# AN ANALYSIS OF THE COST OF DISABILITY ACROSS EUROPE USING THE STANDARD OF LIVING APPROACH

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# AN ANALYSIS OF THE COST OF DISABILITY ACROSS EUROPE USING THE STANDARD OF LIVING APPROACH

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## ABSTRACT

This article presents for the first time a comparative study of the cost of disability for 26 European countries. Using the European Union Statistics on Income and Living Conditions 2008 and two alternative methodologies, one based on how easy or difficult it is for households to make ends meet and the other related to access of households to a set of services and assets, we present estimates of the extra costs of disability for households. Also discussed are the possible explanatory reasons for the pattern of costs found in the analysis.

**KEYWORDS:** disability, cost, standard of living, income, welfare.

**JEL CLASSIFICATION:** I10, I30.

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## 1. INTRODUCTION

Disability can be understood as a functional limitation, resulting not only from a medical condition of the body or the whole person, but also from the relation of a person with the environment, which involves dysfunction at one or more of three levels: impairments, activity limitations and participation restrictions.[1] The resulting loss of autonomy, physical or mental, prevents performance of some of the Activities of Daily Living (ADL).

Disability is far from being a marginal phenomenon in developed countries.[2] According to Eurostat, 30.8% of European Union (EU) citizens suffered from a long-standing illness or health problem in 2008, whereas 8.1% reported experiencing severe and Development (OECD) and in the EU there is strong concern about the issue and a mandate to try and attain the full economic and social participation of people with disabilities.[3] As a reflection of this concern, in the OECD and in the EU there is a variety of disability benefit systems, regulations and coverage. Some of these policies address the re-integration of disabled people into the labor market while others aim to compensate individuals with disabilities.[4] Public social spending in this area reached a sizable 2% of GDP in the EU27 in 2008, fluctuating from 0.7% in Cyprus to 4.4% in Denmark.

The aim of this paper is to offer an estimate of the extra costs of severe disability using a large sample of European countries. As far as we know, this is the first attempt to offer such an estimation using homogeneous data and the same methodology for all the EU member countries (with the exceptions of Finland, France and Malta) plus

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[1] We understand disability within the so-called "bio-psycho-social model", according to which disability is the result of the interaction of the functional status of a person with his/her environment, taking into account the social aspects of disability and not seeing disability only as a 'medical' or 'biological' dysfunction. This is the approach adopted by the International Classification of Functioning, Disability and Health, endorsed by the 54th World Health Assembly on May 22, 2001(resolution WHA 54.21). For a discussion of the definition and the measuring of disability see OECD (2010).

[2] For a more global picture, with different insights on the situation of disabled people in developing countries, see WHO (2011).

[3] The OECD has a research field on disability, starting with a first report in 2003, opening a specific project of which the last outcome is a new report published in 2010, reviewing the policies of thirteen countries. The European Commission has published a European Disability Strategy 2010-2020 (European Commission, 2010). Nevertheless, in both cases the aim is restricted to the labor market outcomes of people with disability, particularly eliminating barriers to their labor market integration and fostering higher participation rates among workers with disability.

[4] For a review, see OECD (2003).

Norway and Iceland. In addition, we try to outline several plausible explanations for the differences in estimated costs across countries.

Our approach to the cost of disability draws from the work of Amartya Sen (2004), who makes a distinction between two types of handicaps that tend to be associated with disability (Sen, 2004): on the one hand, a disabled person may find it harder to get a job or to keep it, and may receive a lower wage, and disability can even affect the acquisition or accumulation of human capital;[5] on the other hand, because persons with disabilities have special needs, they face more difficulties than able people in achieving well-being from their resources or may need more income for the same activity. Sen calls the first one an “earning handicap” and the second one, a “conversion handicap”. The latter handicap is recognized in social protection systems in many countries, which provide benefits, be they direct expenditure or tax expenditures, to offset the higher consumer costs associated with disability.

The starting point of our work is Sen’s (1985, 1987) concept of distributive justice, based on equalizing people's basic capabilities. For this author, the ultimate reference in redistributive policy is the *standard of living*, not the utility or the mere possession of goods. The issue is to establish an objective minimum standard that represents a good approximation to the real income level, considering that the standard of living is primarily an issue concerning lifestyle, rather than the means for its development. For Sen, the standard of living is a matter of *functionings* and *capabilities*. As is well known, Sen’s point of departure is the modern theory of the consumer (Lancaster, 1966), according to which goods are not relevant in themselves, but only in that they incorporate features and properties that make them desirable. What matters is the use that each person can get from these characteristics, which depends on his or her *capability* to perform the *functions* to take advantage of the characteristics of each good. Therefore, given a set of goods, each individual, according to his/her capabilities, can convert its characteristics into different combinations of *functionings*, from which he/she obtains a certain level of welfare. The standard of living approach aims to determine the extra cost of disability by comparing households with disabled and non-disabled members with the same level of welfare and allowing the difference in income to determine the extra cost of disability.

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[5] This is illustrated, for example, by the work of She and Livermore (2009) for the United States.

Researchers have not devoted much attention to the study of the costs of disabilities and almost all the literature focuses on Anglo-Saxon countries. This body of research is also based on very different methodologies (discussed in the third section) and it relies exclusively on national studies, so the comparability of the different results found in the literature is far from ideal. Apart from the surveys of Indecon (2004), Tibble (2005) and Stapleton, Protik and Stone (2008), one should highlight the works of Martin and White (1988), Matthews and Truscott (1990), Jones and O'Donnell (1995), Zaidi and Burchardt (2005), Kuklys (2005) and Wood and Grant (2010) for the United Kingdom, Indecon (2004) and Cullinan, Gannon and Lyons (2011) for Ireland, Saunders (2007) for Australia, She and Livermore (2007), Mitra, Findley and Sambamoorthi (2009) and Anderson *et al*. (2010) for the United States, Wilkinson-Meyers *et al*. (2010) for New Zealand and Braña and Antón (2011) for Spain. In addition, Braithwaite and Mont (2009) estimate the cost of disability for two non-developed countries, like Bosnia and Herzegovina and Vietnam. Although most of the studies are based on the standard of living approach, the overall results of this literature are extremely difficult to summarize: the authors rely on different definitions of disability and uses different variables and econometric specifications to estimate the extra cost of disability, making their outcomes hardly comparable. The absence of comparative studies might also cast some additional doubts on the methodology followed, as cross-country studies using a common methodology can contribute to test the appropriateness of the standard of living approach by arriving at results that make sense and could be explained according to economic theory. In this respect, the present work also aims to contribute to fill this gap.

The current study estimates the extra cost of disability –understood as suffering a chronic health condition and a severe limitation of daily activities- for 26 European countries using two different strategies, one based on a subjective question on a household's ability to make ends meet and another related to the ownership of several assets. The main finding of the article is that such a cost varies widely across countries, from around 20% to more than 100% of household income depending on the country. In general, Nordic countries and the Netherlands place at the top of the ranking, with Mediterranean and Eastern European states at the bottom. We suggest that this pattern is related to the model of caring for people with disabilities: in the former case, Welfare

States allow many disabled individuals to live by themselves, while in the latter care for people with disabilities is mainly a family responsibility.

The article unfolds in five additional sections as follows. In section 2, we describe the database used to estimate the cost of disability, pointing out its strengths and shortcomings. The third section presents and discusses the methodology followed in the estimation of the cost of disability. In section 4, the results obtained in terms of the cost of disability in the 26 European countries of the sample are presented, while section 5 discusses them. Finally, section 6 summarizes the main conclusions obtained in the paper and outlines further lines of research.

## 2. DATA

The database used in this research is the European Union Statistics on Income and Living Conditions 2008 (EU-SILC 2008).[6] Our original aim was to study the cost of disability in the 27 member states of the EU plus Norway and Iceland, countries of the European Economic Area that are also included in the database. However, it was impossible to include Finland, France and Malta in the analysis. Finland was excluded because only the household head is interviewed about his/her disability condition, whereas the other two countries refused our request and did not authorize micro-data dissemination. Therefore, the study focuses on the cost of disability in 26 European countries. The main advantage of this database is that it provides detailed information on household income and living conditions that is comparable across countries.[7] Sample sizes are considerably large: they range from more than 3,300 households in Cyprus to roughly 20,000 in Italy. Nevertheless, the EU-SILC also has several shortcomings. First, some information is not available for all countries, so the comparative analysis has to necessarily be restricted to those variables that are present in all member states.[8] Second, and importantly, information in the database on disability is not as exhaustive and detailed as desirable. In particular, there are only two questions that address this issue. The first asks the interviewee if he or she has a chronic illness or

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[6] Detailed information on the database, including methodological papers and national questionnaires, can be found at http://circa.europa.eu/Public/irc/dsis/eusilc/library.

[7] As is common in this type of survey, information on income refers to the previous year (2007).

[8] For instance, those countries that collect detailed information on some types of issues (for instance, the gender pay gap) are not required to ask for the same information in the EU-SILC.

health problem, while the second inquires as to whether the household member has been limited in his or her daily activity during the previous 6 months. Although other studies in the literature, such as Zaidi and Burchardt (2000) –in some of their specifications- and Cullinan, Gannon and Lyons (2011), use similar questions to characterize the disability condition, the limitations of the survey in this sense preclude us from having detailed information on the type of disability suffered by household members. Such information would have greatly contributed to better characterize the disability. In the third place, information on disability is not available for people 16 years old or under, an important limitation of this study that one should bear in mind.

In order to operationalize the concept of disability, we apply a quite demanding definition: a person is considered as disabled if he or she simultaneously reports suffering from a chronic illness or condition and having been intensely limited during the last 6 months. The exigency of the chosen concept of disability can be seen clearly in the data shown in Table 1. Focusing on the average of the 26 countries of the sample, of the 30% of population with a chronic condition and the 16.4% of population with a condition that limits their activity, only 7.4% is considered to have a strong disability. A by-product of the definition of disability used in this study is the remarkably low dispersion of the percentage of population considered to be suffering from a strong disability among the countries of the sample, roughly half of the dispersion of those with a chronic condition or with limitations of activity.

In order to check the verisimilitude of the results obtained in terms of prevalence of disability according to the proposed concept, we compared these results with those obtained using two alternative sources and definitions: the 2002 *Labour Force Survey* (LFS) *ad-hoc* module on employment of disabled persons, and the 2004 *European Health Interview Survey* (EHIS). For the 12 countries for which the three data sources offer information, the EU-SILC shows the lowest variability among countries (the coefficient of variation is 0.237 in the EU-SILC compared to 0.471 in the LFS and 1.46 in the EHIS), which may suggest that the database we use better captures the disability condition.

Table 1. Population over 16 years old with a chronic condition, limitations of daily activities and disability condition in Europe (2008)

| | Chronic condition (%) | Limitations of daily activities (%) | | Disability (%) |
|---|---|---|---|---|
| | | Yes, limited | Yes, strongly limited | |
| Austria | 32.6 | 19.0 | 10.6 | 9.8 |
| Belgium | 24.4 | 15.9 | 6.6 | 5.7 |
| Bulgaria | 23.7 | 11.1 | 4.5 | 3.8 |
| Cyprus | 26.2 | 11.8 | 6.3 | 5.9 |
| Czech Republic | 27.2 | 16.4 | 5.4 | 5.3 |
| Germany | 36.2 | 22.4 | 10.4 | 9.7 |
| Denmark | 26.6 | 18.9 | 8.5 | 7.2 |
| Estonia | 37.8 | 20.7 | 9.5 | 9.4 |
| Spain | 30.6 | 17.6 | 5.4 | 4.9 |
| Greece | 22.1 | 11.5 | 8.1 | 7.9 |
| Hungary | 38.2 | 18.8 | 10.1 | 10.0 |
| Ireland | 24.0 | 14.3 | 5.4 | 4.9 |
| Iceland | 27.5 | 5.4 | 10.2 | 10.2 |
| Italy | 22.3 | 19.4 | 8.0 | 6.8 |
| Lithuania | 28.4 | 17.7 | 7.1 | 6.7 |
| Luxembourg | 24.2 | 13.6 | 7.0 | 4.7 |
| Latvia | 33.5 | 24.8 | 7.5 | 7.3 |
| Netherlands | 33.6 | 22.8 | 6.7 | 6.3 |
| Norway | 33.5 | 10.6 | 7.0 | 6.7 |
| Poland | 31.1 | 15.3 | 6.4 | 6.1 |
| Portugal | 33.8 | 18.4 | 11.9 | 11.2 |
| Romania | 19.2 | 12.3 | 6.7 | 6.2 |
| Sweden | 35.5 | 10.3 | 8.1 | 8.1 |
| Slovenia | 42.8 | 17.4 | 10.9 | 9.8 |
| Slovakia | 29.1 | 23.1 | 10.7 | 10.0 |
| United Kingdom | 32.5 | 11.0 | 8.4 | 8.4 |
| | | | | |
| Unweighted mean | 29.8 | 16.4 | 7.9 | 7.4 |
| Standard deviation | 5.9 | 4.7 | 2.1 | 2.1 |

Source: Authors' analysis from EU-SILC 2008.

## 3. METHODOLOGY

The extra cost that disability imposes on households has been studied from different perspectives, which are associated with different research strategies.[9] The subjective-

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[9] For a survey on the different strategies, see, for instance, Indecon (2004), Wilkinson-Meyers *et al*. (2010) and WHO (2011).

direct approach, the most straightforward procedure, consists in asking disabled people (or experts) what the costs of having a disability are. The main limitation of this method is that the respondents can hardly make an accurate estimation of how much they would spend on common goods everyone purchases if they were not disabled (Zaidi and Burchardt, 2000). Some studies using this approach are Martin and White (1988) and Wood and Grant (2010) for the UK and the report of Indecon (2004) for Ireland, which offers a set of estimates for specific types of disability according to several assumptions and another one based on a detailed survey on disabled people (whose response rate was less than 20% and whose size was less than 300).

The second possible strategy relies on the study of the consumption patterns of both the disabled and the non-disabled population, identifying those items disabled people spend more on controlling by income. This approach has usually been applied to evaluate the extra costs associated with certain items, as Matthews and Truscott (1990) and Jones and O’Donnell (1995) do for the British case and Mitra, Findley and Sambamoorthi (2009) and Anderson *et al*. (2010) for medical expenses in the United States. Although this method overcomes several limitations of the subjective-direct approach, it presents a serious shortcoming: the estimated cost of disability is constrained by the income of disabled people; in other words, they only report how much they actually spend, so it is not possible to measure the potential cost of disability.

The third and last approach is the so-called standard of living approach. This method is based on comparing the income levels of households with and without disabled members with the same level of welfare. The extra income required by households with disabled members for achieving such level of welfare represents the extra cost of disability. This method has usually received good reviews because of the robustness of the results obtained (Indecon, 2004, Tibble, 2005).

Furthermore, it is worth mentioning that, some authors (Wilkinson-Meyers *et al*., 2010) have recently proposed to benefit from the strengths of each method, in a process that would involve looking at the specific needs of disabled population with the advice of a panel of experts, confronting such estimation of the costs with a focus group of disabled individuals and, finally, validating the model using wide surveys.

In this article, we follow the third methodology, the standard of living approach, (from now on subjective-indirect), which has been the most popular one in an otherwise spare literature (Zaidi and Burchardt, 2000, Indecon, 2004, She and Livermore, 2007, Saunders, 2007, Braithwaite and Mont, 2009, Cullinan, Gannon and Lyons, 2011). This method consists in estimating the effect of income and disability on welfare in order to determine how much income is needed to compensate for the existence of members with disability in the household, given a level of welfare. In practice, the method can be operationalized estimating a model such as:

$$W_i = \alpha Y_i + \beta D_i + \gamma X_i + \varepsilon_i \qquad [1]$$

where $W_i$ is a variable that denotes the welfare level or standard of living of household $i$, $D_i$ is a dummy variable indicating whether or not there are disabled members in the household, and $X_i$ is a vector that includes an intercept and a set of variables capturing socio-demographic characteristics of households (head sex, head age –using several dummies-, head marital status, head migrant status, head pensioner condition, household size, number of children of 0-4, 5-10 and 10-13 years old and housing tenure status).[10] In the equation presented above, the relationship between welfare, income and disability is linear, which implies that the cost of disability in terms of income is given by a fixed monetary amount represented by $-\beta/\alpha$. Obviously, such a relationship can be modeled in alternative ways, including income in logs, squared or even interactions between both variables. A specification including income logs, for instance, assumes not only decreasing returns to income in terms of welfare but also that the cost of disability is a constant proportion of income. Although in the process of research we tried several alternative specifications, we finally opted for a specification where income was modeled in logs, which proved to be the one that best fitted data according to several statistical criteria described below.

One of the main issues of concern in the standard of living approach is how to determine households' welfare disregarding income data. Following the spirit of Zaidi and Burchardt (2005), we proceed in two ways. Firstly, we consider as welfare indicator the response given by household heads to the question regarding the ability of the households to make ends meet with their current income. The possibilities for answering this question were: "with great difficulty", "with difficulty", "with some difficulty", "fairly easily", "easily" and "very easily". In order to fit the model, we use

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[10] The set of variables included in the analysis is similar to the ones used by other works in the literature such as Indecon (2004), Zaidi and Burchardt (2005) and Cullinan, Gannon and Lyons (2011).

an ordered *logit*, which assumes the existence of an underlying and unobservable variable (welfare), which is codified into intervals that determine categories that are fully observed by the researcher. As is well-known, this type of model is estimated using maximum likelihood methods. In order to choose between different specifications of the model, we use the Akaike and Bayesian Information Criteria, which suggest that including income in logs is the most appropriate strategy. The phrasing of the question used to construct the welfare indicator is similar to the questions used in comparable studies for other countries.[11]

Secondly, we construct an indicator aiming to capture welfare using information on assets of households. One possibility is to simply count the number of assets and fit a negative binomial regression model. However, this method reveals problems of convergence for some countries, hindering the comparability of the analysis. Another option is grouping the assets and considering that a certain number of them determine a given level of welfare. For example, 4 items can be interpreted in terms of a low level of welfare, and 15 items a large level. This strategy, used by Zaidi and Burchardt (2005), Braithwaite and Mont (2009) and Cullinan, Gannon and Lyons (2011), give rise to problems of convergence similar to those found in the negative binomial regression. We therefore used a third and quite pragmatic approach: we carried out a principal component analysis (PCA) of 15 different items/assets or dimensions of the households in the sample. The first principal component obtained by this procedure, which accounts for as much of the variability of the data as possible and can be considered as a good way of estimating household welfare (Filmer and Pritchett, 2001), is taken as the dependent variable of the equation [1], which is thus estimated by OLS with robust standard errors. For comparability purposes with the first approach, we also estimate the model including income in logs. The following items, those on which there is available information in the SILC, were selected for carrying out the analysis:

- Capacity to afford paying for one week annual holiday away from home.
- Capacity to afford a meal with meat, chicken, fish or vegetarian equivalent every second day.

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[11] The question is quite similar to the question included in the European Community Household Panel used by Cullinan, Gannon, and Lyons (2011). Zaidi and Burchardt (2005) use as well a very similar question taken from the British Household Panel Survey, along with another one asking whether the interviewed household can save. Sea and Livermore (2007) and Saunders (2007) test several questions in the same spirit (food insecurity or ability to pay bills, meet expenses, pay rent or mortgage and get medical care, among others).

- Capacity to meet unexpected financial expenses.
- To have a telephone.
- To have a colour television set.
- To have a computer.
- To have a washing machine.
- To have a car.
- Not to have any natural light problems at home.
- Not to have any noise problems at home.
- Not to have any pollution or environmental problems.
- No crime or violence in the area.
- Not to have a leaking roof, damp walls, floors or foundation or rot in window frames and floor.
- To be able to keep home adequately warm.
- Not to be in a crowded household (defined as that with two or more people per room).

The use of two different methodologies –a choice also made by Zaidi and Burchardt (2005)- aims to assess how robust the findings are to the approach chosen to measure household welfare. In the first case, the question is of a more "subjective nature" (since the household self-reports its ability to meet ends), while the second one can be considered as a more "objective" approach, since it only relies on a household's assets and services. Nevertheless, even in the latter option, the welfare variable can be contaminated by differences in preferences.

## 4. RESULTS

Before presenting the results of the empirical analysis, it is advisable to look at the main descriptive statistics of the sample, namely, the proportion of households with people with any chronic condition, the proportion of households with people with intense limitations of their daily activity and, finally, the percentage of households with disabled members (according to the definition presented above) (Table 2).

The estimated cost of disability (with their corresponding 95% confidence intervals) in the 26 countries included in the study is displayed in Figures 1 and 2. The detailed econometric results –comprising 52 econometric analyses (2 models and 26 countries)- are omitted for brevity but they are available from the authors upon request.

In the first place, it should be mentioned that, overall, the magnitude of the costs is quite similar in both models, between 21% and 99% of household income in the first approach and between 20% and 132% according to the second one. Nevertheless, there are very important differences for particular countries, such as the Netherlands, Denmark, Romania or Spain, among others. In the second place, although it is not easy to extrapolate a clear pattern from the results, several facts can be highlighted. For example, in both estimations Scandinavian countries, headed by Norway, lead the ranking of the costs of disability, while at the bottom, in general, are Eastern European countries and Luxembourg. The next section tries to outline several explanations for these patterns.

Table 2. Main descriptive statistics of the database

| | Observations (No. of households) | % of households with people with chronic illnesses or conditions | % of households with people with intense limitations | % of households with disabled people |
|---|---|---|---|---|
| Austria | 6,078 | 49.4 | 17.9 | 16.6 |
| Belgium | 6,793 | 38.2 | 11.7 | 10.2 |
| Bulgaria | 4,772 | 46.0 | 10.8 | 9.2 |
| Cyprus | 4,045 | 45.8 | 13.3 | 12.3 |
| Czech Republic | 12,361 | 40.4 | 9.3 | 9.1 |
| Germany | 13,672 | 49.3 | 14.9 | 13.8 |
| Denmark | 6,036 | 26.6 | 8.4 | 7.1 |
| Estonia | 5,443 | 54.4 | 16.3 | 16.1 |
| Spain | 14,719 | 50.6 | 11.3 | 10.3 |
| Greece | 7,276 | 37.4 | 15.7 | 15.5 |
| Hungary | 9,798 | 59.2 | 19.0 | 18.9 |
| Ireland | 5,766 | 43.4 | 11.3 | 10.5 |
| Iceland | 3,231 | 27.1 | 10.1 | 10.1 |
| Italy | 23,237 | 36.4 | 14.7 | 12.6 |
| Lithuania | 5,242 | 44.6 | 13.4 | 12.6 |
| Luxembourg | 4,091 | 38.4 | 13.2 | 8.9 |
| Latvia | 5,647 | 54.8 | 15.4 | 14.8 |
| Netherlands | 10,866 | 33.0 | 6.5 | 6.1 |
| Norway | 5,829 | 33.3 | 6.9 | 6.5 |
| Poland | 16,489 | 52.5 | 13.7 | 13.2 |
| Portugal | 4,938 | 55.4 | 22.8 | 21.4 |
| Romania | 8,562 | 35.2 | 14.5 | 13.5 |
| Sweden | 7,942 | 35.2 | 8.0 | 8.0 |
| Slovenia | 11,352 | 41.0 | 10.4 | 9.3 |

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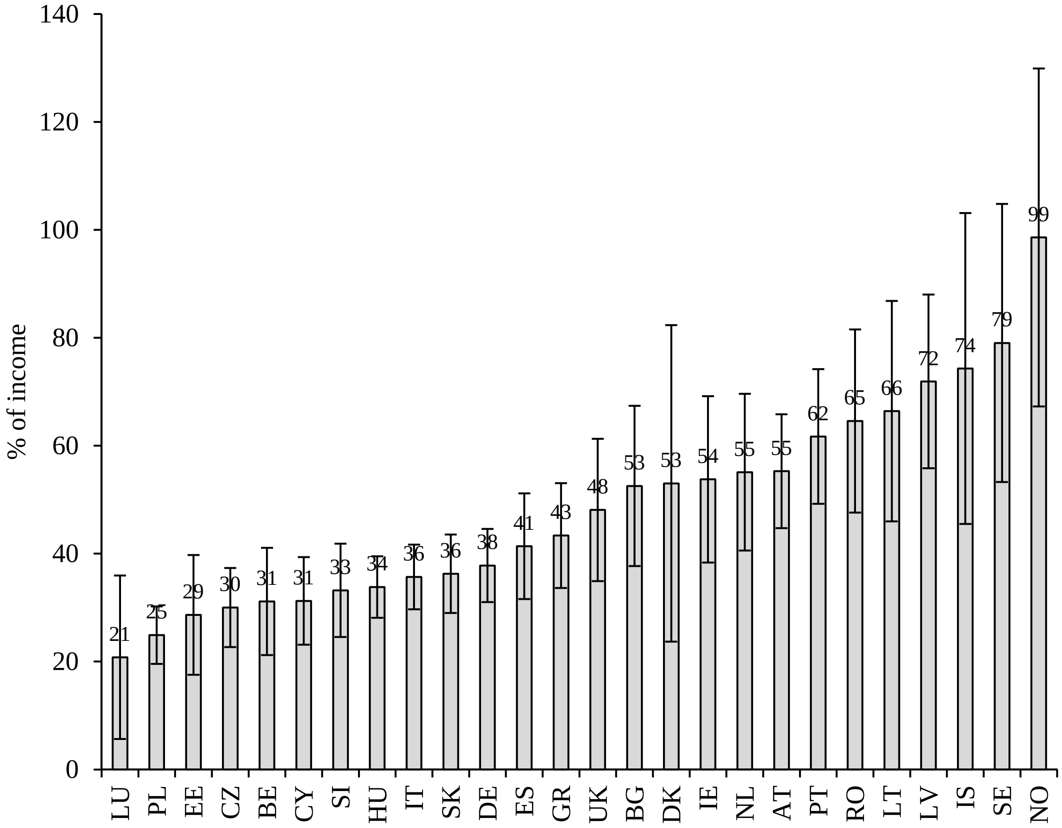
Source: Authors' analysis from EU-SILC 2008.

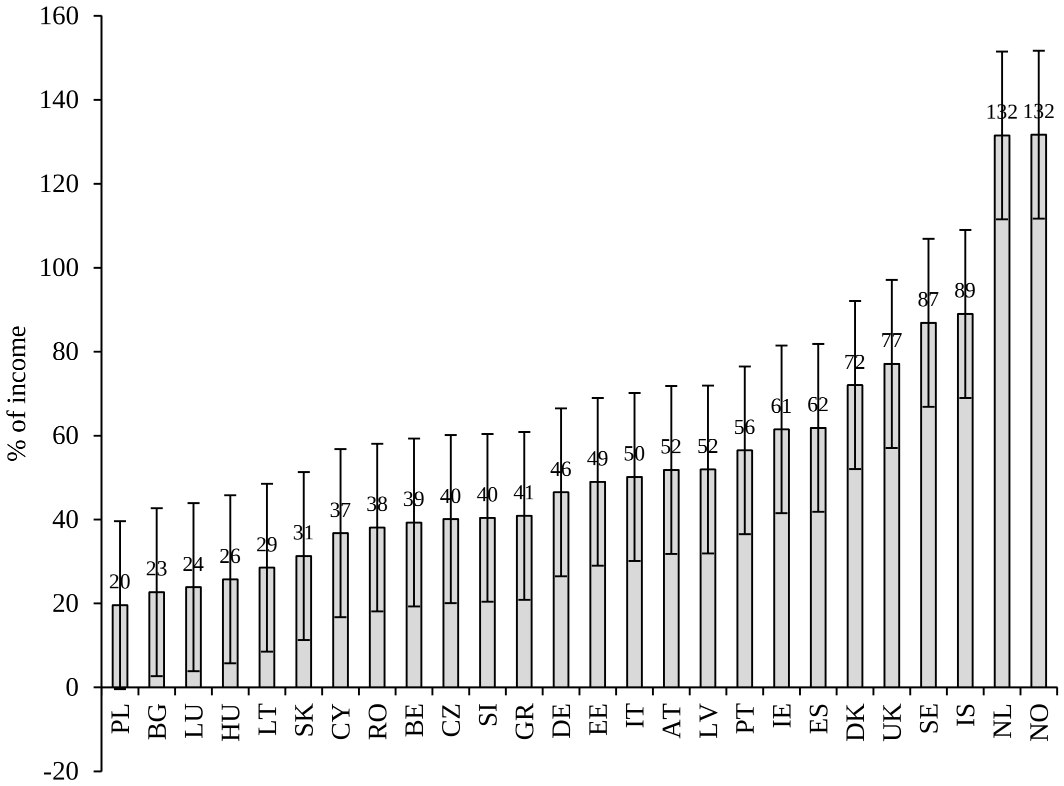
Figure1. The estimated cost of disability across the European Union (welfare based on reported ability to make ends meet)



Note: Interval confidences calculated at the 95% confidence level.

Source: Authors' analysis from EU-SILC 2008.

Figure 2. The estimated cost of disability across the European Union (welfare based on PCA of households' assets)



Note: Interval confidences calculated at the 95% confidence level.

Source: Authors' analysis from EU-SILC 2008.

In order to check the robustness of our findings, we repeat the analysis changing the definition of disability, making it less demanding, and performing again the calculations using both sorts of strategies (the question about how people make ends meet and the welfare indicator based on households' items). The alternative definition of disability includes those individuals who report suffering a chronic illness and being limited to a certain degree or intensively. This broader concept obviously increases the percentage of households with disabled members. The results obtained using this alternative definition are available upon request and are very similar to the ones reported above. In this respect, the correlation (displayed in Table 3) between the results obtained using the method based on the question regarding the ability to make ends meet and the one that relies on households' assets is around 0.5 in the case of intense limitations of daily activity (model I *versus* model II) and more than 0.6 when people with intense or mild limitations or daily activity are considered as disabled (model III *versus* model IV). In the second place, there is barely any difference when we compare the results by definition of disability, that is, the correlation between the models based on the question on the ability to make ends meet (model I *versus* model III) and those based on households' assets (model II *versus* model IV) is remarkably high, around 0.9. Nevertheless, it is worth mentioning that the differences according to the way welfare is measured are larger than those reported by Zaidi and Burchardt (2005) for the UK, who obtain similar findings both for the subjective question on ability to make ends meet and the approach based on households' items.

Table 3. Parametric and non-parametric correlation among outcomes of the different models

Pearson's correlation coefficient (parametric)

| | Model I | Model II | Model III | Model IV |
|---|---|---|---|---|
| Model I | 1.000 | | | |
| Model II | 0.647 | 1.000 | | |
| Model III | 0.876 | 0.605 | 1.000 | |
| Model IV | 0.565 | 0.913 | 0.647 | 1.000 |

Spearman's rank correlation coefficient (non-parametric)

| | Model I | Model II | Model III | Model IV |
|---|---|---|---|---|
| Model I | 1.000 | | | |
| Model II | 0.606 | 1.000 | | |
| Model III | 0.844 | 0.522 | 1.000 | |
| Model IV | 0.537 | 0.951 | 0.638 | 1.000 |

Notes:

- Model I is based on intense limitations of daily activity and the question about ability to make ends meet; model II is based on intense limitations of daily activity and households' assets; model III is based on mild or intense limitations of daily activity and the question about ability to make ends meet; definition 4 is based on mild or intense limitations of daily activity and households' assets.
- All the correlation coefficients are significantly different from zero at the 1% level.

Source: Authors' analysis from EU-SILC 2008.

## 5. DISCUSSION

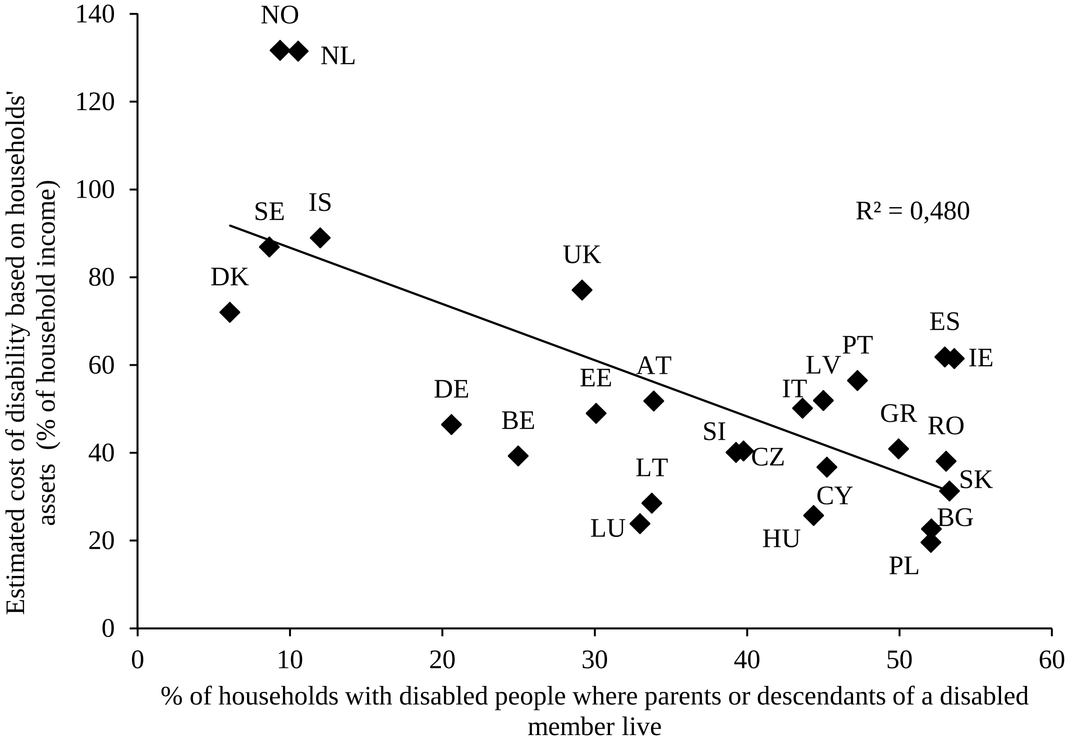
The results presented in the previous section show the existence of important variations in the extra cost of disability across the European countries of the sample. There are alternative explanations behind such differences that we discuss below.

In first place, part of the differences might be related to measurement problems related to the subjective nature of the disability data used in the analysis. As can be inferred from Table 1, some countries, notably Hungary, Estonia, Portugal or Slovakia, Austria and Germany declare much higher strong disability rates, around 10% or higher, than countries such as Denmark, the Netherlands or Slovenia, with strong disability rates around 5%. It could be argued that some of the differences respond to the different concept of disability applied by the respondent when filling in the survey questionnaire. If that were the case, those countries with high "statistical" disability rates would show a lower cost of disability, as part of the population considered disabled is not really so, showing therefore zero or very low extra cost and bringing down the estimated average cost of disability. We have tested whether there is a negative correlation between the strong disability rate and the cost of disability and, although such a relation holds for specific countries such as Germany (high disability rate and low disability cost, or Denmark, the opposite), it does not hold for the full sample.

The second possible explanation considered is related to one of the methodologies used, the so called subjective-indirect. As was explained in section 3, this methodology compares the ease or difficulty that different households have in making ends meet with their current income, interpreting the differences in the ability of otherwise identical households but for the presence of one of more members with disabilities in terms of the cost of the disability. It can be argued that the ability to make ends meet will be affected by the expectations of the households of what they are entitled to do (what they want to do). If that is so, then societies with a strong feeling of equal rights for disabled people and a strong culture of equality might breed higher expectations and demands in households with disabled members and correspondingly higher disability cost. This could explain the high cost of disability in countries with a strong social-democratic tradition of equal opportunities such as Denmark, Sweden or Norway. This argument seems sound, but in order to serve as a reasonable explanation of the observed differences in disability costs, such differences should only be present in the subjective-indirect method, and not in the second objective method. As that is not the case, we must also reject this second explanation as a prime hypothesis for the results found.

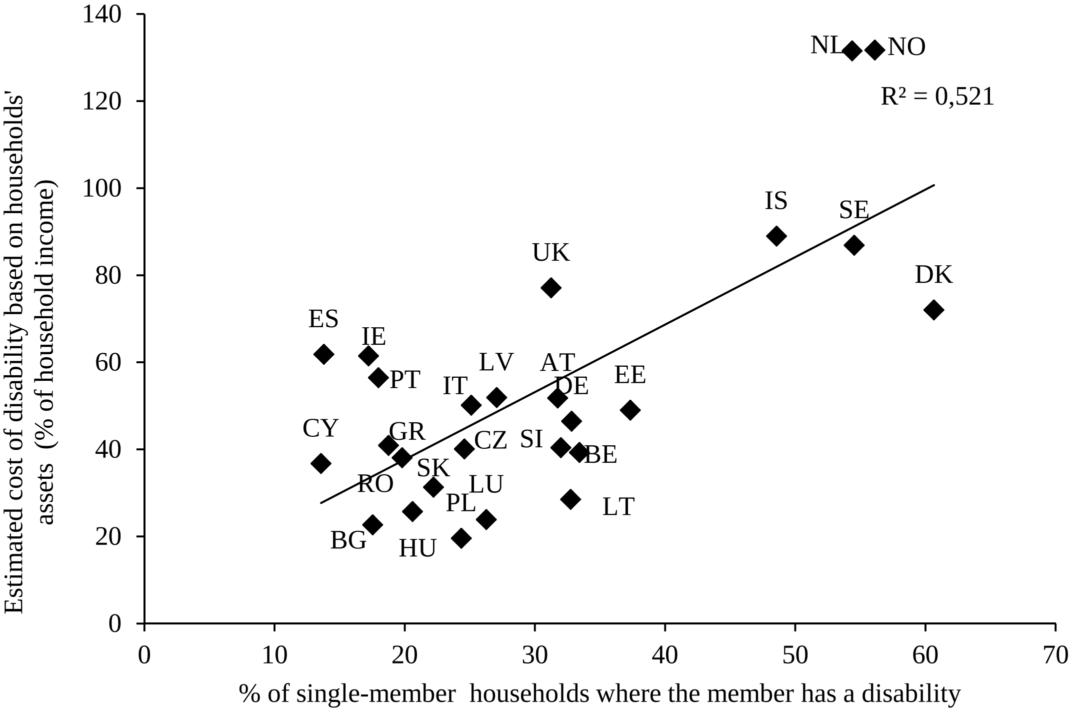
The last explanation considered is the different living arrangements of individuals with disabilities and patterns of caring for disabled people across Europe. Particularly, there are very important differences among the characteristics of households with disabled members in the countries of the sample. It can be argued that when people with disabilities live with parents or children who care for them, an important share of the extra cost of disability is covered by them through non-market– and non-publicly financed- care. In contrast, if people with disabilities live on their own in single households, then they will be more dependent on services brought from outside the household and, hence, such costs will be more visible to our estimation method. In order to test this hypothesis, we present several plots using cross-country data that support it. Such figures are based on model II (the approach based on model I yields similar but somewhat weaker correlations). Firstly, as shown by Figure 3, there exists a negative correlation between the percentage of households with disabled members where disabled people share residency with parents or descendants and the estimated cost of disability. Figure 4 complements the information of the previous graph by pointing out a positive correlation between the proportion of households with disabled members where a disabled member lives alone and the cost of disability. Both figures show that, on average, those countries with a higher estimated cost of disability are also countries where disabled people tend to live more on their own. This evidence could be explained by the fact that part of the cost of disability would be higher for people who live alone because they need extra monetary resources to cover for their disabilities in terms of mobility, household duties, etc. that otherwise could be taken care of by other members of the household (outside of the market).

Figure 3. Percentage of households with disabled members where disabled people share residency with their parents or descendants and estimated disability cost



Source: Authors' analysis from EU-SILC 2008.

Figure 4. Percentage of single-member households where the member has a disability



Source: Authors' analysis from EU-SILC 2008.

In other words, it becomes clear that in countries where disabled people live alone and do not share a household with their relatives (the potential and actual care givers for the disabled population and children in many European countries) and therefore do not profit from non-market services provided by the family, the cost of disability is higher. Not by chance, those countries where households with disabled members seem to support the heaviest load are also countries that have established more generous disability social protection systems. As depicted in Figure 5, there is a positive correlation between the "generosity" of disability protection programs of the different countries and the cost faced by a household with handicapped people and the median income (the $R^2$ rises up to 0.64 if one removes Luxembourg, a clear outlier).[12] One interpretation of such a relation is that social protection systems try to respond to different needs. An alternative interpretation might be that it is precisely the existence of such generous systems what allows people with disabilities to live on their own and not to be forced to be dependent on family care. A more eclectic view simply assumes that both issues (the cost of disability and disability benefits) are likely to be jointly determined, partly because living arrangements and the Welfare State are embedded in institutional and social frameworks. In this respect, it is worth making a reflection on the types of magnitudes we are dealing with. Throughout this article we have been referring to a purely monetary concept of welfare. It is plausible to assume that people with disabilities who are able to live on their own in places such as the Netherlands or the Nordic countries enjoy some non-pecuniary but valuable compensation through a higher autonomy and a greater freedom of choice, as they are not forced to depend exclusively on their relatives' care. Some of these rewards could also be shared by their families, who would thus enjoy a greater degree of freedom when deciding whether to act as their caregivers or not.

A last remark to be made in this section refers to Luxembourg and its position at the bottom of the rankings. The low cost in the Grand Duchy can be interpreted as a result of an extremely high per capita income, closely related to the well-known particularities of the country, which makes the cost of disability a lighter load for national households.

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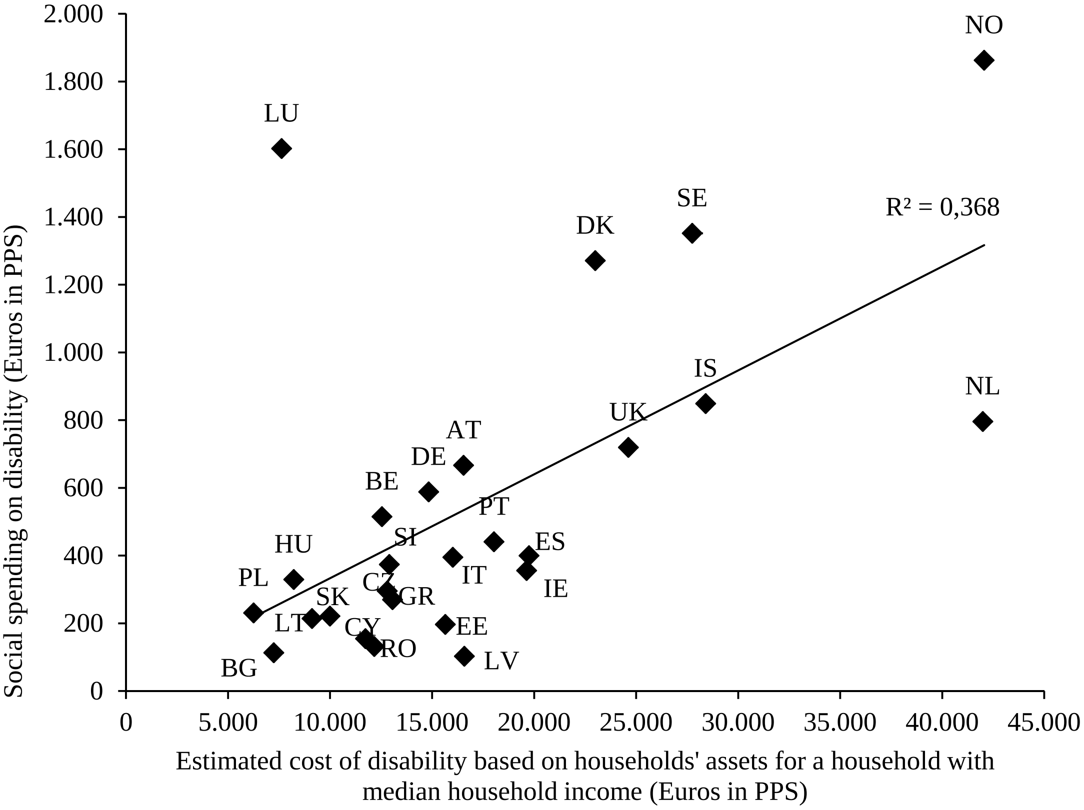
[12] According to the econometric log specification used in the article, the cost of disability as proportion of disposable income is constant. The cost of disability in Euros in PPS has been calculated for a household with the median income, which can be considered as representative. The correlation obtained when using the mean income is exactly the same.

Figure 5. Percentage of single-member households where the member has a disability



Source: Authors’ analysis from EU-SILC 2008.

## 6. CONCLUSION

The aim of this paper has been to present for the first time a comparative analysis of the cost of disability in Europe using the EU-SILC 2008. Because of its comparative ambition, the work has also served to test the usefulness and appropriateness of the standard of living method itself in that it has provided results reasonably consistent with economic theory. The study was based on the so-called standard of living approach, using two different methodologies (one based on self-reported ability to make ends meet and the other associated with access to several items, assets and services). The first important finding of the study is that there is a significant diversity in the cost of disability as it varies across European countries. The overall pattern show Scandinavian countries at the top of the ranking and Eastern European states at the bottom. The second contribution of the article is related to the discussion of these explanatory patterns. After rejecting other hypotheses that could help to interpret the results found, such as the different expectations of people with disabilities in different countries, or problems related to mis-measurement of disability rates, our analysis suggests that the cost of disability is related to the living arrangements of handicapped people, that is, those who live with their relatives can enjoy some services and goods for free, while disabled people living on their own have to face higher costs and do not profit to the same extent from free care provided by the family.

Nevertheless, there is a long way to go in the study of the cost of disability in both developed and developing countries. Disability is a quite common phenomenon in Europe and is likely to be a more and more important problem in the coming decades because of the ageing population. In this sense, several further research lines can be suggested. Firstly, the findings could be reinforced by the use of databases that, apart from income, contain more detailed and objective information on the health conditions of individuals (even if self-reported), information which was not available when writing this paper. In the second place, research into the extra costs of disabilities could profit from the joint use of alternative methods of estimation (without being restricted to the use of a single approach), combining quantitative and qualitative methods. Third, the EU-SILC database itself offers the possibility of studying the impact of disability on living conditions from a longitudinal perspective. In this respect, it seems particularly relevant to explore the links between poverty and disability across Europe.

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