty. We thus further aim to demonstrate the sensitivity of poverty measures to the adjustment of the extra costs of disability.

<2>Data

We draw on data from the fifth wave of the Survey of Health Aging and Retirement in Europe (SHARE), which was collected in 2013 and included additional questions on material deprivation that were not included in previous waves (Börsch-Supan, 2017). Since 2004, SHARE has provided an ex-ante harmonized cross-national and longitudinal panel dataset of older working-age adults across various European countries. The reference population of SHARE are adults age 50 and older residing in the territory of the country at the time of data collection. SHARE contains all the essential information required for the empirical work performed in this paper: net household disposable income, indicators of standard of living, multiple disability variables, and other personal attributes such as marital status, education, gender, and age. Because disability benefit programmes are designed for those who are still of working age and not receiving pensions, we restrict our analytic sample to those age 50 to 65 years old. Though SHARE provides a longitudinal panel data, the current analysis is cross sectional and limited to wave 5. We further restrict the dataset to all observations without missing data. The final analytic sample consists of 19,793 respondents across 15 countries (Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Switzerland, Belgium, Israel, Luxembourg, the Czech Republic, Slovenia, and Estonia).

<3>The Standard of Living Indicators

The empirical work undertaken here is not aimed at specifying a model that could explain variation in standards of living overall. Rather, what is needed is to determine how income is related to a component of standard of living (i.e. to obtain an estimate of an income curve), and how disability reduces standard of living (i.e. by shifting the income curve to the right). Thus, the method adopted here relies heavily on the identification of a standard of living indicator that is affected by a switch towards disability-related extra consumption items.

Several considerations come into play in the choice of standard-of-living indicator (see Zaidi and Burchardt (2005) for a discussion). The important ones are reiterated here. The relationship with income is important so that the indicator is sensitive to changes in available resources. The indicator should consist of goods and services preferences which are independent of disability status. There will also be other variations in preferences or tastes, but they will be 'averaged out' in choosing a composite indicator that is based on a range of different items. Choosing an indicator which is sensitive to the bottom of the distribution means the results will reflect extra needs (necessities) but may not discriminate well for higher-income households. Choosing an indicator which is sensitive at the top of the distribution, on the other hand, means the results will reflect extra expenditure on non-essential items (e.g. luxuries). Again, a composite indicator will help to cover the full range.

We experimented with several SOL indicators and decided on two. The first SOL indicator consists of a subjective assessment of the level of difficulty experienced by the household in making ends meet. For this question, respondents were asked to respond whether the household is able to make ends meet with great difficulty, with some difficulty, fairly easily, or easily. We refer to this indicator as SOL One. The second indicator is an index of material deprivation imputed by the SHARE survey team that uses 11 items and refers to two domains:

the failure in the affordability of basic needs and financial difficulties (see, Malter and Börsch-Supan, 2015; Adena et al., 2015). We will refer to this indicator as SOL Two. Each of the indicators are outlined in Table A1. Questions used in the index of SOL Two include the inability to afford groceries, meet unexpected expenses, afford to heat your home, and postponing visits to the doctor and dentist to reduce costs. Scores on the index vary from 0 to 1 with the higher the score the greater the material deprivation experienced.

The disability variable

There is little consensus as to the best way to identify disability in cross-national policy research. There is no single definition that is universally accepted to cover all its aspects and severity (Burchardt, 2014). We thus experiment with three indicators of disability. The first consists of whether the respondent said 'yes' to whether they have a health problem that limits paid work. This is a frequently used indicator of work-disability in large public surveys (Burkhauser et al., 2002). As a second disability variable, we use a question in the SHARE data that is made specific to each country surveyed and that identifies those who are receiving public disability benefits (Börsch-Supan et al., 2009). This disability benefit variable is important since it provides us with an indirect measurement of the decommodifying effects of the disability benefits provided. Insofar as disability benefits truly decommodify, we would expect to see little to no extra costs of living among those receiving these benefits.

Rates of work-disability and disability benefit receipt have been shown to vary widely cross-nationally and as a result of both individual level (i.e. health differences) and country level (i.e. different disability policies, welfare states, and labour market factors) factors (Börsch-Supan et al., 2009; Benitez-Silva et al., 2010; Kapteyn et al., 2007; Burkhauser et al., 2014). To identify a more universal measure of disability and to compare the effects of different degrees of

disablement, we construct a latent health index that was developed and validated by Poterba et al. (2013). The index consists of a composite measure of health that divides the population into quintiles of lesser and poorer health. The composite measure is compiled using a principal component analysis from 19 different measures of health. Table A2 provides the variables and the first principal component factors scores used in the analysis. The first principal component is the weighted average of the 19 health indicators and is used to maximize the share of the variance of the individual health indicators across the population in question. Using the coefficients from the first principal component, each individual in the dataset is assigned a raw health score. These raw scores are then divided into quintiles that provide a national population level health ranking with those in the fifth quintiles in the worst health and those in the first quintiles in the best health. The health score also points to the disability severity experienced by the individuals.

Income and control variables

We use an imputed net income variable which aggregates at the household level all sources of income (see De Luca et al., 2015). Importantly, it provides a measure of post-transfer income that includes all moneys received from welfare state transfers, such as disability insurance benefits or any other extra costs of living benefits. The control variables tested were determined by our hypotheses about their importance in the relationship between standard of living, income and disability. For instance, housing ownership is included since it is expected that homeowners and tenants with the same level of income, measured before housing costs, will have different standards of living. Similarly, country dummies are included to control, at least partly, for geographical differences in costs of living. Marital status, number of children and education status are other important control variables found to be significant in our specification search. The inclusion of explanatory variables reported for the final specification of the models was determined at the end

by their statistical significance. The model is not designed to capture all explanatory factors for the standard of living equation.

Results

Pooled Estimation Results

We begin by providing our estimates that are pooled across the 15 countries in Table 2. Results are reported for two indicators of standard of living: respondent's self-assessment of the level of difficulty experienced by the household in making ends meet (SOL One), and the material deprivation index (SOL Two). For SOL One, the dependent variable is a categorical variable that is defined in an ordered way. We thus make use of the ordered logistic regression to estimate the regression equation. For SOL Two, the material deprivation index is a continuous variable, so we use the OLS regression. A range of income specifications were explored, including linear and non-linear terms and interaction terms. A log income specification was found to provide the best fit, thus confirming our *a priori* hypothesis that the marginal returns of income to standard of living decrease as income rises. In other words, an additional €1 makes more difference to the standard of living of a poor person than a rich person. The adjusted R-squared statistics – a measure of the explanatory power of the models – while not high, are reasonable for cross-sectional analysis of this kind.

All estimates of extra costs are shown in the top rows of the table and are expressed as the percentage of income by which costs increase for households with a member with disabilities. The extra costs estimates are derived from the ratio of coefficients on disability and income, as shown by equation [2]. For instance, looking at Table 2, using the 'ability to make ends meet' indicator of standard of living (SOL One) and the work-disability variable, the ratio of coefficient for disability (-0.301) and coefficient for log income (0.682) provides the estimate that this group

requires about 44 percent more income to maintain their living standards for a person with disabilities in the household. These results for the work-disability indicator range from 44 to 62 percent for all households for SOL One and SOL Two, respectively, and are similar to past estimates in the advanced economic countries as shown in Table 1.

The results broken down by household type further reveal that single working-age adults with work-disabilities face substantially larger extra costs associated with their disability compared to married or partnered households. One of the reasons is presumably that they do not have help from their family members either in the provision of care or as a source of supplemental household income. Reliant on a single source of household income, the single individual with a work-disability must receive substantially more income (55 percent SOL One and 93 percent for SOL Two) to maintain a living standard comparable to a single household without a disability. The results for disability benefit recipients follow a similar pattern, though the extra costs estimates are considerably lower than for those reporting work-disabilities. For example, on average for all households across the 15 countries, we estimate that a disability benefit recipient must receive 30 percent more income than a person not receiving disability benefits to make ends meet (SOL One) and 40 percent more income to maintain a living standard in accordance with the material deprivation index (SOL Two). We can assume that the estimates for disability benefit recipients are lower than for those who are work-disabled due to the fact that these individuals are receiving a partial compensation on account for their disabilities. Nevertheless, the extra costs estimate for disability benefit recipients indicate that disability benefit recipients maintain considerable extra costs of living and are not fully deccomodified as a result of the benefits they receive.

Table 2 further provides estimates of the extra costs of disability for those who are in work. In recent decades, there has been well identified international expansion of active labour

market policies designed to promote recommodification by assisting those historically reliant on income replacement programmes to return to employment (Gilbert, 2002), including many with disabilities (OECD, 2010; Böheim and Leoni, 2017). These measures include, among others, increasing the incentives for employers to integrate their employees with disabilities, providing increased access to vocational rehabilitation and work incentives for beneficiaries to work.

On average and across the 15 countries in our dataset, 23 percent of those receiving disability benefits report being employed and 33 percent of those reporting work-disabilities report being employed. Among those who are working, we find that a person with a work disability must receive 32 percent more income than a person not with a work disability to make ends meet (the SOL one indicator of standard of living). We further identify that, among those working, disability benefit recipients who combine work and benefit receipt report about half as much extra costs of living at 15 percent (for SOL one indicator). The results for SOL two indicator are slightly higher but they also show that the extra costs of living are lowest for those who are in work, especially for those who also receive disability benefits. This may be attributable to differences in disability severity among those beneficiaries who are able to work. It may also suggest that recommodification efforts that encourage labour market participation among those with work disabilities or that allow for the combination of market income and benefit receipt may be particularly helpful in reducing the extra costs of disability.

<insert Table 2 near here>

<Table head>Table 2: Extra costs of living estimates for two disability definitions and two SOL indicators by household type

Disability definition	Work-disability		Disability Benefits	
SOL indicator	One	Two	One	Two
Extra costs estimate (All)	-44%	-62%	-30%	-40%
Extra costs estimate (Married/Partnered)	-45%	-58%	-30%	-36%

Extra costs estimate (Single person)	-55%	-93%	-37%	-57%
Extra costs estimate (Working)	-32%	-47%	-15%	-22%
All Households				
Income (log)	0.682	-0.281	0.702	-0.294
Work-disability	-0.301	0.173		
Disability Benefits			-0.210	0.116
Observations	22,990	22,990	22,990	22,990
Adjusted/Pseudo R-squared	0.15	0.317	0.146	0.302
Married/Partnered				
Income (log)	0.634	-0.272	0.648	-0.281
Work-disability	-0.286	0.157		
Disability Benefits			-0.192	0.101
Observations	16,945	16,945	16,945	16,945
Adjusted/Pseudo R-squared	0.151	0.302	0.147	0.289
Single				
Income (log)	0.610	-0.226	0.648	-0.251
Work-disability	-0.338	0.210		
Disability Benefits			-0.237	0.142
Observations	6,045	6,045	6,045	6,045
Adjusted/Pseudo R-squared	0.133	0.308	0.127	0.286
Working				
Income (log)	0.650	-0.238	0.656	-0.242
Work-disability	-0.205	0.112		
Disability Benefits			-0.097	0.053
Observations	12994	12994	12994	12994
Adjusted/Pseudo R-squared	0.137	0.139	0.134	0.140

Note: Standardized beta coefficients. All models control for age, secondary education, number of children, home ownership, and country dummies, whose coefficients are not included here for the sake of brevity. Full results provided in Tables A3, A4, A5, and A6 in the appendix.

In Table 3, we provide the extra costs of living estimates according to the latent health quintiles and thus are able to examine whether the extra costs of disability vary by the severity of an individual's health condition. As expected from past research, the extra costs of living with disability are shown to increase as people have more severe impairments with those in poorest health or in the fifth quintile requiring nearly 60 percent more income than those in the first health quintile to achieve a suitable standard of living. The results for SOL Two, the material deprivation index, reveal a similar linear severity trend and is in accordance with the results presented above in being larger than the estimates for SOL One.

<Insert Table 3 near here>

<Table head>Table 3: Extra costs of disability estimates by health severity and two SOL indicator

	SOL One		SOL Two	
	Standardized beta coef.	*Extra costs estimate (%)*	Standardized beta coef.	*Extra costs estimate*
Income (log)	0.681		-0.278	
1st health quintile (the best health)				
2nd health quintile	-0.056	-8%	0.030	-11%
3rd health quintile	-0.110	-16%	0.050	-18%
4th health quintile	-0.251	-37%	0.120	-43%
5th health quintile	-0.405	-59%	0.241	-87%

Note: Calculations are based on the SOL estimation approach used in Table 2 but with the health quintile variable derived from the principal component analysis. Both models control for age, secondary education, number of children, and home ownership, and country dummies. Full results provided in Table A7.

Extra cost estimates by country and across welfare state regime

The results presented thus far are for the pooled sample across countries, with country dummies included as control variables. This constrains the estimated relationship between income, disability and standard of living to be the same across countries. Next, we relax this assumption by modelling each country separately and provide estimation of the extra costs of disability in 15 advanced economic countries using the more conservative SOL One variable (namely, self-assessment on household's ability to make ends meet) in Table 4. We provide our results for each of the individual countries for SOL Two and by welfare regime for SOL Two in the appendix Tables A8 and A9.

<Insert Table 4 near here>

<Table head>Table 4: Extra disability costs estimate by country (SOL One)

	Work disabled (%)	*Receives disability benefit (%)*	N
Austria	-53	-23	1,503
Germany	-28	-15	2,462

Sweden	-74	-76	1,323
Netherlands	-60	-45	1,491
Spain	-49	-34	1,970
Italy	-33	-25	1,502
France	-30	-10	1,715
Denmark	-49	-27	1,756
Switzerland	-44	-45	1,162
Belgium	-63	-53	2,392
Israel	-35	-34	385
Czech Republic	-57	-27	1,551
Luxembourg	-30	-27	770
Slovenia	-46	-36	1,117
Estonia	-71	-42	1,891

Note: Calculations are based on the approach used in Table 2 for each country separately using SOL One. All models control for age, secondary education, number of children, and home ownership.

It is interesting to note here that, though we are missing countries from the liberal welfare regimes, such as the US or UK, our cross-country results do not appear to follow the three worlds cluster of Esping-Andersen (1990). In Sweden, for example, where substantial disability benefit reforms have occurred in recent years (Burkhauser et al., 2014) and which is considered a highly decommodifying social democratic welfare state regime, our estimates suggest the disability benefit recipients require approximately 76 percent more income to maintain their living standards. Disability benefit recipients in France (10%) and Germany (15%) appear to require less income to make ends meet than benefit recipients in the other Conservative regimes, including Belgium (53%), the Netherlands (45%), Luxembourg (27%) and, to a lesser extent, Austria (23%).

The southern European countries of Spain (34%) and Italy (25%) have fairly low extra costs of living estimates for benefit recipients, while disability benefit recipients in the post-socialist countries of Estonia (42%), Slovenia (36%), and the Czech Republic (27%) have somewhat higher estimates. In accordance with the results above, the extra costs estimate for

those on disability benefits are, in all but two countries, less than the estimates of the extra costs

estimates for those with a work-disability. As noted above, this discrepancy is likely attributable

to the receipt of income replacements. As indicated in the country specific estimates, Table 5

further shows that the extra costs estimates are higher in the Eastern European and Social

Democratic welfare state regimes than in the Conservative and Mediterranean welfare state

regimes.

<Insert Table 5 near here>

<Table head>Table 5: Extra disability costs estimate by welfare state regime (SOL One)

		Extra cost estimate	Income (log)	Disability	Observations
Social Democratic	Work-Disabled	-62%	0.699	-0.431	3079
	Disability Benefit	-52%	0.723	-0.377	3079
Conservative	Work-Disabled	-40%	0.785	-0.314	11495
	Disability Benefit	-28%	0.807	-0.227	11495
Mediterranean	Work-Disabled	-41%	0.601	-0.248	3857
	Disability Benefit	-31%	0.612	-0.189	3857
Eastern European	Work-Disabled	-66%	0.545	-0.358	4559
	Disability Benefit	-38%	0.562	-0.215	4559

Note: Calculations are based on the approach used in Table 2 for each country separately using SOL One. All models control for age, secondary education, number of children, and home ownership. The welfare state regimes used are Social Democratic (Sweden and Denmark); Conservative Regimes (Austria, Germany, the Netherlands, Switzerland, Belgium, and Luxembourg); Mediterranean regimes (Spain, Italy, Israel, and France); Eastern European welfare state regimes (Estonia, and Slovenia). Israel is considered a Mediterranean regime as following Gal (2010).

Böheim and Leoni (2017), building from a typology of the 'three worlds of disability

policy' recognised by the OECD (2010), identify three country clusters of disability policy

regimes that closely align with the welfare regimes of Esping-Andersen (1990). The first cluster

is the 'Nordic' or 'Social-democratic' cluster consisting of Germany, Denmark, Finland, Netherlands, Norway, Sweden, and Switzerland, that combines heavy investment in integration measures with generous compensation levels. The second 'residual' cluster includes countries with moderate integration and compensation levels and a greater emphasis on occupational status in the assessment of benefit eligibility. These include Austria, Belgium, Spain, France, Ireland, Italy, Luxembourg, and Poland. The third 'liberal' cluster is composed of countries with low compensation levels but higher employment integration efforts, including Australia, Canada, Great Britain, New Zealand, and the United States. Our analyses are selective since we lack data for all the countries, particularly the liberal cluster. We can nonetheless draw the insights that: (a) the generous social democratic regimes do not directly translate into a lower extra costs of disability estimate; (b) there is considerable internal variation of the extra cost estimates within the various welfare state and disability policy regime types, such as those between Sweden (-74%) and Denmark (-49%), the Netherlands (-60%) and Germany (-28%), and Slovenia (-46%) and Estonia (-71%); and (c) the Eastern European countries of Slovenia and Estonia also have higher extra cost estimates suggesting that future research should investigate treating these countries as a separate disability policy regime. Largely for these mixed results for each welfare and disability policy regime types, we resist undertaking any further analysis on the basis of the regime clustering.

While we do not endeavour to explain all the differences here, we can hypothesize as to the major drivers of the identified variation across countries and regimes.

<BL>

- A first hypothesis concerns the varying degrees of social security entitlements and tax reliefs for people with disabilities and their caregivers. In countries with more generous disability supports, one would suspect there to be fewer extra costs of living.

- A second hypothesis concerns the impact of other policy domains outside of a country's disability policies. For example, individuals in countries with less generous healthcare systems, limited public transportation options and reduced access to low-cost caregiving services may also have greater disability related expenses.

- A third hypothesis, perhaps helpful in explaining the high estimate for Social Democratic countries and, specifically Sweden, concerns the diminishing returns to income hypothesis by which the extra costs of disability will be high in richer countries as more income would be necessary to maintain a suitably higher standard of living despite disability. This hypothesis would also be consistent with the finding of lower extra costs of living identified in developing countries as identified in the literature (see, Table 1).

- A fourth hypothesis concerns the role of the voluntary sector and the informal provision of care. In some welfare state regimes, the role of the formal voluntary sector may be important, while in others the informal care provided by non-household members may be more significant, and these factors may also help to explain the variations in the costs of living associated with disability. In the Mediterranean welfare state regime, for example, the family is known to play a large role in the provision of care and support, which may contribute to the low extra cost estimates identified (Moreno-Fuentes and Marí-Klose, 2016).

<BL>

<3>*Implications of extra costs of disability on poverty risks*

We next examine how the poverty risks of people with disability are affected when we also account for differences in the costs of living between households with and without disabled adult members. Our objective here is to show the sensitivity of accounting for the extra disability costs rather than making a judgement on poverty levels per se in the countries in question. We choose to define poverty as consistent with the Eurostat's measure of at-risk-of poverty (the so-called AROP measure widely used in the European countries), but the individual countries may measure national levels of poverty in different ways. The rationale underlying this sensitivity test is that the adjustment in differences across households that accounts for the extra costs of disability are an improvement over conventional correction for household size and composition only while carrying out interpersonal comparison of economic resources and needs across people of different attributes.

Results reported in Table 6 make use of the extra costs estimates for those with work-disability in each country derived from Table 4. To adjust poverty metrics for the extra costs of living with a disability, we first generate a weighted median income score by country. We then identify an unadjusted rate of poverty by identifying individuals with incomes less than 60 percent below the median income in their respective country. To provide an adjusted score of the poverty rate, we generate the lost income that is due to work-disability using these estimates and create a new net income variable that is adjusted for the lost income. We then regenerate the poverty indicator (less than 60 percent below median income) using the adjusted net income variable. The results in Table 6 demonstrate how the poverty risks change for those with work-disabilities and for the population aged 50–65 when we account for the additional costs that arise due to disabilities. A considerably greater proportion of persons with disabilities are categorized as at risk of poverty after the disability costs adjustment. On average, the poverty rate for an older working-

age adult with a work-disability is nearly twice as high (43 percent for the unadjusted rate as opposed to 68 percent for the adjusted rate). The poverty risks for the population aged 50–65 are also higher for all countries after adjusting for the extra costs of disability and range from a 2-percentage point increase in Italy to a 16-percentage point increase in Estonia.

<Insert Table 6 near here>

<Table head>Table 6: Unadjusted and adjusted poverty rates for people with disabilities age 50–65

	Poverty rate for respondents with no disabilities (%)	Unadjusted poverty rate for respondents with disabilities (%)	Adjusted poverty rate for respondents with disability (%)	Un-adjusted poverty rate for total pop. 50–65 (%)	Adjusted poverty rate for total pop 50–65 (%)
Austria	21	41	79	25	32
Germany	22	46	59	29	33
Sweden	27	43	99	30	41
Netherlands	24	44	82	28	37
Spain	23	29	76	24	33
Italy	21	39	62	23	25
France	24	47	64	28	32
Denmark	19	40	82	25	36
Switzerland	25	47	75	28	32
Belgium	24	42	86	28	36
Israel	30	54	73	35	38
Czech Republic	21	40	91	25	38
Luxembourg	27	45	61	31	34
Slovenia	30	32	59	31	34
Estonia	25	42	92	31	47
Total sample	23	43	68	27	32

Notes: All results are weighted using calibrated weights. Poverty is defined as below 60 percent of median income threshold in the specific country of residence.

Conclusions

The analysis followed the SOL approach to quantifying the extra costs experienced by people with disabilities across 15 European countries, following the approach of Zaidi and Burchardt (2005, 2009). This approach recognizes that given a fixed amount of income households with people with disabilities cannot achieve the same standard of living as households without disabled persons. We propose that this indirect measurement technique serves as an additional indicator of disability-related decommodification in the welfare state. Insofar as disability benefit programmes decommodify their benefit recipients, we would expect to see little to no extra costs of living among persons receiving these benefits. However, our estimates indicate that disability benefit recipients require substantial additional income in order to achieve their standard of living. This finding has strong implications for analysing the adequacy of social welfare programmes targeting people with disabilities.

The paper further highlighted that there is heterogeneity among types of households, employment status, and across levels of disability severity that is important in determining costs of living for a household with a disability relative to a typical family. Thus, if income of a single adult with a disability is gauged relative to a poverty threshold without making an adjustment to either their income or the standard, poverty among this subgroup will be understated. Moreover, we identified that those with disabilities who engage in work, on average, have lower extra cost estimates and that those who combine disability benefits with work have about half as much extra costs of living, which suggests the benefits of creating opportunities for benefit recipients to combine market income with benefit receipts.

We further observed differences in the extent of achieved decommodification across individual countries and welfare state regimes. Our results were somewhat counterintuitive and in

conflict with the ranking of welfare states identified by Esping-Andersen (1990), as we find particularly large estimates of the extra costs of living in the social democratic welfare state regime. We provided hypotheses for explaining these results, which should be explored further in the future work. Finally, the results obtained show the feasibility of deriving an equivalence scale to account for differences in disability status across households for the advanced economic countries. The results are drawn from the SHARE dataset and are the first to calculate and compare the extra costs of disability using ex ante harmonized survey data across countries. The important finding, which confirms the insights drawn from previous studies, is that the extra costs of disability are substantial in all countries studied with considerable variations identified among different household types, with individuals with more severe disability conditions and across countries.

We also examined how the poverty risks of people with disability are affected when we account for differences in the costs of living between households with and without disabled adult members. The rationale underlying this sensitivity test is that the interpersonal comparison of economic resources and needs must also account for differences in disability costs. Our results show that, by 'equivalizing' household incomes which account for sources of variation in households' needs arising due to disability, the poverty risks for people with disabilities are substantially higher. The impact of this adjustment is not only on the relative position of disabled and non-disabled people in the income distribution, but also on the estimated poverty risks for the overall population. This information on the extra costs that people with disabilities encounter across the advanced economic countries can be useful for policy makers to better understand the limitations of current disability support programmes at providing people with disabilities with a decent standard of living.

<2>Notes

<Take in notes and endnotes here>

<2>References

Adena, M., Myck, M. and Oczkowska, M. (2015) 'Material deprivation items in SHARE Wave 5 data: a contribution to a better understanding of differences in material conditions in later life', in A. Börsch-Supan, T. Kneip, H. Litwin, M. Myck and G. Weber (eds) *Ageing in Europe: Supporting Policies for an Inclusive Society*. Berlin: De Gruyter.

Benitez-Silva, H., Disney, R. and Jiménez-Martín, S. (2010) 'Disability, capacity for work and the business cycle: an international perspective', *Economic Policy* 25(63): 483–536.

Berkowitz, E. (1987) *Disabled Policy: America's Policy for the Handicapped*, Cambridge: Cambridge University Press.

Berthoud, R. (1991) 'Meeting the costs of disability', in G. Dalley (ed.) *Disability and Social Policy*, London: Policy Studies Institute.

Berthoud, R., Blekesaune, M. and R. Hancock, (1993) 'Ageing, income and living standards: evidence from the British Household Panel Survey', *Ageing and Society* 29(7): 1105.

Böheim, R. and Leoni, T. (2017) 'Sickness and disability policies: Reform paths in OECD countries between 1990 and 2014', *International Journal of Social Welfare* 27(2): 168–185.

Börsch-Supan, A. (2017) *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5. Release version: 6.0.0.* SHARE-ERIC. Data set.

Börsch-Supan, A., Brugiavini, A. and Croda, E. (2009) 'The role of institutions and health in European patterns of work and retirement', *Journal of European Social Policy* 19(4): 341–358

Braithwaite, J. and Mont, D. (2009) 'Disability and poverty: a survey of World Bank poverty assessments and implications', *ALTER, European Journal of Disability Research* 3(3): 219–232.

Burchardt, T. (2004) 'Capabilities and disability: the capabilities framework and the social model of disability', *Disability and Society* 19(7), 735–751.

Burkhauser, R., Daly, M., Houtenville, A. and Nargis, N. (2002) 'Self-reported work-limitation data: what they can and cannot tell us', *Demography* 39(3): 541–555.

Burkhauser, R., Daly, M., McVicar, D. and Wilkins, R. (2014) 'Disability benefit growth and disability reform in the US: lessons from other OECD nations', *IZA Journal of Labor Policy* 3(1): 4.

Cullinan, J., Gannon, B. and Lyons, S. (2011) 'Estimating the extra cost of living for people with disabilities', *Health Economics* 20(5): 582–599.

De Luca, G., Rossetti, C. and Malter, F. (2015) 'Sample design and weighting strategies in SHARE Wave 5', in F. Malter and A. Börsch-Supan (eds) *SHARE Wave 5: Innovations & methodology*, Munich: Munich Center for the Economics of Ageing at the Max Planck Institute for Social Law and Social Policy.

De Swann, A. (1988) *In Care of the State: Health Care, Education and Welfare in Europe and the USA in the Modern Era*, New York: Oxford University Press.

Esping-Andersen, G. (1990) *The Three Worlds of Welfare Capitalism*, Cambridge: Polity Press.

Eurostat (2019, October 28) Disability statistics – poverty and income quintiles. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/pdfscache/34425.pdf

Ferragina, E. and Seeleib-Kaiser, M. (2011) 'Thematic review. Welfare regime debate: past, present, futures?', *Policy & Politics* 39(4): 583–611.

Gal, J. (2010) 'Is there an extended family of Mediterranean welfare states?', *Journal of European Social Policy* 20(4): 283–300.

Gilbert, N. (2002) *Transformation of the Welfare State: The Silent Surrender of Public Responsibility*, New York: Oxford University Press.

Goodin, R.E., Heady, B., Muffels, R. and Dirven, H.-J. (1999) *The Real Worlds of Welfare Capitalism*, Cambridge: Cambridge University Press.

Kapteyn, A., Smith, J.P. and Van Soest, A. (2007) 'Vignettes and self-reports of work disability in the United States and the Netherlands', *American Economic Review* 97(1): 461–473.

Loyalka, P., Liu, L., Chen, G. and Zheng, X. (2014) 'The cost of disability in China', *Demography* 51(1): 97–118.

Malter, F. and Börsch-Supan, A. (eds) (2015) *SHARE Wave 5: Innovations & methodology*, Munich: Munich Center for the Economics of Ageing at the Max Planck Institute for Social Law and Social Policy.

Minh, H., Giang, K., Liem, T., Palmer, M., Thao, N. and Duong, L. (2015) 'Estimating the extra cost of living with disability in Vietnam', *Global Public Health* 10(1): S70–S79.

Mitra, S., Palmer, M., Kim, H., Mont, D. and Groce, N. (2017) 'Extra costs of living with a disability: a review and agenda for research', *Disability and Health Journal* 10(4): 475–484.

Morciano, M., Hancock, R. and Pudney, S. (2015) 'Disability costs and equivalence scales in the older population in Great Britain', *Review of Income and Wealth* 61(3): 494–514.

Moreno-Fuentes, F. and Marí-Klose, P. (eds) (2016) *The Mediterranean Welfare Regime and the Economic Crisis*, Abingdon: Routledge.

Newacheck, P., Inkelas, M. and Kim, S. (2004) 'Health services use and health care expenditures for children with disabilities', *Pediatrics* 14: 79–85

OECD (2010) *Sickness, Disability and Work: Breaking the Barriers: A Synthesis of Findings across OECD Countries*, Paris: Directorate for Employment, Labour and Social Affairs, Organization for Economic Co-operation and Development.

Orloff, A. (1996) 'Gender in the welfare state', *Annual Review of Sociology* 22(1): 51–78.

Palmer, M., Williams, J. and McPake, B. (2016) *The Cost of Disability in a Low-income Country*. Working Paper. Victoria, Australia.

Poterba, J., Venti, S. and Wise, D. (2013) 'Health, education, and the postretirement evolution of household assets', *Journal of Human Capital* 7(4): 297–339.

Saunders, P. (2007) 'The costs of disability and the incidence of poverty', *Australian Journal of Social Issues* 42(4): 461–480.

Schimmel, J. and Stapleton, D. (2012) 'The financial repercussions of new work-limiting health conditions for older workers', *INQUIRY: The Journal of Health Care Organization, Provision, and Financing* 49(2), 141–163.

Scruggs, L. and Allan, J. (2006) 'Welfare-state decommodification in 18 OECD countries: a replication and revision', *Journal of European Social Policy* 16(1): 55–72.

She, P. and Livermore, G. (2007) 'Material hardship, poverty and disability among working-age adults', *Social Science Quarterly* 88(4): 970–989.

Stapleton, D., Protik, A. and Stone, C. (2008) *Review of International Evidence on the Cost of Disability*, Department for Work and Pensions Research Report no. 542, London: Department for Work and Pensions.

Stone, D. (1984) *The Disabled State*, Philadelphia, PA: Temple University Press.

Taylor-Gooby, P. (2004) 'New social risks and welfare states: New paradigm and new politics?',

    in Taylor-Gooby, P. (ed) *New Risks, New Welfare: The Transformation of the European*

    Welfare State, Oxford: Oxford University Press.

Wilkinson-Meyers, L., Brown, P., McNeill, R., Patston, P., Dylan, S. and Baker, R. (2010)

    'Estimating the additional cost of disability: beyond budget standards', *Social Science*

    and Medicine 71: 1882–1889.

Zaidi, A. and Burchardt, T. (2005) 'Comparing incomes when needs differ: equivalisation for the

    extra costs of disability', *Review of Income and Wealth* 51(1): 89–114.

Zaidi, A. and T. Burchardt (2009) 'Estimating the extra costs of living for disabled people in EU

    Member States', Paper presented at the 2009 ODI Evidence Day, London: Department

    for Work and Pensions.

<2>Notes

[1] The Social Democratic regimes were shown to be the most decommodifying and the Liberal welfare regimes the least with the Conservative regimes in between. A stratification index was also developed to identify the typologies, which concerned the way social policies can influence social inequities and the general order of social relations (Esping-Andersen, 1990).

[2] The at-risk-of poverty rate as calculated by Eurostat consists of the share of people with an equivalized (by household size) disposable income (after social transfers) below the poverty threshold of 60 percent of the national median income.