# The Health of Disability Insurance Enrollees: An International Comparison

Enrica Croda
Department of Economics
Ca' Foscari University of Venice
Cannaregio, 873 - 30121 Venice (Italy)
enrica.croda@unive.it

Jonathan Skinner
Department of Economics
Dartmouth College HB 6106
Hanover NH 03755
jon.skinner@dartmouth.edu

Laura Yasaitis
Harvard Center for Population and Development Studies
9 Bow Street, Cambridge MA 02138
yasaitis@gmail.com

September 2015

## Abstract

Rising costs of disability insurance (DI) programs are putting increased strain on central government budgets across nearly all developed economies. Yet there are few objective comparisons across countries of how well DI programs target those in the poorest health. In this paper, we use the Survey of Health, Ageing, and Retirement in Europe (SHARE) and the Health and Retirement Study (HRS) in the United States during 2004-10 to measure the health of people aged 50-64 receiving disability insurance, as well as the prevalence of people in poor health receiving DI (or any other assistance). Using these two measures, we find that U.S., Swedish, and Danish DI programs are most successful at targeting benefits to those in the worst health, with France, Germany, and Italy less so. We also find that in countries with scaled-back DI programs, such as the Netherlands, there was also a temporal decline in the fraction of people in poor health receiving government assistance.

This research was supported by the U.S. Social Security Administration through grant #1DRC12000002-01-00 to the National Bureau of Economic Research as part of the SSA Disability Research Consortium. We are also grateful to the National Institute on Aging (PO1 AG019783) and to the SHARE consortium for data use (see Footnote 2). We thank Steven Venti and David Wise for kindly providing us with the programming code to construct the PVW health index, and Dana Blumin, Lans Bovenberg, Danilo Cavapozzi, Dimitris Christelis, Juergen Maurer, Ellen Meara, Erik Meijer, Michael Schoenbaum, Douglas Staiger, David Wise, and Steven Venti for very helpful comments. Luca Gerotto provided valuable research assistance. The findings and conclusions expressed are solely those of the authors and do not represent the views of SSA, any agency of the Federal Government, or the NBER.

## 1. Introduction

There are large variations across countries in the fraction of the population receiving disability insurance (DI) payments, ranging from 3.3 percent in Italy and 3.8 percent in Spain, to 8.2 percent in the Netherlands and 10.3 percent in Sweden.[1] Most countries are concerned about disability insurance enrollment, and the resulting pressure on public sector budgets in Europe and the United States (European Commission, 2006; OECD, 2003, 2010; McVicar, 2008; Leibman, 2015).

Previous literature suggests that institutional features of disability programs reflecting ease of being accepted and the generosity of benefits, are important determinants of the overall size of a country's DI program (Börsch-Supan, 2007, 2008, 2011; Milligan and Wise, 2012). Yet there is little or no information about the characteristics of disability insurance enrollees across countries – do programs with high enrollment rates accept more "gray-area" applicants who are in better health or who have better job opportunities than average? Or do smaller-than-average disability insurance programs fail to cover people with high rates of disability? More generally, how do country-level disability programs "sort" applicants with regard to underlying health status versus other factors that may include employment opportunities or other factors extrinsic to health and job prospects?

Pioneering work by the OECD (2003, 2010) has categorized DI programs along dimensions such as the severity of disability needed to qualify, the duration and size of the compensation, and types of vocational and employment support, summarized by numerical scores giving equal weight to each dimension. Yet the equal weighting of qualitative

[1] These estimates are from the OECD Social Expenditure Database for 2008, just prior to the great recession, except for Italy, which is from 2007.

assessments reflecting official legislation may not capture how these systems operate on a day-to-day basis.

In this paper, we introduce country-level measures that capture the quantitative, rather than qualitative, characteristics of disability programs. We base estimates on micro-level data from the Health and Retirement Study (HRS) and the Survey of Health, Ageing, and Retirement in Europe (SHARE) for a set of 10 European countries and the United States for people between ages 50-64. Our approach to measuring quantitative aspects of disability programs is based on an earlier literature that focused on the design of income assistance programs that most efficiently *targeted* those who were in the most abject poverty (e.g., Besley and Kanbur, 1993). In a similar way, we seek to measure the extent to which a country's disability program targets those in the poorest health.

There are a variety of approaches to quantifying the extent to which disability programs target those in poor health. We adopt two approaches. The first is simply a measure of the average (percentile) health status among those receiving disability insurance. We hypothesize that the average health percentile will be higher in countries with larger DI programs, consistent with the idea that larger programs will (almost mechanically) enroll at the margin from a healthier population, but that this approach still allows us to compare countries with similar sized programs. The second is a measure that captures a different dimension of DI programs: the fraction of people in the bottom decile of the health distribution covered by DI, or whether the disability "safety net" covers those in the worst health.

There are substantial challenges to measuring the extent of disability (see Mitra, 2005). We consider several approaches based on new developments in the optimal indexing of multiple health characteristics. Specifically, we exploit the richness of health-related information

available in both SHARE and HRS, to construct three different health indices following the principal components methodology used by Poterba, Venti and Wise (2010, 2011, 2013). These indices measure the health of disability insurance enrollees as a percentile of the country-specific distribution of health for those aged 50-64, and thus adjust for differences across countries in how individuals respond to survey questions about health and disability (e.g., Kapetyn, Smith and van Soest, 2009). Our first index is based on the variant of their index proposed in Poterba, Venti and Wise (2013), expanded to include the SHARE data. We refer to this as PVW. The PVW index was originally designed to capture an overall measure of health and capacity for work. Our second index of health, uses the same principal component methodological approach of PVW, but is based more on questions instead that measure functional ability, as in Mont and Loeb (2011); we refer to this as ML. Third, we use a similar principal component approach to create a mental health index/depression (MHD) index, to capture the severe impact of mental disorders on employment even when the individual is healthy along other dimensions (OECD,2012). Finally, we also consider a fourth hybrid summary measure that is the *minimum* of these three indices, suitably rescaled in percentile terms.

We first consider the pooled survey data from the 2004-2010 SHARE and HRS waves, so that our characterizations of countries reflect the stock of DI recipients. Our results suggest large differences across countries in the health status of people receiving DI benefits. Consider for example two countries with similar sized DI programs, the U.S. (9.9 percent of the 50-64 population in 2010) and Belgium (9.4 percent). We find that the average percentile of health for DI enrollees in the US is 13.6 percent; for Belgium 24.8 percent (using the PVW index). This means that, for the same fraction of people on DI, those in the US DI program are, on average, in considerably worse health.

The fraction of people in the bottom decile of the health distribution who are covered by DI also differs across countries, ranging from France, with about one out of ten recipients in the bottom health decile (12.2 percent), to the Netherlands (45.4 percent) and the U.S. (48.3 percent), with about half of the recipients in the bottom health decile, to Denmark (56.6 percent), and Sweden (63.1 percent) showing a substantially higher fraction of people in the bottom decile of health receiving DI benefits. These results hold up even when we include additional early retirement programs that could substitute for DI insurance (e.g., Borghans et al., 2014).

Whether we use the Poterba, Venti, and Wise index, or our other three measures, we find much the same result; that the U.S. does a better job of targeting DI enrollment than do other countries, such as Belgium and Spain, with similar (per capita) sized DI program. Similarly, Denmark ranks highly with regard to targeting low-health individuals.

Perhaps countries use their disability programs to insure against poor labor market outcomes or jobs involving manual labor prior to retirement. In this more general model of disability insurance, we would expect to find that markers for less favorable labor market opportunities, such as low educational attainment, might increase the likelihood of qualifying for disability insurance, conditional on health status. However, except for Denmark, low educational attainment (relative to tertiary education) has little impact on the likelihood of DI enrollment, conditional on health. This result is consistent with Denmark's recognition as a country with "best practice" DI programs (according to OECD, 2009) that help to keep disabled people with better employment opportunities in the labor force.

Finally, we can track how well these micro-based measures capture the impact of DI reforms that effected restrictions in the existing program, or that experienced continued growth.

For example, de Jong et al. (2013) and Koning and Lindeboom (2015) have shown that more intensive screening of disability applicants in the Netherlands led to improved targeting of recipients; lower disability rolls with little offsetting flows of workers into unemployment insurance applications. They also find, as we do, that the reforms have tended to reduce slightly the share of people in the bottom decile of health that are covered, while in the U.S. that share has increased.[2]

## 2. Model and Estimation

The general theory of targeting is straightforward; a given level of social spending should be targeted to those in greatest need. For example, in the case of poverty alleviation, targeting is diluted when higher-income households receive financial transfers, or when truly poor households fail to receive these transfers. The problems arise when the objective of the transfer program, to alleviate poverty, leads to adverse incentives that lead to greater revenue costs and inadequate provision of benefits, for example when recipients change their behavior in order to qualify for the transfer or a larger cash payment from the program (Besley and Kanbur, 1993). These issues of incentive compatibility arise as well in disability insurance programs, which are further complicated by the inability to even measure health, or functional capabilities in the sense of Amartya Sen (Sen, 1989; Mitra, 2005; Mont, 2007). Thus countries may optimally (or sub-optimally) adopt a variety of different approaches for transferring resources to the disabled, but aside from qualitative information on government policies (OECD, 2003, 2010), there is little quantitative evidence across countries on characteristics of individuals who qualify (or who do not qualify) for disability insurance.

[2] We are currently preparing 2012 data to capture subsequent changes after 2010.

To fill this gap, we consider a general model of disability application (and acceptance), and its empirical implementation. The objective of disability insurance is to provide financial support for those with mental or physical disabilities leading to poor market opportunities and the need for financial assistance. We consider two versions of the model. In the simplest version, we assume that the primary determinant of whether the individual receives disability insurance is health status. Of course, health status is a complex multi-factorial concept, and we consider several approaches to measuring health status below.

DI receipt occurs through a two-step process. First, the individual chooses to apply for DI insurance, and then the application is reviewed (and perhaps initially rejected) by the DI agency. Thus receipt of benefits is the product of the binary variable of whether one applies, and whether the application is approved. Our reduced form model of this two-step process is:[3]

$$
\begin{aligned}
& Y_{ij}^{*} = \beta_j X_{ij} + \alpha_j (h_{ij} - H_j) + u_{ij} \\
(1) \qquad & Y_{ij} = 1 \quad if \quad Y_{ij}^{*} > 0 \\
& Y_{ij} = 0 \quad otherwise
\end{aligned}
$$

where $Y_{ij}^{*}$ is a linear index for individual i and country j which, if positive, implies that the application (or receipt) $Y_{ij} = 1$ occurs, and where $Y_{ij}$ is zero otherwise, and $\sigma_j^2 = Var(u_{ij})$. The likelihood that $Y_{ij}^{*}$ is positive in turn depends on the health $h_{ij}$ of the individual, and whether it exceeds the country-specific benchmark $H_j$. (Note that better health corresponds to a higher h, which means that $\alpha_j < 0$.) Thus there are three key factors that determine the country level rate of people receiving DI. The first is the distribution of health status $h_{ij}$. Because of concerns about differences across countries in how disability is perceived and reported (e.g., Kaptyen,

[3] In the logistics model, it can be shown that the reduced form coefficients reflected weighted averages of the parameters related to application, and the parameters that determine the likelihood of acceptance given the application takes place.

Smith, and van Soest, 2009), we focus in this paper solely on the relative distribution of health within a country; thus $h_{ij}$ will in practice be considered in country-specific percentile terms (as in Poterba, Venti, and Wise, 2013; also see Meijer, Kapteyn, and Andreyeva, 2011 for a hybrid approach).

Second, countries may differ with regard to the "hurdle" or benchmark rate of health $H_j$, setting higher or lower standards for whether the individual's disability qualifies as sufficiently serious to warrant financial assistance. Clearly, a higher $H_j$ will lead to a larger population receiving disability. The third factor is the ratio $\alpha_j/\sigma_j$ which captures the ability of the disability program to target those with poor health. Since $\sigma_j$ is normalized to one in our probit regressions, we interpret $\alpha$ as the combined effect of both how much a specific factor matters, and how much error is present in the decision to award DI insurance.[4] At the extreme, if the application process is a pure lottery, the ratio will be zero, while if the selection process is nearly deterministic, the ratio will be large in magnitude.

More realistically, disability insurance applications and approvals could also be affected by job market opportunities; thus a college graduate with muscle weakness may be less likely to qualify for disability insurance compared to an individual who didn't finish high school. Therefore, we consider a more general model that includes labor market opportunities. In this case, the estimating reduced form equation can be written

$$
\begin{aligned}
& Y_{ij}^{*} = \beta_j X_{ij} + \alpha_j (h_{ij} - H_j) + \gamma_j (w_{ij} - W_j) + u_{ij} \\
(2) \qquad & Y_{ij} = 1 \quad if \quad Y_{ij}^{*} > 0 \\
& Y_{ij} = 0 \quad otherwise
\end{aligned}
$$

[4] For example, in probit models, the standard deviation of the error term is normalized to one.

where labor market opportunities are reflected in the potential market wage $w_{ij}$ relative to the country-specific wage deemed relevant for disability insurance, $W_j$. Given the difficulty in measuring wages for people not in the labor force, in the empirical analysis we proxy $w_{ij}$ using education. Since higher wages make DI insurance applications less likely, so $\gamma < 0$, and the ratio $\alpha/\gamma$ captures the relative importance of health versus market opportunities.

## 3. Data

We use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) and the US Health and Retirement Study (HRS) for the years 2004, 2006, and 2010 (waves 1, 2, and 4 for SHARE and waves 7, 8, and 10 for HRS).[5] [6] For Europe, we focus on the ten European countries that participated in every wave of SHARE. They are a balanced representation of the various regions in Europe, ranging from Scandinavia (Sweden and Denmark) through Western and Central Europe (the Netherlands, Belgium, France, Germany, Switzerland and Austria) to

[5] This paper uses data from SHARE wave 4 release 1.1.1 (March 2013), SHARE wave 1 and 2 release 2.5.0 (May 2011) and SHARELIFE release 1 (November 2010). The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (projects SHARE-I3, RII-CT-2006-062193, COMPARE, CIT5- CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Programme (SHARE-PREP, N° 211909, SHARE-LEAP, N° 227822 and SHARE M4, N° 261982). Additional funding from the U.S. National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see www.share-project.org for a full list of funding institutions).

[6] Most SHARE countries were on a harmonized bi-annual schedule. However, the schedule of fieldwork in the different countries depended on the timing of partially de-centralized funding. SHARE wave 1 was fielded mostly in 2004, with some interviews taking place in 2005. SHARE wave 2 was fielded in 2006 and 2007. SHARE wave 4 was fielded mostly in 2011 with some interviews taking place in 2010 and in 2012. In this paper we associate SHARE wave 1 with 2004, SHARE wave 2 with 2006, and SHARE wave 4 with 2010. The 2008 wave of SHARE (Wave 3- SHARELIFE), was designed to capture information about respondents' life histories, and contained very different questions from the other waves. We therefore excluded this year from both data sources.

the Mediterranean (Spain and Italy). Properties of the SHARE data, such as response rates and sample sizes, have been reported elsewhere (e.g., Börsch-Supan, 2007). About two-thirds of the variables in SHARE are identical to variables in HRS, and most of the remainder is fairly comparable (Börsch-Supan, 2007). Some transformations of the original variables have been necessary to ensure close comparability between the two data sets.

Disability insurance is defined as all branches of publicly financed insurances against the loss of the ability to perform gainful employment. Receipt of disability benefits is determined by responses to questions specific to each survey. For HRS respondents, we use a derived variable provided by RAND that describes the respondent's disability status in each wave. Respondents are considered to be receiving disability benefits if this variable indicates that they were currently receiving benefits from SSI, SSDI, or both. For SHARE respondents, we determine disability benefit receipt by recoding answers to country-specific questions about receipt of public disability benefits.[7]

Our analysis depends critically on measuring health status. Perhaps the most commonly used measure of health status is self-reported health. This indicator, however, has serious shortcomings in cross-countries comparative analyses, because of self-reporting bias (Kapteyn,

[7] Following Borsch-Supan (2007, 2011), the DI institutions considered in each country are the following: Staatliche Invaliditätspension in Austria, Assurance invalidité légale/Wettelijke uitkering wegens arbeidsongeval of beroepsziekte; Pension de maladie, d'invalidité, maladie professionnelle/Wettelijke uitkering wegens ziekte of invaliditeit of tegemoetkoming aan personen met een handicap in Belgium, Invalidenrente aus IV, assurance invalidité légale (AI) and Rendità invalidità (AI) in Switzerland, rwerbsminderungsrente and Beamtenpension wegen Dienstunfähigkeit in Germany**,** Offentlig sygedagpenge and offentlig førtidspension in Denmark, Pensión pública contributiva y no contributiva de invalidez/incapacidad in Spain, Prestation publique d'invalidité (AAH, APA) in France, Συνταξη αναπηρ ´ ´ιας in Greece, Assicurazione pubblica di disabilità (anche assegno di accompagnamento) and pnsione pubblica di invalidità o di inabilità in Italy, WAO, Waz of invaliditeitspensioen and Algemene bijstandswet (Abw), IOAW/IOAZ, aanvullende bijstandsuitkering, Toeslagenwet (TW) in the Netherlands, Förtidspension (sjukersättning), yrkesskadepension, and sjukbidrag in Sweden, SSDI and SSI disability pension in the United States (US) . See separate Data Appendix for further details (not yet completed).

Smith and van Soest, 2009). We, therefore, exploit the richness of health-related information available in both SHARE and HRS to create several health indices based on the methodology introduced by Poterba, Venti and Wise (2010, 2011, 2013).[8] Their approach views "true" health as a latent construct for which several noisy measures are available. So they start with a large number of variables that are assumed to be related to the underlying "true" health status, perform a principal component analysis on them and obtain the first principal component of these indicators. They propose to use this first principal component as health index measure.

We expand on this approach to allow for cross country comparisons. We pool data across years and perform separate principle components analyses for each country. We retain the first principal component and use this to create country- and year-specific percentile scores for each respondent. These percentile scores are strongly related to respondents' self-rated health, as well as their grip strength (a reliable indicator of health status available in the SHARE data), neither of which was included in the derivation of the index index.

Our main index, PVW herafter, follows closely the construction of the variant of their index proposed in Poterba, Venti and Wise (2013). We use 23 different items which provide a large amount of health-related information, including body mass index (BMI), nine indicators for functional health limitations (difficulties in walking 1 block -HRS- or 100 meters -SHARE-, sitting, getting up from a chair, climbing stairs, lifting heavy objects, picking a coin from a table, raising arms over head, pushing/pulling large objects), one indicator for having problems with at least one activity of daily living (ADL), indicators for having experienced chronic diseases or conditions (high blood pressure, diabetes, cancer, lung diseases, heart problems, stroke, arthritis, psychological problems), indicators for the use of health care services in the past year or two

[8] See Kapteyn and Meijer (2014) for an insightful review of alternative approaches.

(having visited a doctor, an hospital or a nursing home), and having had back pain. We do not include self-reported health, which instead is present among the indicators used by Poterba, Venti and Wise (2013).

To capture the complex relationship between disability and health, we construct additional indices of health status. The second index addresses the issue that disability arises from the interaction of an individual's functional status and the environment, and focuses on a set of indicators that emphasizes functional ability, as in Mont and Leob (2010) (hence our designation of this as ML). This is based on 22 items, including the same nine indicators for functional health limitations used in PVW, but more detailed information on limitations with ADL (separate indicators for difficulties with dressing, bathing, walking across a room, eating, getting out of bed ad using the toilet), as well as indicators for difficulties with instrumental activities of daily living (IADLs), such as the ability to use a map, use a phone, manage money, manage medications, shopping, or prepare one's own meals, and the presence of health problems limiting work or the usual activities, and excluding diagnosed diseases, which conversely are included in the PVW index.

Mental disorders are among the most common causes of disability (OECD, 2013), and someone with a severe mental illness may be unable to work, despite being in otherwise robust health. We construct a third index, meant to capture mental health and depression (MHD hereafter) which relies on the set of questions used to construct the CES-D depression score in HRS and the Euro-D depression score in SHARE.[9]

[9] Recall that while the questions asked in the U.S. and in SHARE countries, are not identical, we only need to assume that the battery of questions rank individuals similarly within the country. The variables we have used in constructing the indices are listed in Table A1 in the Appendix.

Finally, we also consider a fourth hybrid summary index that is the *minimum* of these three indices, suitably rescaled in percentile terms, reflecting the idea that a bad score along just one of these dimensions will qualify the individual for disability insurance as well as making it very difficult for them to work.

In the empirical analysis, we focus on individuals aged between 50 and 64 in each wave. We consider individuals until age 65 because in all the countries of our sample, disability insurance benefits are automatically converted to old age pension benefits at age 65. We drop all respondents with missing values for our dependent variable (whether receiving disability payments) or at least one of the variables used in the health indices. Thus, the final sample consists of an unbalanced sample of 42,341 persons/wave from SHARE and 24,002 persons/wave from HRS. Actual regression samples may be smaller due to individuals with key data items missing.

Table 1 presents descriptive statistics for the main variables used in the analysis, by country. The gender composition of our sample is fairly balanced across countries. Respondents on average are 57 years old in every country. Between 70 (Austria) and 80 (Italy) percent of them are married. DI recipiency rates vary widely across countries. The percentage of all individuals aged 50 to 64 receiving DI benefits ranges from less than 3 percent in France to almost 15 percent in Sweden. In Europe it is highest in the Nordic countries, Sweden (14.8 percent) and Denmark (14.2 percent). The recipiency rate in the Netherland is close to that of the Nordic countries (13.9 percent). The U.S. enrollment rate (9.2 percent) is close to the European average (as represented by SHARE). Another variable that show a remarkable degree of heterogeneity across countries is the proportion of individuals self reporting being retired: about one out of 10 Swiss (10.3 percent) and Dutch (11.8 percent) do so, compared to about one out of

five US (19.5 percent) persons, one out of four Belgian (24.5 percent) or French (26.7), and almost one every three Italians (31.5).

Educational attainments for these cohorts of individuals are also fairly different across countries. Education was split into primary, secondary, and tertiary. For SHARE, we rely on the ISCED-97 coding provided in the generated variables file.[10] For the HRS, primary corresponds to 11 years of education or less, secondary to 12 years, and tertiary to more than 12 years of education. The U.S. has the largest share of individuals having attained a tertiary level of education (56.7%). At the other extreme, the Mediterranean countries in our sample, Spain and Italy, have the largest share of individuals who managed to attain only a primary level of education.

**4. Results**

Table 2 shows summary statistics for 50-64 individuals receiving Disability Insurance disaggregated by country and wave/year. In the first two columns, we include the percentage and number of respondents for each country and year receiving disability insurance.[11] There is wide variation in DI receipt across countries, from less than 4 percent of French respondents aged 50-64 in each survey year receiving DI benefits in all years to about 17 percent in Sweden (16.7 percent) and Denmark (16.9 percent) in 2004. Denmark and the Netherlands show the largest declines over this time period; from 16.9 to 12.9 percent for Denmark, and from 16.8 to 11.8

[10] The SHARE generated variables files provide the 1997 International Standard Classification of Education (ISCED-97) coding. We combined the ISCED-97 codes 0 (none), 1 (primary education), 2 (lower secondary education), into one category ("primary"), the codes 3 (upper secondary education) and 4 (post-secondary, non-tertiary education) into another category ("secondary"), and categories 5 (first stage of tertiary education) and 6 (second stage of tertiary education) into yet another category ("tertiary"). See separate Data Appendix for further details (not yet completed).

[11] In Table1 this statistic is calculated pooling all the three waves.

percent for the Netherlands. These results are consistent with efforts by Denmark to assist potential DI recipients to find jobs, and by the Netherlands to reduce the inflow since 2002 (Koning and Lindeboom, 2015). By contrast, U.S. rates have increased from 8.3 in 2004 to 9.9 percent in 2010 (see also Autor and Duggan, 2006). Similarly, enrollment rates have increased in other European countries, such as Germany and Belgium.

*4a. Summary statistics of DI targeting*

In the remaining columns of Table 2 we report measures for the first of our two proposed markers of targeting, the average (percentile) health status of DI enrollees, where health status is measured by each of our proposed indices: average health according to our main index, the PVW index (column 2) and to the alternative indices, the Mont-Leob index of functionality (column 3), the mental health/depression index (column 4), and the minimum score, suitably renormalized (column 5).

Figure 1 provides a comparison of the distribution of DI enrollees by PVW health status index decile, for the entire 2004-10 data, for two countries with similar fractions of people age 50-64 with disability benefits, the U.S. (9.2%), and Belgium (8.5%). The distribution of benefits in the U.S. is skewed more to the left, meaning that a larger fraction of DI benefits accrue to people who report worse health.

Our second marker of targeting, the fraction of individuals in the bottom decile of the health distribution covered by DI, as well as by any public pensions, is provided in Table 3, by country and year. Note that the percentage of people in the bottom decile of health status (using the PVW index) receiving DI benefits was roughly one-third in Belgium, compared to about half in the U.S.

Many countries such as France rely more on other pension programs beside just their DI program, and so it is useful to consider also broader classifications of pension support beyond DI. Figure 2 shows the distribution of pension or DI support for France by health status decile (using the PVW index). The red area shows the additional coverage by non-DI public pensions, the green next area reflecting private pensions, and the remaining top segment the share of the decile not receiving any pension. (Figure A1 in Appendix provides similar graphs for all countries in the analysis.) While other programs cover many of the least healthy French, even their combined programs fall short of covering the least healthy compared to many other countries. [12]

*4b. Regression Analysis*

We next estimate the models in (1) in a Probit model, separately for each country and for the whole SHARE sample. We control for characteristics of the respondents such as age, gender, marital status, self-reported retirement status, and report estimates of the Probit marginal effects on health status in Table 4, using the PVW index. Panel A shows estimates obtained from specifications where the health index is included "linearly" for ease of interpretation. However, we recognize that health is likely to have a non-linear effect. Therefore, in panel B we include indicators for whether an individual's health status belongs to the bottom decile to the second decile, or the third decile of the health distribution (the excluded reference group are individuals whose health status can be classified between thee 30% percentile and the 100$^{th}$ percentile of their country's health distribution).

[12] For the "sickest" decile of the population (using the PVW index), just half of the population in France receives any pension benefits. In the highest health decile, 20% of the French are receiving some kind of pension.

Table 5 reports Probit estimates for the models in (2), basically expanding the specifications in table 4 to include education as a measure of labor market opportunities. In most countries, the weight placed on education is quite modest, except in Denmark where the coefficient for tertiary+ education is –0.11 implying that the probability of receiving DI insurance is 11 percentage points lower for those with at least a college education, holding constant health status, age, retirement status, and sex. In Spain and Italy, the impact of tertiary education is to reduce the probability of DI enrollment by 3.0 and 3.6 percentage points, respectively conditional on health, and on the other demographic characteristics, but for the other countries the estimates are small in magnitude and largely statistically insignificant.

*4c. Comparing our disability measures with OECD composite measures*

To characterize disability policies across countries, OECD (2003, 2010) proposed two indicators: the first indicator focuses on compensation measures or benefit programs (the OECD generosity/compensation score, OECDg hereafter), while the second indicator focuses on employment or integration measures (the OECD employment score, OECDe hereafter). Each of the two policy dimensions is divided into ten sub-dimensions. The sub-dimensions are all given equal weight and the same score range, from 0 to 5 points. The points for each sub-dimension are then added to obtain the overall score, with 50 being the possible maximum score for each indicator.

The generosity/compensation indicator focuses on dimensions such as the coverage of the program, the extent of disability needed to qualify for benefit entitlement, the duration and size of compensation, the type of medical assessment (if any) required to certify disability, the extent of vocational assessment, and so on. The employment/integration indicator focuses on the whole

range of employment and rehabilitation measures, such as the type and extent of employment support, the timing and comprehensiveness of vocational rehabilitation programs, and the work incentives provided for beneficiaries. When a country's generosity/compensation score is greater than its employment/integration score, it indicates a strong focus on compensation over rehabilitation, and conversely. The average scores across the OECD countries are 25.8 for OECDg and 24.9 for OECDe (OECD, 2010; Appendix 3.A1 and Apppendix 3.A2).

Table 6 shows the OECD DI policy scores (last two columns) together with the percentage of the population receiving benefits and other public pensions. For the generosity of the DI program (OECDg), Sweden leads the list (with a score of 37 out of 50), followed by the Netherlands (32) and Switzerland (32), and with the U.S. the least generous (17). The employment/integration indicator (OECDe) is highest in Denmark (37) and lowest in Italy (18). The correlation coefficients between the OECDg and OECDe composite measures, and our primary measure of DI disability, is modest; between 0.34 and 0.45 (and none significant), so while we appear to be capturing a common element across countries, the correlation between the measures is not large.

One exception, however, is Denmark, which scores well in both our ranking and in the OECD ranking. This likely reflects differences in policies towards encouraging people who are not in perfect health to continue working in Denmark. As an OECD (2009) study found,

> The disability scheme in *Denmark* which was reformed in 2003 incorporates a most fundamental conceptual shift. Disability assessment is now focused on what a person can do rather than their loss of capacity; more precisely, the extent to which a person is able to carry out a subsidised job (a so-called "flex-job"). A disability benefit is only granted where capacity is held to be permanently reduced to the extent that a flex-job cannot be performed, and participation in rehabilitation would not help to restore this capacity. In determining capacity, a comprehensive individual resource profile is being put together which includes measures of health,

> social and labour market proximity criteria. In this respect, Denmark is a best-practice example within the OECD (p. 19).

In this case, it is perhaps not a coincidence that our regression estimates point to Denmark as being the only country in our sample that appears to target DI recipients with better labor market opportunities to remain in the labor market, rather than become eligible for DI.

## 5. Discussion and Conclusion

There are few objective approaches to monitoring the characteristics of public disability insurance programs. In this paper, we study the reported health and work opportunities of the population age 50-64 enrolled in a disability insurance (DI) program across a sample of 10 European countries and the United States. We observed considerable differences across countries with regard to the composition of people eligible for DI benefits relative to those without DI benefits. While previous work has sought to describe the institutional features of individual country-level programs, as in OECD (2003, 2010), this paper attempts to infer characteristics of DI programs based on micro-level data from SHARE and the HRS on DI enrollees and non-enrollees.

The variations do not appear to be explained either by labor market considerations – that is, that some countries are more likely to insure against poor labor market opportunities than others – or by alternative social insurance programs that supplement disability programs. Whether these differences reflect societal preferences for other goals effected through the use of disability insurance, imperfect screening (e.g., Mitra, 2005), or more general random variability in the disability application and appeal process (as in Maestas, Mullen and Strand, 2013, and French and Song, 2014), is not clear. Nonetheless, we believe that these objective measures of

disability insurance targeting are useful metrics that can be used to assess the performance of country-level disability programs at a point in time, and over time.

We developed several measures to quantify the degree to which disability insurance targets potential applicants for disability insurance across the 11 countries in our sample. These capture both the average health of individuals conditional on receiving disability, as well as the fraction of people in the bottom decile of health status who are receiving disability insurance. While not all of the measures yield consistent answers, Denmark and the U.S. scored reasonably well, while France, Germany, and Belgium do less well.

It may appear surprising that the U.S. DI program scored so well, given the very long waiting period and extensive appeals for people with what appear to be serious disabilities (Eckholm, 2007). Yet it may be precisely this process that restricts DI eligibility to the sickest group. More worrisome is if the long periods of time spent out of the labor force during the stressful application process has an independent impact on health status (Maestas, Mullen and Strand, 2013; Atlas and Skinner, 2009).

We also developed a regression model that captures differences across countries in the degree to which they weight health status versus market opportunities. For example, even holding health status constant, Denmark shows a much stronger gradient of DI eligibility by education, suggesting that even disabled college graduates are encouraged to find work. Most countries, however, showed only modest differences (or none at all) in DI eligibility across education groups. As income (and educational) inequality continues to rise, there may be greater opportunities to sidestep DI enrollment for people with higher education who may continue to work. The recent successes of supportive employment in the U.S. and Europe, by which mentally disabled people are encouraged to return to appropriate work, shows considerable

promise (Burns et al, 2007), and there is at least suggestive evidence that at least in the U.S., such programs can pay for themselves by reducing disability and medical costs (Drake, et al., 2009).

There are several limitations in this study. First, the health status indices may not fully reflect the ability to work, particularly when interacted with the type of industry. A broken leg will be more of a problem for construction workers than for computer programmers. In theory, this is not a fatal problem if the degree of bias is similar across countries, but we do not know how the degree of bias differs across countries. However, our PVW measure does the best job of predicting disability status, in the sense that the average percentile health status is the lowest of all the potential measures. Second, even the index measures of health care are intrinsically ordinal, and while deciles (or even centiles) of responses by country and by year avoid stronger assumptions about cardinality, they also abstract from real differences in health across countries. For example, someone in the 15$^{th}$ percentile in the U.S. may experience far more real pain from working than someone in the 15$^{th}$ percentile in Sweden.

The primary concern of many policy makers has been with the rapid and unsustainable growth in DI programs worldwide that do not appear to be associated with worsening health (Milligan and Wise, 2012; Borsch-Supan, 2007, 2011; Börsch-Supan and Roth, 2011). Our new measures of disability insurance efficiency cannot answer the question of what is the appropriate size of DI programs in a particular country, which is fundamentally a political issue. But our new measures can at a minimum provide an objective approach to measuring the extent to which DI programs target those in the poorest health and least able to work, whether it means measuring the average percentile health of those receiving DI insurance, or the fraction of people in very poor health who are not receiving DI insurance.

More importantly, the longitudinal nature of the SHARE and HRS data allow policy makers to monitor the consequences of disability insurance reform to better understand the consequences of reducing DI enrollment in response to budgetary pressures. Amartya Sen (1995), writing about the targeting of income transfers to the poor, identified a key tradeoff between the "type II error of including the nonpoor among the poor" and the "type I errors of not including some real poor among the listed poor." For example, Koning and Lindebloom (2015) find, like we do, that the spectacular success of the Netherlands reforms were associated with both a sharp decline in the number of people on disability, but also a drop between 2004 and 2010 in the percentage of those in the bottom decile of health status that were covered through the DI program (or through any program); thus the reforms to their DI program reduced the inclusion of the healthy in the DI program (to paraphrase Sen), but also increased the fraction of unhealthy people not on DI.

In the context of disability policy, it is impossible to judge the success of a given policy reform without longer-term monitoring of the health of DI recipients and non-recipients. This paper provides a new framework for providing systematic measures of program targeting that are both consistent within countries, and which allow for comparisons across countries.

**References**


Atlas, Steven J., and Jonathan Skinner, "Education and the Prevalence of Pain," in David A. Wise (ed.), *Research Findings in the Economics of Aging*, University of Chicago Press: Chicago: 145-166, 2010.

Autor, David H., and Mark G. Duggan, "The Growth in the Disability Insurance Roles: A Fiscal Crisis Unfolding," *Journal of Economic Perspectives* 20(3), Fall 2006: 71-96.

Banks, James, Arie Kapteyn, James P. Smith, and Arthur van Soest, "International Comparisons of Work Disability", RAND Working Paper, WR-155, 2004.

Banks, James, Michael Marmot, Zoe Oldfield, and James P. Smith, "Disease and Disadvantage in the United States and in England," *JAMA* 295(7) May 3, 2006: 2037-2045.

Banks, James, Richard Blundell, and Carl Emmerson. 2015. "Disability Benefit Receipt and Reform: Reconciling Trends in the United Kingdom." *Journal of Economic Perspectives*, 29(2): 173-90.

Benitez-Silva, Hugo, Buchinsky, Moshe, Chan, Hiu Man, Cheidvasser, Sofia and Rust, John P., "How Large is the Bias is Self-Reported Disability?" *Journal of Applied Econometrics* 19, 2004: 649-670.

Besley, Timothy, and Ravi Kanbur, "The Principles of Targeting," in Michael Lipton and Jacques van der Gaag (eds.), *Including the Poor*, The World Bank: Washington, D.C.: 67-90, 1993.

Borghans, Lex, Anne C. Gielen, and Erzo F. P. Luttmer, "Social Support Substitution and the Earnings Rebound: Evidence from a Regression Discontinuity in Disability Insurance Reform." *American Economic Journal: Economic Policy*, 6(4) 2014: 34-70.

Börsch-Supan, Axel, "Changes in Health Status and Work Disability," in Axel Börsch-Supan, Agar Brugiavini, Hendrik Jürges, Arie Kapteyn, Johan Mackenbach, Joannes Siegrist and Guglielmo Weber (eds.), *Health, Ageing, and Retirement in Europe – Starting the Longitudinal Dimension*. Mannheim Research Institute for the Economics of Aging (MEA): Mannheim: 228-236, 2006.

Börsch-Supan, Axel, "Work Disability: The Effects of Demography, Health, and Disability Insurance," Working Paper, University of Mannheim, October 2007.

Börsch-Supan, Axel, "Health and disability insurance," *Zeitschrift für Arbeitsmarktforschung*, Vol. 44, No. 4, 2011: 349-362.

Börsch-Supan, Axel, and Henning Roth, "Work Disability and Health over the Life Course," In Axel Börsch- Supan, Martina Brandt, Karsten Hank, and Mathis Schröder (eds.), *The Individual*

*and the Welfare State: Life Histories in Europe*, Springer-Verlag: Berlin Heidelberg: 215-224, 2011.

Burns, Tom, Jocelyn Catty, Thomas Becker, Robert E. Drake, Angelo Fioritti, et al., "The Effectiveness of Supported Employment for People with Severe Mental Illness: A Randomised Controlled Trial," *The Lancet*, 370(9593), 29 Sept/5Oct 2007:1146-52.

Case, Anne, and Angus Deaton, "Broken Down by Work and Sex: How Our Health Declines," in D. Wise (ed.) *Analyses in the Economics of Aging*, University of Chicago Press and NBER, 2005.

Drake, Robert E., Jonathan S. Skinner, Gary R. Bond, and Howard H. Goldman, "Social Security and Mental Illness: Reducing Disability with Supported Employment," *Health Affairs*, Vol. 28, N. 3, 2009:pp. 761-770

Eckholm, Erik, "Disability Cases Last Longer as Backlog Rises," *The New York Times*, December 10, 2007.

European Commission, *Adequate and Sustainable Pensions*, Joint Report by the Commission and the Council, Luxembourg: European Communities, 2006.

European Commission, *MISSOC Tables 2013*, Luxembourg: European Communities, 2013.

Social Protection Committee, *Promoting Longer working Lives through Pension Reforms. Second Part. Early Exits from the Labour Market*, European Commission, Directorate-General for Employment, Social Affairs and Equal Opportunities, 2008.

French, Eric, and Jae Song. 2014. "The Effect of Disability Insurance Receipt on Labor Supply." *American Economic Journal: Economic Policy*, 6(2): 291-337.

Kapteyn, Arie, and Erik Meijer, 2014. "A Comparison of Different Measures of Health and their Relation to Labor Force Transitions at Older Ages." In David A. Wise (ed), *Discoveries in the Economics of Aging*, University of Chicago Press and NBER, 2014, pp.115-156 (with a Comment by S. Venti).

Kapteyn, Arie, James Smith, and Arthur van Soest, "Dynamics of Work Disability and Pain," Rand Working Paper WR-387, March 2006.

Kapteyn, A., J. P. Smith, and A. van Soest," Work Disability, Work, and Justification Bias in Europe and the U.S.," NBER Working Paper 15245, August 2009.

Koning, Pierre, and Maarten Lindeboom. 2015. "The Rise and Fall of Disability Insurance Enrollment in the Netherlands." *Journal of Economic Perspectives*, 29(2): 151-72.

Liebman, Jeffrey B. 2015. "Understanding the Increase in Disability Insurance Benefit Receipt in the United States." *Journal of Economic Perspectives*, 29(2): 123-50.

Maestas, Nicole, Kathleen J. Mullen, and Alexander Strand. 2013. "Does Disability Insurance Receipt Discourage Work? Using Examiner Assignment to Estimate Causal Effects of SSDI Receipt." *American Economic Review*, 103(5): 1797-1829.

McVicar, Duncan, "Why Have UK Disability Benefit Rolls Grown So Much," *Journal of Economic Surveys*, 22(1), 2008: 114-39.

Meara, Ellen, and Jonathan Skinner, "The Dynamics of Disability: Evidence from a Cohort of Back Pain Patients," mimeo, Dartmouth College, 2011.

Meijer, Erik, Arie Kapteyn, and Tatiana Andreyeva, "Internationally Comparable Health Indices," *Health Economics*, Vol. 20, pp. 600–619, 2011.

Meng, Chun-Lo, and Peter Schmidt, "On the Cost of Partial Observability in the Bivariate Probit Model," *International Economic Review* 26(1), February 1985: 71-85.

Milligan, Kevin S., and David A. Wise (eds.), *Social Security and Retirement Around the World: Mortality and Health, Employment, and Disability Insurance Participation and Reforms*, University of Chicago Press and NBER, 2012.

Mitra, Sophie, "Disability and Social Safety Nets in Developing Countries," World Bank Social Protection Discussion Paper Series No. 0509, May 2005.

Mont, Daniel. 2017. "Measuring Health and Disability", *The Lancet*, Vol. 369, pp. 1658-1663.

Mont, Daniel, and Mitchel Loeb. 2010. "A Functional Approach to Assessing the Impact of Health Interventions on People with Disabilities", *Alter – European Journal of Disability Research*, 4, pp. 159-173.

OECD, 2003. *Transforming Disability into Ability*, Paris: OECD.

OECD, 2009, "Sickness, Disability, and Work: Keeping on Track in the Economic Downturn," High-Level Forum, Stockholm, 14-15 May 2009.

OECD, 2010. *Sickness, Disability, and Work. Breaking the Barriers*, Paris: OECD.

OECD, 2012. *Sick on the Job? Myths and Realities about Mental Health and Work*, Paris: OECD.

Poirier, Dale J., "Partial Observability in Bivariate Probit Models," *Journal of Econometrics* 12, 1980: 209-217.

Poterba, James M., Steven F. Venti, and David A. Wise, "The Asset Cost of Poor Health" NBER Working Paper 16389, September 2010.

Poterba, James M., Steven F. Venti, and David A. Wise, "Family Status Transitions, Latent Health, and the Post-Retirement Evolution of Assets," in D.A. Wise (ed.), *Explorations in the Economics of Aging*, University of Chicago Press: Chicago; pp. 23–69, 2011.

Poterba, James M., Steven F. Venti, and David A. Wise, "Health, Education, and the Post-Retirement Evolution of Household Assets, NBER Working Paper 18695, January 2013.

Sen Amartya, 1995. "The Political Economy of Targeting" in D. van de Walle and K. Nead, eds., *Public Spending and the Poor* (Washington, DC, World Bank).

Social Security Administration & International Social Security Association, *Social Security Programs Throughout the Word: Europe, 2012*, SSA Publication No. 13-11801, August 2012.

Social Security Administration & International Social Security Association, *Social Security Programs Throughout the Word: The Americas, 2011,* SSA Publication No. 13-11804, February 2012.

Van Lancker, Wim, Joris Ghysels, and Bea Cantillon, "The Impact of Child Benefits on Single Mother Poverty: Exploring the Role of Targeting in 15 European Countries," *International Journal of Social Welfare*, 24(3), July 2015: 210–222.

**Table 1: Descriptive Statistics**

| Country | Male | Age | Married | Retired | Received DI benefits | Education Level | |
|---|---|---|---|---|---|---|---|
| | | | | | | Primary only | Tertiary |
| Sweden (N = 3576) | 50.2 | 57.4 | 72.1 | 14.8 | 14.8 | 35.0 | 28.8 |
| Denmark (N = 3541) | 49.6 | 57.0 | 76.2 | 17.3 | 14.2 | 14.6 | 42.8 |
| Germany (N = 3480) | 49.3 | 57.3 | 74.9 | 18.9 | 6.7 | 10.6 | 31.8 |
| Netherlands (N = 4630) | 49.8 | 57.2 | 78.3 | 11.8 | 13.9 | 43.4 | 28.1 |
| Belgium (N = 6361) | 49.5 | 57.0 | 75.0 | 24.5 | 8.5 | 39.8 | 30.6 |
| France (N = 5892) | 48.5 | 56.7 | 77.3 | 26.7 | 2.7 | 35.4 | 25.2 |
| Switzerland (N = 3139) | 49.6 | 56.9 | 72.7 | 10.3 | 6.8 | 29.3 | 14.1 |
| Austria (N = 3815) | 49.1 | 57.3 | 70.8 | 43.1 | 7.4 | 21.0 | 24.9 |
| Spain (N = 3546) | 48.7 | 56.6 | 76.8 | 13.1 | 8.2 | 70.8 | 13.9 |
| Italy (N = 4361) | 48.3 | 57.1 | 80.2 | 31.5 | 5.2 | 61.8 | 7.9 |
| US (N = 24002) | 48.0 | 57.1 | 72.5 | 19.5 | 9.2 | 13.4 | 57.6 |

Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on pooled sample of respondents aged 50 through 64 in each wave. Percentage values, except for Age (average age). Retired based on self-reported labor market activity. All figures, except for sample sizes, are population-weighted.

**Table 2: Summary Statistics and Average Percentile Health of People on Disability Insurance**

| Country/Year | % (N) received DI benefits | Of those receiving DI benefits, mean health index: PVW | ML | MHD | Minimum |
|---|---|---|---|---|---|
| Sweden | | | | | |
| 2004 | 14.8% (242) | 22.3 | 24.5 | 35.9 | 20.9 |
| 2006 | 16.7% (226) | 22.6 | 25.3 | 38.5 | 21.3 |
| 2010 | 12.8% (93) | 18.4 | 21.3 | 30.9 | 17.3 |
| Denmark | | | | | |
| 2004 | 16.9% (153) | 22.4 | 24.9 | 34.5 | 20.4 |
| 2006 | 12.7% (179) | 21.2 | 21.8 | 34.3 | 19.3 |
| 2010 | 12.9% (147) | 24.2 | 22.6 | 33.9 | 19.8 |
| Germany | | | | | |
| 2004 | 5.3% (80) | 20.3 | 22.6 | 36.3 | 19.4 |
| 2006 | 6.1% (75) | 25.9 | 31.2 | 35.7 | 25.3 |
| 2010 | 8.7% (42) | 30.5 | 40.9 | 40.7 | 29.9 |
| Netherlands | | | | | |
| 2004 | 16.8% (260) | 25.9 | 31.1 | 36.5 | 24.6 |
| 2006 | 13.4% (185) | 24.6 | 31.0 | 36.2 | 24.5 |
| 2010 | 11.8% (149) | 24.1 | 28.5 | 42.3 | 24.7 |
| Belgium | | | | | |
| 2004 | 7.3% (128) | 25.3 | 26.9 | 39.0 | 23.2 |
| 2006 | 8.7% (137) | 25.4 | 29.9 | 36.9 | 24.7 |
| 2010 | 9.4% (270) | 24.8 | 30.8 | 38.4 | 23.4 |
| France | | | | | |
| 2004 | 3.8% (62) | 22.5 | 20.1 | 36.3 | 19.5 |
| 2006 | 1.6% (18) | 29.1 | 36.0 | 44.7 | 23.2 |
| 2010 | 2.9% (94) | 25.3 | 25.6 | 39.9 | 20.7 |
| Switzerland | | | | | |
| 2004 | 8.3% (40) | 18.2 | 18.0 | 32.4 | 15.0 |
| 2006 | 9.4% (52) | 17.2 | 18.7 | 30.7 | 15.8 |
| 2010 | 9.9% (101) | 17.0 | 17.9 | 33.8 | 15.7 |
| Austria | | | | | |
| 2004 | 4.8% (36) | 20.6 | 27.6 | 38.2 | 21.2 |
| 2006 | 7.8% (37) | 26.6 | 36.3 | 37.9 | 26.2 |
| 2010 | 9.0% (207) | 25.2 | 28.6 | 36.1 | 23.6 |
| Spain | | | | | |
| 2004 | 7.8% (87) | 27.9 | 30.2 | 36.1 | 20.6 |
| 2006 | 8.6% (74) | 26.4 | 26.5 | 38.2 | 23.3 |
| 2010 | 8.1% (116) | 24.8 | 28.7 | 31.5 | 20.8 |
| Italy | | | | | |
| 2004 | 5.7% (78) | 24.6 | 23.9 | 38.2 | 20.9 |
| 2006 | 5.7% (68) | 17.4 | 22.8 | 40.4 | 17.1 |
| 2010 | 4.2% (70) | 21.3 | 17.8 | 33.7 | 17.9 |
| US | | | | | |
| 2004 | 8.3% (714) | 14.3 | 18.7 | 26.9 | 15.2 |
| 2006 | 9.4% (610) | 15.9 | 20.4 | 29.4 | 16.2 |
| 2010 | 9.9% (1157) | 13.6 | 18.3 | 27.9 | 13.9 |

Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on sample of respondents aged 50 through 64 in each wave. All figures, except for sample sizes, are population-weighted.

**Table 3: Percentage of Those in the Bottom Decile of Each Health Index Receiving Disability or Any Pension**

| | PVW | | ML | | MHD | |
|---|---|---|---|---|---|---|
| | DI benefits | Any pension | DI benefits | Any pension | DI benefits | Any pension |
| Sweden | | | | | | |
| 2004 | 61.5 | 84.5 | 63.3 | 91.3 | 35.6 | 59.6 |
| 2006 | 61.3 | 75.5 | 68.3 | 86.0 | 47.0 | 75.4 |
| 2010 | 66.9 | 87.6 | 69.2 | 89.5 | 41.7 | 57.8 |
| Denmark | | | | | | |
| 2004 | 65.0 | 79.2 | 71.4 | 85.7 | 41.1 | 52.1 |
| 2006 | 47.9 | 74.4 | 59.6 | 79.3 | 35.4 | 59.4 |
| 2010 | 56.6 | 76.2 | 74.6 | 87.9 | 35.2 | 44.0 |
| Germany | | | | | | |
| 2004 | 23.0 | 51.9 | 29.8 | 57.2 | 15.4 | 44.8 |
| 2006 | 16.4 | 62.0 | 19.7 | 62.0 | 16.9 | 48.6 |
| 2010 | 22.1 | 32.7 | 18.3 | 30.3 | 17.1 | 32.4 |
| Netherlands | | | | | | |
| 2004 | 51.9 | 65.5 | 67.1 | 77.6 | 43.2 | 54.0 |
| 2006 | 45.7 | 66.0 | 39.4 | 62.0 | 30.6 | 52.3 |
| 2010 | 39.1 | 61.8 | 41.6 | 58.9 | 21.2 | 43.1 |
| Belgium | | | | | | |
| 2004 | 30.3 | 66.6 | 36.7 | 66.2 | 15.3 | 52.4 |
| 2006 | 34.0 | 66.6 | 40.6 | 71.2 | 27.0 | 64.1 |
| 2010 | 29.6 | 61.7 | 44.4 | 71.4 | 24.8 | 51.4 |
| France | | | | | | |
| 2004 | 18.4 | 53.2 | 23.9 | 54.4 | 10.2 | 34.8 |
| 2006 | 5.2 | 37.3 | 8.3 | 45.7 | 2.1 | 24.8 |
| 2010 | 13.6 | 57.1 | 16.9 | 55.7 | 5.8 | 46.1 |
| Switzerland | | | | | | |
| 2004 | 43.9 | 66.9 | 52.2 | 68.8 | 26.4 | 47.2 |
| 2006 | 36.2 | 55.0 | 41.3 | 55.6 | 30.1 | 46.9 |
| 2010 | 33.8 | 48.5 | 43.9 | 54.6 | 20.4 | 39.2 |
| Austria | | | | | | |
| 2004 | 17.7 | 64.9 | 19.7 | 66.1 | 8.0 | 57.4 |
| 2006 | 27.3 | 74.5 | 27.7 | 74.8 | 29.9 | 74.5 |
| 2010 | 29.8 | 68.8 | 36.3 | 78.8 | 23.9 | 59.2 |
| Spain | | | | | | |
| 2004 | 25.1 | 50.5 | 32.8 | 58.6 | 24.5 | 44.7 |
| 2006 | 36.1 | 50.8 | 37.5 | 56.5 | 25.0 | 48.0 |
| 2010 | 23.9 | 47.5 | 21.6 | 45.4 | 28.3 | 54.0 |
| Italy | | | | | | |
| 2004 | 20.1 | 45.8 | 33.0 | 53.5 | 18.2 | 39.7 |
| 2006 | 28.5 | 61.1 | 41.0 | 61.6 | 11.6 | 45.8 |
| 2010 | 19.1 | 46.1 | 23.9 | 49.7 | 18.0 | 47.9 |
| US | | | | | | |
| 2004 | 42.5 | 67.2 | 49.7 | 72.6 | 28.3 | 53.0 |
| 2006 | 45.9 | 71.8 | 55.4 | 78.9 | 25.3 | 53.4 |
| 2010 | 55.0 | 76.3 | 59.2 | 79.4 | 30.0 | 59.8 |

Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on sample of respondents aged 50 through 64 in each wave. Percentage values. All figures, except for sample sizes, are population-weighted.

## Table 4: Probit Marginal Effects – Model 1 – PVW Health Index

### Panel A

| | SHARE | SE | DK | DE | NL | BE | FR | CH | AT | ES | IT | US |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Health index | -0.002 | -0.003 | -0.004 | -0.001 | -0.003 | -0.002 | -0.001 | -0.001 | -0.001 | -0.002 | -0.001 | -0.001 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Mean dep var | 0.828 | 0.156 | 0.135 | 0.566 | 0.128 | 0.841 | 0.295 | 0.615 | 0.734 | 0.781 | 0.495 | 0.103 |
| N obs | 35092 | 2952 | 2740 | 2868 | 3714 | 5333 | 4938 | 2662 | 3488 | 2836 | 3561 | 22151 |

### Panel B

| | SHARE | SE | DK | DE | NL | BE | FR | CH | AT | ES | IT | US |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Health index | | | | | | | | | | | | |
| Decile 1 | 0.315 | 0.458 | 0.525 | 0.224 | 0.436 | 0.297 | 0.121 | 0.351 | 0.174 | 0.257 | 0.246 | 0.412 |
| | (0.009) | (0.034) | (0.032) | (0.030) | (0.029) | (0.022) | (0.016) | (0.032) | (0.024) | (0.030) | (0.027) | (0.012) |
| Decile 2 | 0.154 | 0.24 | 0.331 | 0.116 | 0.259 | 0.143 | 0.044 | 0.126 | 0.078 | 0.155 | 0.078 | 0.199 |
| | (0.008 | (0.031) | (0.033) | (0.024) | (0.027) | (0.019) | (0.013) | (0.025) | (0.019) | (0.028) | (0.018) | (0.010) |
| Decile 3 | 0.087 | 0.130 | 0.168 | 0.096 | 0.129 | 0.084 | 0.025 | 0.016 | 0.084 | 0.083 | 0.05 | 0.088 |
| | (0.007) | (0.028) | (0.030) | (0.022) | (0.023) | (0.017) | (0.011) | (0.016) | (0.020) | (0.025) | (0.016) | (0.008) |
| Mean dep var | 0.828 | 0.156 | 0.135 | 0.566 | 0.128 | 0.841 | 0.295 | 0.615 | 0.734 | 0.781 | 0.495 | 0.103 |
| N obs | 35092 | 2952 | 2740 | 2868 | 3714 | 5333 | 4938 | 2662 | 3488 | 2836 | 3561 | 22151 |

Dependent variable: 1 if receives DI benefits, 0 otherwise. PVW Health index. All specifications include the following additional covariates: dummy variables for male, age groups 55-59 and 60-64, marital status, retired, interview year. Regressions on the whole SHARE sample include also country dummies. Robust standard errors in parentheses.

Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on pooled sample of respondents aged 50 through 64 in each wave.

## Table 5: Probit Marginal Effects – Model 2 – PVW Health Index

### Panel A

| | SHARE | SE | DK | DE | NL | BE | FR | CH | AT | ES | IT | US |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Health index | -0.002 | -0.003 | -0.003 | -0.001 | -0.003 | -0.002 | -0.001 | -0.001 | -0.001 | -0.002 | -0.001 | -0.001 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Education | | | | | | | | | | | | |
| Secondary | -0.016 | -0.017 | -0.062 | -0.000 | -0.007 | -0.016 | -0.002 | -0.010 | -0.009 | -0.026 | -0.015 | -0.009 |
| | (0.002) | (0.010) | (0.012) | (0.009) | (0.010) | (0.006) | (0.004) | (0.005) | (0.007) | (0.007) | (0.005) | (0.002) |
| Tertiary+ | -0.025 | -0.024 | -0.099 | -0.008 | -0.018 | -0.021 | -0.004 | -0.019 | -0.010 | -0.029 | -0.027 | -0.015 |
| | (0.002) | (0.012) | (0.013) | (0.009) | (0.010) | (0.006) | (0.004) | (0.005) | (0.007) | (0.007) | (0.004) | (0.002) |
| Mean dep var | 0.828 | 0.156 | 0.135 | 0.566 | 0.128 | 0.841 | 0.295 | 0.615 | 0.734 | 0.781 | 0.495 | 0.103 |
| N obs | 35085 | 2952 | 2739 | 2868 | 3714 | 5333 | 4932 | 2662 | 3488 | 2836 | 3561 | 22151 |

Dependent variable: 1 if receives DI benefits, 0 otherwise. PVW Health index. All specifications include the following additional covariates: dummy variables for male, age groups 55-59 and 60-64, marital status, retired, interview year. Regressions on the whole SHARE sample include also country dummies. Robust standard errors in parentheses.
Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on pooled sample of respondents aged 50 through 64 in each wave.

## Table 5: Probit Marginal Effects – Model 2 – PVW Health Index

### Panel B

| | SHARE | SE | DK | DE | NL | BE | FR | CH | AT | ES | IT | US |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Health index | | | | | | | | | | | | |
| Decile 1 | 0.298 | 0.446 | 0.474 | 0.217 | 0.428 | 0.282 | 0.119 | 0.329 | 0.166 | 0.233 | 0.219 | 0.386 |
| | (0.009) | (0.034) | (0.034) | (0.030) | (0.029) | (0.022) | (0.016) | (0.032) | (0.023) | (0.030) | (0.026) | (0.013) |
| Decile 2 | 0.145 | 0.233 | 0.296 | 0.111 | 0.254 | 0.135 | 0.044 | 0.119 | 0.075 | 0.142 | 0.065 | 0.188 |
| | (0.007 | (0.030) | (0.032) | (0.023) | (0.027) | (0.019) | (0.012) | (0.025) | (0.018) | (0.027) | (0.017) | (0.010) |
| Decile 3 | 0.082 | 0.125 | 0.145 | 0.093 | 0.126 | 0.080 | 0.025 | 0.014 | 0.082 | 0.075 | 0.043 | 0.083 |
| | (0.006) | (0.028) | (0.029) | (0.022) | (0.023) | (0.017) | (0.011) | (0.015) | (0.020) | (0.024) | (0.015) | (0.008) |
| Education | | | | | | | | | | | | |
| Secondary | -0.018 | -0.022 | -0.070 | 0.000 | -0.006 | -0.019 | -0.001 | -0.013 | -0.013 | -0.031 | -0.015 | -0.016 |
| | (0.002) | (0.012) | (0.013) | (0.010) | (0.011) | (0.006) | (0.004) | (0.007) | (0.008) | (0.007) | (0.005) | (0.003) |
| Tertiary+ | -0.029 | -0.032 | -0.110 | -0.011 | -0.021 | -0.026 | -0.003 | -0.027 | -0.014 | -0.036 | -0.030 | -0.026 |
| | (0.002) | (0.014) | (0.014) | (0.011) | (0.011) | (0.006) | (0.005) | (0.005) | (0.008) | (0.007) | (0.004) | (0.003) |
| Mean dep var | 0.828 | 0.156 | 0.135 | 0.566 | 0.128 | 0.841 | 0.295 | 0.615 | 0.734 | 0.781 | 0.495 | 0.103 |
| N obs | 35085 | 2952 | 2739 | 2868 | 3714 | 5333 | 4932 | 2662 | 3488 | 2836 | 3561 | 22151 |

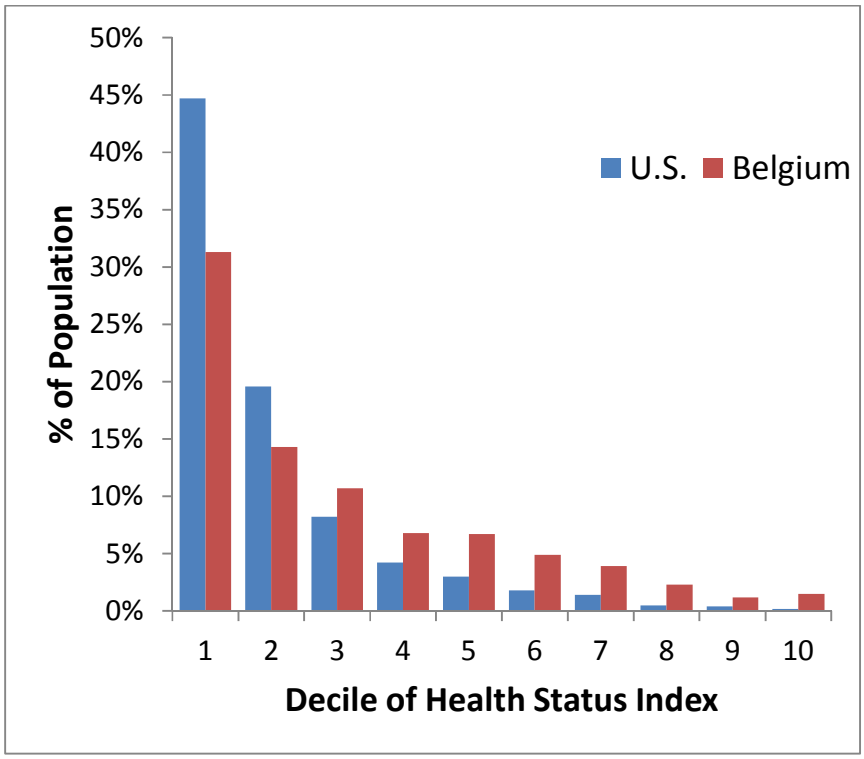
Dependent variable: 1 if receives DI benefits, 0 otherwise. PVW Health index. All specifications include the following additional covariates: dummy variables for male, age groups 55-59 and 60-64, marital status, retired, interview year. Regressions on the whole SHARE sample include also country dummies. Robust standard errors in parentheses.
Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on pooled sample of respondents aged 50 through 64 in each wave.

**Table 6:**
**Percentage of Population Receiving Disability and Pension Benefits,**
**Fraction of DI Recipients in Bottom 10% of Health Status, and OECD Disability Scores**

| Country | Percentage of Population Receiving Benefits | | | Mean PVW Index of Those Receiving DI | % Receiving DI of Those in Bottom Decile PVW Index | OECD DI policy score | |
|---|---|---|---|---|---|---|---|
| | DI | Any Public Pension | Any Pension | | | OECDg | OECDe |
| Sweden | 14.8 | 34.1 | 36.3 | 21.4 | 63.1 | 37 | 32 |
| Denmark | 14.2 | 33.3 | 34.5 | 22.5 | 56.6 | 28 | 37 |
| Germany | 6.7 | 31.0 | 31.7 | 26.4 | 20.6 | 24 | 35 |
| Netherlands | 13.9 | 25.2 | 33.9 | 25.0 | 45.4 | 32 | 35 |
| Belgium | 8.5 | 41.9 | 44.2 | 25.1 | 31.3 | 25 | 24 |
| France | 2.7 | 30.8 | 31.7 | 24.9 | 12.2 | 25 | 26 |
| Switzerland | 6.8 | 16.8 | 21.7 | 17.5 | 37.9 | 32 | 27 |
| Austria | 7.4 | 48.1 | 49.1 | 24.8 | 25.3 | 24 | 30 |
| Spain | 8.2 | 26.9 | 28.1 | 26.3 | 28.2 | 27 | 22 |
| Italy | 5.2 | 34.7 | 36.4 | 21.1 | 22.5 | 26 | 18 |
| US | 9.2 | 27.5 | 33.3 | 14.5 | 48.3 | 17 | 21 |

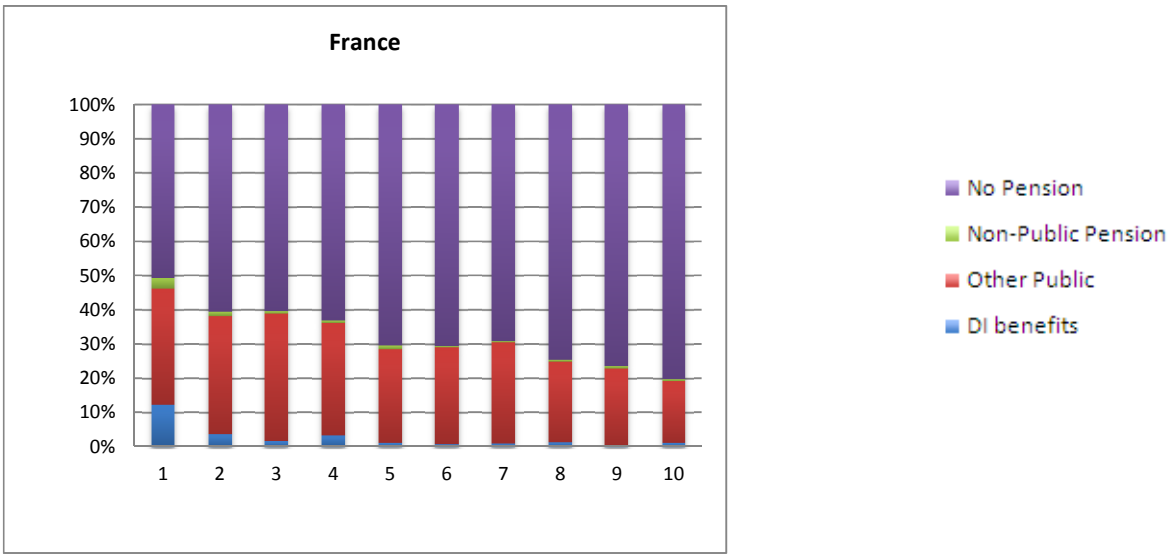
Percentage of individuals receiving disability insurance (column 1), receiving any public pension (column 2), receiving any pension (column 3), average PVW health index of individuals receiving DI (column 4), percentage of individuals receiving DI who are in the bottom 10% of PVW health index (column 5), OECD generosity (compensation) score (column 6) and employment (integration) score (column 7). Source: OECD (2010) and authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on a longitudinal sample of # individual respondents, aged 50-64 in each wave. All figures, except for OECD scores, are population-weighted.

**Figure 1: Percent of Population on Disability Insurance, by Health Status, the United States and Belgium: 2004-10**




Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on a sample of individual 50-64 respondents. PVW health index. Population-weighted data.

**Figure 2: Disability Insurance Receipt, and Any Public Pension Receipt, by Health Status Index France, 2004-10**




Source: Authors' calculations using SHARE wave 1 (2004/2005), wave 2 (2006/2007) and wave 4 (2011/2012) and HRS wave 7, wave 8 and wave 10. Based on a sample of individual 50-64 respondents. PVW health index. Population-weighted data.

## Appendix

### Table A1: Variables included in the indices

| | PVW | ML | MHD HRS | MHD SHARE |
|---|---|---|---|---|
| *Health care utilization* | | | | |
| # hospital visits in past year (SHARE)/2 years (HRS) | X | | | |
| # days in nursing home in past year (SHARE)/2 years(HRS) | X | | | |
| # MD visits in past year (SHARE)/2 years (HRS) | X | | | |
| *Difficulties with activities of daily living (ADL)* | | | | |
| Dressing, including shoes and socks | | X | | |
| Bathing or showering | | X | | |
| Walking across a room | | X | | |
| Eating, cutting up food | | X | | |
| Getting in or out of bed | | X | | |
| Using the toilet, incl getting up or down | | X | | |
| At least one ADL | X | | | |
| *Mobility, fine motor, and functional limitations* | | | | |
| Walking 1 block (HRS) or 100 meters (SHARE) | X | X | | |
| Difficulty sitting for 2 hours | X | X | | |
| Difficulty getting up from chair | X | X | | |
| Difficulty climbing a flight of stairs | X | X | | |
| Difficulty stooping | X | X | | |
| Difficulty lifting 10 lbs | X | X | | |
| Difficulty picking up a dime | X | X | | |
| Difficulty raising arms over head | X | X | | |
| Difficulty pushing/pulling large object | X | X | | |
| *Medical history* | | | | |
| Ever had high blood pressure | X | | | |
| Ever had diabetes | X | | | |
| Ever had cancer | X | | | |
| Ever had lung disease | X | | | |
| Ever had heart problems | X | | | |
| Ever had stroke | X | | | |
| Ever had psych problems (SHARE- depression only) | X | | | |
| Ever had arthritis | X | | | |
| Back pain | X | | | |
| *Difficulties with instrumental activities of daily living (IADL)* | | | | |
| using a map in a strange place | | X | | |
| telephone calls | | X | | |
| managing money | | X | | |
| taking medications | | X | | |
| Shopping for groceries | | X | | |
| preparing a hot meal | | X | | |

## Table A1: Variables included in the indices (continued)

| | PVW | ML | MHD HRS | MHD SHARE |
|---|---|---|---|---|
| *CESD depression questions* | | | | |
| Felt depressed last week | | | X | |
| Everything was an effort last week | | | X | |
| Sleep was restless last week | | | X | |
| Was happy last week | | | X | |
| Felt lonely last week | | | X | |
| Enjoyed life last week | | | X | |
| Felt sad last week | | | X | |
| Could not get going last week | | | X | |
| *EURODEP depression questions* | | | | |
| Sad or depressed last month | | | | X |
| Any hopes for the future | | | | X |
| Felt would rather be dead in last month | | | | X |
| Tend to blame self/feel guilty | | | | X |
| Trouble sleeping recently | | | | X |
| Loss of interest in last month | | | | X |
| Irritable recently | | | | X |
| Loss of appetite | | | | X |
| Fatigue in last month | | | | X |
| Difficulty concentrating on entertainment | | | | X |
| Difficulty concentrating on reading | | | | X |
| Enjoyed any activities recently | | | | X |
| Cried in last month | | | | X |
| Ever had depression symptoms greater than 2 weeks | | | | X |

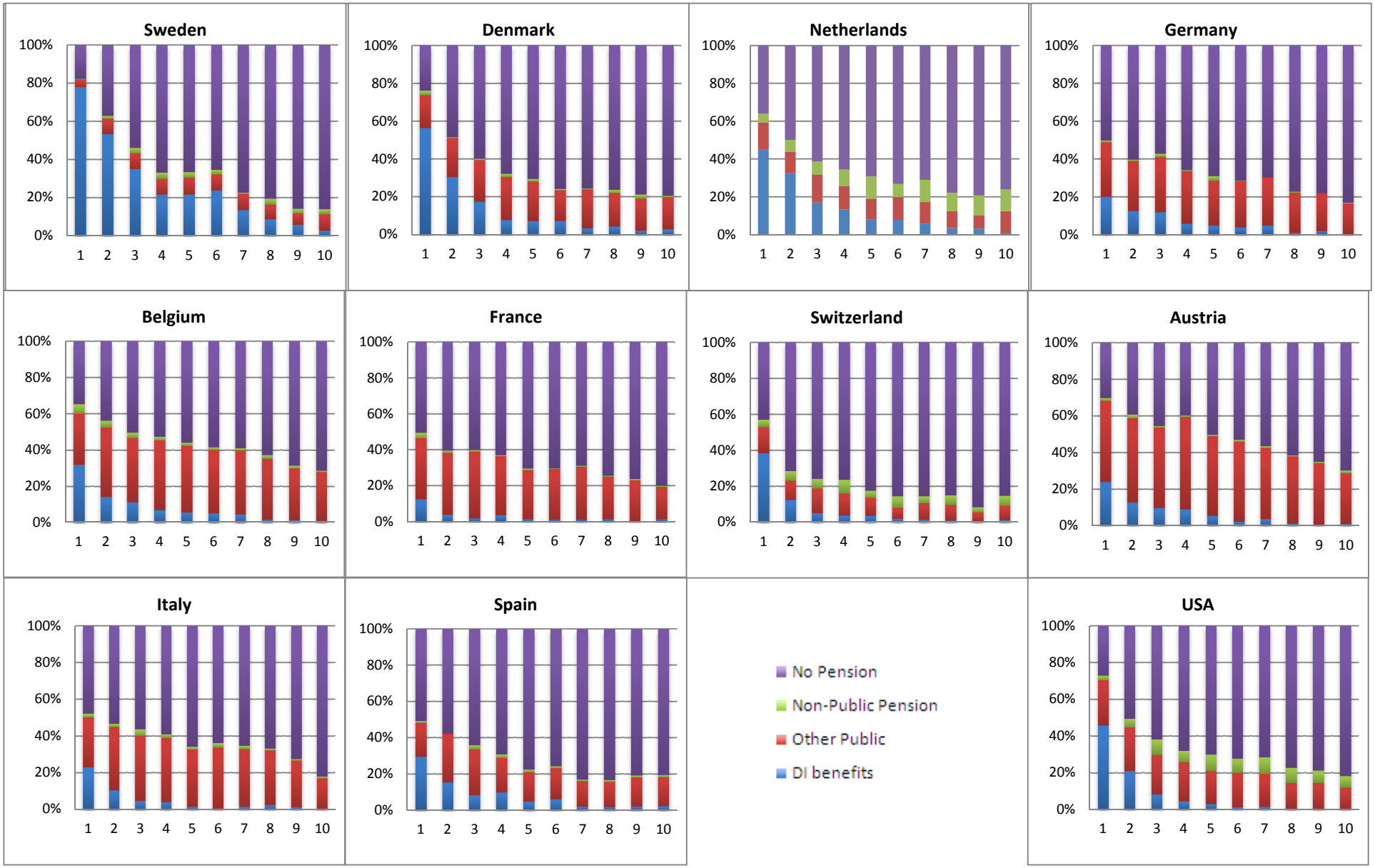



**Figure A1: DI and other Public Benefits Receipt by Health Index Deciles and Country 2004-2010**