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Disability and employment across Central and Eastern European Countries

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Abstract

We contribute to the scarce literature focusing on the life outcomes of disabled people in Central and Eastern European Countries by estimating the effects of disability on employment probabilities for six Central and Eastern European Countries. We find that disability negatively affects the employment probabilities of disabled people, especially those with severe disabilities. The effects of disability persist even after controlling for disability benefits, signaling a predominant role for disability per se. The long-term effects of disability are smaller than the short-term effects, suggesting the partial integration of disabled people into the labor market over time, which might favor both social inclusion and a country's economic performance.

JEL codes: J14, J15, J21, O150

Keywords: Disability, Employment probabilities, Caring activities, State dependence, East-Central Europe, Country differences

1 Introduction

Disabled people are disadvantaged in many socioeconomic dimensions. The European Disability Strategy 2010–2020 (European Commission 2010) aims to empower people with disabilities, by eliminating barriers in eight areas, i.e., accessibility, participation, equality, employment, education and training, social protection, health, and external action, for which specific key actions are identified.

Among different dimensions, the labor market dimension has mostly attracted the interest of researchers and policy makers because of the poor labor market performance of disabled people. It has been emphasized that supporting the labor market integration of disabled people would be important for a number of reasons, such as favoring social inclusion and increasing income and providing for a more productive labor supply and for the positive effects of economic output in the long term (OECD 2010).

The related literature has mainly focused on developed countries, such as the UK (Kidd et al. 2000 and Jones et al. 2006), Ireland (Gannon 2005), Australia (Oguzoglu 2010), and Italy (Agovino et al. 2014 and Addabbo et al. 2014), while Mussida and Sciulli (2015) proposed a comparative analysis for four major EU countries (Italy, Spain, France, and the UK). Finally, Mizunoya and Mitra (2013) investigated the situation in developing countries. All of these studies found a negative impact of disability on employment (or labor market participation); the magnitude of which varies across

countries and gender. In addition, some evidence has indicated the existence of long-term effects of disability on employment and the relevance of educational integration and achievements for disabled people.

Despite the conditions of disabled people being particularly difficult in Central and Eastern European Countries (CEEC) (see Rasell and Iarskaia-Smirnova 2013), quantitative analysis focusing on transition economies has been scarce (Mete 2008). This paper seeks to fill this gap by offering new empirical evidence about the relationship between employment and (different levels of) disability in CEEC. It has been emphasized that disabled people, who were usually institutionalized or marginalized in special schools under the Soviet system, suffered a worsening of their living conditions during the transition era because of the disruption of the health system and the reduction in financing for residential institutions (Mete 2008).[1]

Furthermore, at least during 1990s, labor policies privileged demand side policies, ignoring supply side interventions aimed at integrating disabled people into the labor market (World Bank 2005). Despite the improvement in the economic performances of CEEC in the new century and the introduction of policies favoring the employment of disabled people (ANED 2009), labor market gaps between disabled and non-disabled people have remained relevant.

Disability can affect employment through various mechanisms that, in principle, can increase or decrease the labor supply. For example, special/additional consumption requirements (She and Livermore 2007) or the adoption of active labor market policies can increase the labor supply of disabled people (e.g., Eichhorst et al. 2010). Nevertheless, the income effects related to the reception of disability benefits, the substitution effect deriving from the higher opportunity costs of working that are associated with disabilities, and lower job-search intensity due to higher mobility costs decrease the labor supply of disabled people. In addition, special time requirements for self-care/rehabilitation activities associated with disability increase the marginal utility of leisure, decreasing the labor supply of disabled people (Mizunoya and Mitra 2013). Finally, from a demand-side perspective, employers would be less likely to hire disabled people because of their suspected lower productivity, the additional costs of adjusting workplaces to meet disability requirements, and prejudice and/or discrimination.

We aim at disentangling this empirical puzzle for transition countries by analyzing six CEEC members, namely, Poland, Lithuania, the Czech Republic, Slovakia, Hungary, and Romania. Therefore, we provide new evidence about the sign and the extent of the net impact of disability on the employment probabilities resulting from the joint action of the different mechanisms discussed above. In addition, we pay specific attention to the role of disability benefits in affecting the employment probabilities of disabled individuals.[2]

The analysis is based on the 2007–2010 longitudinal component of the European Union Statistics on Income and Living Conditions (EU-SILC) data, which allows for a homogenous definition of disability based on the information about daily activity limitations. This identification strategy has been adopted in a number of related papers (e.g., Gannon 2005 and Oguzoglu 2010), allowing for a better comparison with previous results. In addition, this approach allows us to define disability in the spirit of the social model, which exceeds the medical model of disability. In particular, the social model of disability suggests that disability is not confined only to impairments, but it also

depends on their interrelations with the external environment and technical assistance. However, because of the self-reported nature of daily activity limitations, we cannot exclude that estimations are affected by self-reporting bias; robustness checks regarding the validity of our results are provided in a specific section.

Using panel data enables us to model an employment equation accounting for state dependence and to distinguish the shorter- and longer-term effects on the employment opportunities for disabled individuals. In addition, because the initial conditions are likely not to be assigned randomly to the individual, we allow for endogeneity by estimating the employment equation using Heckman's estimator (1981). Finally, with the aim of identifying the role of the receiving of disability benefits in the employment opportunities of disabled people, we run an alternative specification considering the joint effect of disability benefits and disability status by introducing specific interaction dummy variables.

The estimation results show that disability negatively affects the employment opportunities of prime-age individuals in the six CEEC analyzed. The effect is particularly great in magnitude in cases of high disability, ranging from 11 % for Romania to 25 % for Lithuania, which are generally higher values than those of Western countries, whereas they were similar to those observed in Anglo-Saxon countries.[3] We also find that receiving disability benefits, according to theoretical predictions, strongly reduces the employment opportunities of disabled people. Nevertheless, disabled people not receiving disability benefits remain significantly penalized in terms of employment opportunities.

Our results suggest that there is space in CEEC to reduce the employment gap between disabled and non-disabled people. In this context, the effects of disability benefits on the labor supply of disabled people should be considered, with positive effects on different dimensions of socioeconomic activities, including the social inclusion of disabled people and the economic performances of countries involved in the integration process.

Section 2 provides the econometric approach used, Section 3 describes the data and the samples and offers testing for the reporting bias problem, Section 4 discusses the results, and Section 5 concludes the paper.

2 The econometric model

The probability of an individual i being employed at time t is estimated using the following random effects dynamic probit model (on a balanced sample):

$$\begin{aligned} y_{it}^{*} &= \gamma y_{it-1} + x_{it}^{'}\beta + \delta \mathrm{DIS}_{it} + \lambda \mathrm{DIS}_{it-1} + \alpha_i + u_{it} \\ y_{it} &= 1\left[y_{it}^{*} > 0\right] \end{aligned} \tag{1}$$

with $i = 1,\ldots, N$ indicating the individual and $t = 2\ldots T$ the time periods. The dependent variable y_{it} is a dummy variable that is equal to one when the individual i is employed at time t. The inclusion among covariates of the previous employment status, y_{it-1}, allows us to disentangle the contribution to employment opportunities of unobserved heterogeneity and past employment (state dependence), and it allows us to interpret our model as a first-order Markov process. x_{it} is a vector of control variables, β is a vector of unknown parameters to be estimated, α_i is the individual specific and time invariant random component, and u_{it} is the idiosyncratic error term. We assume that both α_i

and u_{it} are normally distributed and independent of x_{it} and that there is no serial correlation in u_{it}.

In addition, we include a vector of disability dummy variables DIS_{it}, indicating in turn one's own disability (D) and one's own strong disability (SD). Those dummy variables allow us to measure the direct impact of different levels of disability on individual employment probability. Furthermore, we also include lagged variables of one's own disability (DIS_{it-1}) into our model, which allows us to disentangle the shorter- and longer-term effects of disability on employment opportunities or the direct effects of past work limitations. Finally, δ and λ indicate two vectors of unknown parameters estimated to be related, respectively, to current and past disability dummy variables.

Equation (1) assumes exogenous initial conditions and therefore independence between α_i and y_{it-1}. However, because it is most likely that the initial employment status is not randomly assigned to the individual, estimates obtained from Eq. (1) would be inconsistent. With the aim of providing consistent estimates, we follow the method proposed by Heckman (1981), which explicitly considers the initial conditions problem by approximating the unknown initial conditions with a static equation, using information from the first wave available in the data. The so-called initial conditions problem arises when the start of the observation period does not coincide with the start of the stochastic process. Wooldridge (2005) also proposed an estimator to account for initial conditions problem in non-linear dynamic random effects models. However, the literature (e.g., Akay 2012) has shown that Heckman's estimator performs better for short panels; therefore, we rely on it in our paper.

The Heckman estimator requires a simultaneous two-stage procedure. In the first stage, a reduced form equation, approximating the conditional distribution of the initial conditions, takes the following form:

$$y_{i1} = 1\left[z_{i1}^{'}\pi + \xi_{i1} > 0\right] \tag{2}$$

where z_{i1} is a vector of exogenous variables that can include x_{i1} control variables and DIS_1 is a disability dummy variable, an additional instrument, where:

$$\xi_{i1} = \theta\alpha_1 + \omega_i \tag{3}$$

with ξ_{i1} correlated with α_i but uncorrelated with ω_i for $t > 1$.

The joint probability of the observed binary sequence for individual i, given the unobserved heterogeneity term, is

$$\Phi\left[\left(z_{i1}^{'}\pi + \theta\alpha_i\right)(2y_{i1}-1)\right]\prod_{t=2}^{T}\Phi\left[\left(\gamma y_{it-1} + x_{it}^{'}\beta + \delta\mathrm{DIS}_{it} + \lambda\mathrm{DIS}_{it-1} + \alpha_i\right)(2y_{it}-1)\right] \tag{4}$$

It follows that the likelihood function to be maximized is defined as:

$$L = \prod_i \int_{\alpha/\sigma_\alpha} \Phi\left[\left(z_{i1}^{'}\pi + \theta\alpha_i\right)(2y_{i1}-1)\right]\prod_{t=2}^{T}\Phi\left[\left(\gamma y_{it-1} + x_{it}^{'}\beta + \mathrm{DIS}_{it} + \lambda\mathrm{DIS}_{it-1} + \alpha_i\right)(2y_{it}-1)\right]dF(\alpha/\sigma_\alpha) \tag{5}$$

where F is the distribution function of α/σ_α and $\sigma_\alpha = \sqrt{\rho/(1-\rho)}$. With α considered to be normally distributed, the integral over α/σ_α can be evaluated using Gaussian-Hermite quadrature.

To obtain an estimate of the extent of state dependence and of the direct impact of one's own disability on the probability of being employed, as well as, in general, to present the results as percentage effects, we must calculate the average partial effect (APE) of the lagged dependent variable y_{it-1} on $P(y_{it}=1)$, following the method suggested by Stewart (2007). The method used here is based on estimates of counterfactual outcome probabilities, taking y_{it-1} as fixed at 0 and 1 and evaluated at $x_{it}=\bar{x}$ (the mean):

$$\hat{p}_j = \frac{1}{N}\sum_{i=1}^{N} \Phi\left\{\left(\bar{x}'\hat{\beta} + \hat{\gamma}_j + \hat{\delta}\bar{\mathrm{DIS}}' + \hat{\lambda}\bar{\mathrm{DIS}}'\right)(1-\rho)^{\frac{1}{2}}\right\}, \tag{6}$$

$$\hat{p}_0 = \frac{1}{N}\sum_{i=1}^{N} \Phi\left\{\left(\bar{x}'\hat{\beta} + \hat{\delta}\bar{\mathrm{DIS}}' + \hat{\lambda}\bar{\mathrm{DIS}}'\right)(1-\rho)^{\frac{1}{2}}\right\} \tag{7}$$

The APEs are given by: $APE = \hat{p}_j - \hat{p}_0$

3 Data and sample

We base our analysis on data from the EU-SILC survey. The EU-SILC is a rotating panel survey based on methodologies and definitions harmonized across most members of the European Union (Eurostat 2010). The topics covered by the survey encompass living conditions, income, social exclusion, housing, work, demography, and education.

The survey is conducted in each country by its National Institute of Statistics; the sampling designs and operational details adopted are similar, with residual differences reflecting the different traditions of the various national institutes and specific objectives added by national governments.

We select data for Poland, Lithuania, the Czech Republic, Slovakia, Hungary, and Romania for the time window 2007–2010. In principle, the 2007–2010 longitudinal EU-SILC data should allow us to investigate Latvia, Estonia, Slovenia, and Bulgaria as well. Unfortunately, once the panel is constructed, and missing data are considered, the number of related observations is too small to perform econometric analysis. Nevertheless, the remaining countries are representative of (economic, institutional, historical, and cultural) the heterogeneity characterizing CEEC.

The rotating scheme of the survey indicates that each sampled household remains in the sample for 4 years, and this structure reduces the phenomenon of attrition, i.e., the unit non-response of eligible persons or households that occurs after the first wave of the panel (Rendtel 2002). As suggested by Eurostat (2010), we checked for the presence of attrition by examining the variable that provides information about membership status (RB110 in the official coding of EU-SILC variables). People were asked whether they were in the same household in previous waves (current household members) or not (not current household members) and whether and why they moved into/out of the household since the previous/last wave. By combining this information with that obtained from variables providing information about "to where the person moved" (RB120 in the official coding of EU-SILC variables), we can reasonably exclude that there is attrition among our data.

We focus on the population interviewed in the period 2007–2010, aged between 25 and 60 years old. The models are estimated separately by country. The effective

(balanced) sample sizes are 11,786 in Poland, 3580 in Lithuania, 4996 in Czech Republic, 5524 in Slovakia, 6740 in Hungary, and 6388 in Romania.

We are interested in the estimation of the effects of different levels of disability on employment opportunities. Table 1 displays the employment rates computed for our (balanced) samples by country for each level/degree of activity limitation of the individual.[4] There is a gap between the employment rates and the opportunities of non-disabled and disabled people, especially those with strong limitations in daily activities. The individuals affected by high disability are indeed disadvantaged (lower employment probability) in all of the countries examined, although to different extents. Romania and Lithuania show the largest gaps between the employment rates of non-disabled people and disabled individuals (40.15 p.p. in Romania and 35.29 p.p. in Lithuania), especially if affected by strong activity limitations (69.25 p.p. in Romania and 70.17 p.p. in Lithuania). Employment disadvantages for disabled (and especially highly disabled) people are also noticeable in the other countries analyzed, i.e., Poland, the Czech Republic, Slovakia, and Hungary. This finding emphasizes that a reduction of the impacts of disability on individual employment opportunities might be a necessary policy intervention to enhance labor market participation (and subsequently the employment prospects/opportunities) in these countries.

Table 2 reports summary statistics by country for the variables used in the econometric analysis throughout the overall period examined. The dependent variable is the employment rate/probability.

Our analysis of the effects of disability is based on individuals' self-reported limitations in activities because of health problems at the time of the interview (PH030 in the official coding of EU-SILC variables, Eurostat 2010). We use dummy variables for disability and strong disability. Past employment accounts for state dependence, whereas lagged disability allows us to distinguish the effects on employment opportunities of shorter- and longer-term disability.

Examining the prevalence of disability, on average (Table 2), approximately 14 % of individuals in our samples report activity limitations (disability). The percentage (portion) ranges from 10.4 % in Romania to 18.1 % in Slovakia. A different picture emerges for strong disability. The average percentage is clearly lower, i.e., approximately 4.5 %. The country with the lowest percentage is the Czech Republic, i.e., approximately 3 %, while the country with the highest incidence is Hungary, where the percentage exceeds 6 %.

The quantitative analysis controls for a list of variables, including age, defined according to four age groups (25–34; 35–44; 45–54; and 55–60)[5] and three educational variables defined according to UNESCO's International Standard Classification of Education (ISCED), distinguishing among education completed in the lower secondary

Table 1 Employment rates by country and level of disability, 2007–2010

	Poland (%)	Lithuania (%)	Czech Republic (%)	Slovak Republic (%)	Hungary (%)	Romania (%)
No disability	78.23	84.86	84.75	87.82	78.85	75.85
Disability	49.70	49.56	53.27	74.45	44.25	35.69
Strong disability	18.98	14.69	26.14	29.96	16.78	6.60

Note: Employment rates computed on balanced samples
Source: our elaborations of EU SILC data

Table 2 Descriptive statistics by country, 2007–2010

	Poland	Lithuania	Czech Republic	Slovak Republic	Hungary	Romania
Employment	0.723	0.769	0.790	0.825	0.694	0.686
Employment time 1	0.728	0.788	0.797	0.830	0.693	0.687
Disability						
No disability	0.835	0.823	0.844	0.768	0.777	0.851
Disability	0.127	0.128	0.126	0.181	0.160	0.104
Strong disability	0.038	0.049	0.031	0.050	0.063	0.045
Disability benefit	0.082	0.114	0.100	0.071	0.136	0.079
Female	0.520	0.527	0.533	0.539	0.561	0.534
Age						
Age [25, 34]	0.201	0.170	0.235	0.246	0.201	0.217
Age [35, 44]	0.288	0.301	0.282	0.255	0.317	0.299
Age [45, 54]	0.349	0.376	0.289	0.358	0.320	0.314
Age [55, 60]	0.162	0.153	0.193	0.142	0.162	0.171
Education						
None, elementary, or lower secondary	0.119	0.101	0.093	0.065	0.167	0.218
Upper secondary	0.655	0.299	0.775	0.719	0.575	0.578
Post-secondary or tertiary	0.227	0.600	0.132	0.215	0.258	0.193
Married	0.783	0.730	0.646	0.713	0.645	0.762
Number of kids 0–3	0.088	0.051	0.076	0.066	0.065	0.033
	0.300	*0.225*	*0.272*	*0.265*	*0.251*	*0.189*
Number of kids 4–15	0.640	0.487	0.485	0.479	0.585	0.481
	0.888	*0.795*	*0.768*	*0.803*	*0.886*	*0.858*
Local unemployment rate	9.210	10.350	5.951	11.400	9.852	5.540
	1.460	*5.617*	*2.403*	*1.745*	*2.851*	*0.953*
Equivalised household income	4.778	5.177	7.262	5.873	4.832	2.480
	3.996	*3.649*	*3.662*	*2.687*	*2.334*	*1.816*
Delta unemployment rate 2006–2007	−30.455	−26.414	−25.009	−16.22	−0.828	−12.252
	4.253	*3.395*	*3.828*	*2.941*	*5.375*	*7.046*
Observations	11,796	3580	4996	5524	6740	6388

Notes: Standard deviations in italics for continuous variables
The full specification also include yearly time dummies
Source: our elaborations of EU SILC data

stage (ISCED 0–2), upper secondary education (ISCED 3), and post-secondary or tertiary education (ISCED 5–7). Dummy indicators for marital status and the presence and number of children in the household by age, i.e., 0–3 years old and 4–15 years old, as well as equalized household income deflated at 2007 prices,[6] are also included in the model. The business-cycle effect is controlled for by introducing the local unemployment rates.[7] This step is particularly recommendable in our analysis because both the sign and the extent of business cycle variation were particularly relevant in the period analyzed. For identification purposes, the initial conditions equation of the estimated models includes a variable measuring the relative change in local unemployment rate between 2006 and 2007, possibly affecting employment probabilities in 2007 but not in later years.

Finally, in the Appendix (Table 6), we report some descriptive characteristics of disability benefits received by disabled individuals in the analyzed countries. The incidence (in the whole sample) ranges between 7.1 % (Slovakia) and 13.6 % (Hungary). The incidence is higher when focusing on disabled people. Particularly, it ranges between 18.1 % (Slovakia) and 46.4 % (Czech Republic) for disabled people and between 57.8 % (Slovakia) and 71.2 % (Lithuania) for highly disabled people. The average amount of disability benefits is relatively low and ranges between 1200 euros per year (Romania) and 3300 euros per year (Czech Republic). The differences in the average amount of disability benefits received by disabled and highly disabled people are relatively small.

3.1 Tests

Our analysis is based on individuals' self-reported limitations in activities because of health problems at the time of the interview (PH030 in the official coding of EU-SILC variables, Eurostat 2010). The information on activity limitations is an individual's self-assessment of whether he or she is limited in his or her usual activities, including "activities people usually do," by any ongoing physical or mental health problem, illness, or disability for at least the previous 6 months. The individuals are also asked about their level of limitation/disability, absence of limitations, limitations, and strong limitations.[8]

Nevertheless, because disability is self-reported, and a self-reporting bias problem might arise (see Kerkhofs and Lindeboom 1995 and Hernández-Quevedo et al. 2005, for similar problems with self-reported health),[9] we test the robustness of our measurement of disability using specific investigations. Particularly, we run a sort of consistency test between self-reported information about limitations in daily activities and self-reported information about different measurements of general health status (PH010 in the EU-SILC questionnaire)[10] and chronic illness (PH020).[11] The ratio of the test is that the stronger the correlation is among different measurements of disabling/poor health conditions, the higher the reliability is of "limitations in daily activities" in identifying a real disabling condition. In other words, the test is based on the hypothesis that the probability an individual serially lying on declarations in simultaneous disabling/poor health conditions indicators is low; consistency among alternative self-reported measurements of disabling/poor health conditions is an indicator of the validity of "limitations in daily activities" for identifying a truly disabling condition.

The cross-controls between disability and this information are shown for all of the countries analyzed in the graphs (Figs. 1 and 2) in the Appendix. The values of rho (correlation) between disability and health status are rather high, ranging from 0.55 in Poland to 0.65 in Hungary (Fig. 1). The values of the correlations are even higher if we consider disability, especially strong disability, and chronic illness. The values of these correlations are, on average, greater than 0.90 in the six countries (Fig. 2). This test is quite reassuring regarding the validity of our measurements of disability/activity limitations to capture the phenomenon of disability itself because they are robust to both subjective and objective alternative measurements.

Another concern with our analysis is related to the possibility that unobserved individual factors simultaneously drive employment and disability variables. We test this circumstance estimating the correlation (rho) between the error terms in a two-

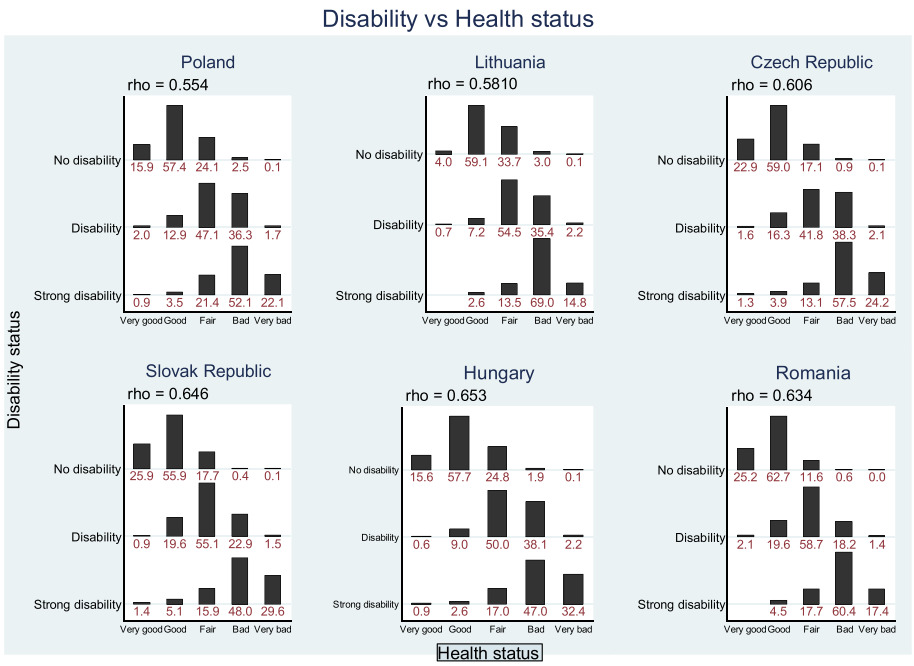

Fig. 1 Correlations between disability and health. Source: our elaborations of EU SILC data

simultaneous equation framework, in which employment and disability equations are estimated jointly using, respectively, a dynamic pooled probit model and a dynamic pooled ordered probit model (see Table 7, Appendix). The correlations between the error terms are relatively weak, negative, and significant. This finding suggests, in agreement with expectations, that there is a negative and weak correlation between self-reported disability and employment. This finding would be indicative that non-

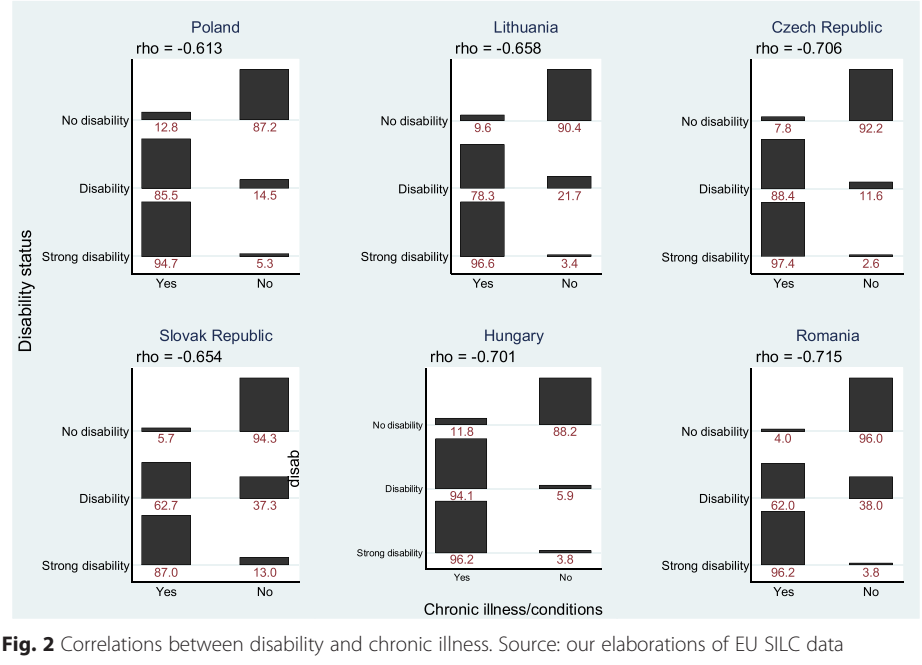

Fig. 2 Correlations between disability and chronic illness. Source: our elaborations of EU SILC data

employed individuals would be more prone to reporting a disability status to justify their employment conditions. However, the estimation results are consistent with those obtained using our benchmark model,[12] reassuring us of the validity of our estimates.

Finally, we run a test of the robustness of the cut-point shifts of our self-perceived measurement of disability with regard to a number of relevant explanatory variables, following the technique suggested by Contoyannis et al. (2004). The systematic use of different threshold levels by subgroups of a population would reflect the existence of reporting bias (Lindeboom and van Doorslaer 2004; Murray et al. 2001). These differences might be influenced by, among other factors, gender, age, and education, indicating that different groups appear to interpret the question within their own specific context and therefore to use different reference points when they are responding to the same question. If the reporting bias is due to a cut-point shift, this fact indicates that there is a change in the relative positions of the reporting thresholds for particular subgroups of the population, resulting in a change in the overall distribution of self-reported disability.

The test investigates the issue of self-reporting bias by dividing the sample of all of the countries examined into subsamples based on gender, age (<45 and >45), and highest attained educational qualification (primary, secondary, or tertiary[13] educational attainment level). For each subsample, we estimate dynamic random effects ordered probit models, controlling for initial conditions and correlated effects. Our findings (Table 8, Appendix) confirm that the relevance/effect/impact of disability, as measured by the magnitude and sign of the APE for lagged disability, does not change significantly (in terms of sign and significance) once we divide our samples by gender, age, and education. This finding is true for all of the countries analyzed. That is, the distribution of responses to the disability question across gender, age, and education across countries is very similar. Our measurement of disability is therefore robust to alternative subsamples' estimates (and specifications) and, in general, to self-reporting bias.

4 Results

4.1 The effects of disability on employment probabilities

The main estimation results are presented in Tables 3 and 4, in which we report the average partial effects of being disabled on employment opportunities. In Table 3, we distinguish between disability and strong disability and between the shorter- and longer-term effects of disability. Table 4 reports an estimation of the joint effect of disability and disability benefits on the employment opportunities of disabled people, as measured by the introduction of specific dummy interaction variables (see Section 4.2).

Table 3 APE for the effects of disability by country, the Heckman model, 2007–2010

		Poland	Lithuania	Czech Republic	Slovak Republic	Hungary	Romania
Time *t*	Disability	−0.058***	−0.111***	−0.071***	−0.026***	−0.049***	−0.038***
	Strong disability	−0.144***	−0.250***	−0.190***	−0.118***	−0.136***	−0.111***
Time *t*−1	Disability	−0.027*	−0.017	−0.015	−0.003	−0.043***	−0.035***
	Strong disability	−0.106***	−0.147***	−0.037	−0.030	−0.093***	−0.049***

*Significant at the 10 % level; **significant at the 5 % level; ***significant at the 1 % level
Source: our elaborations of EU SILC data

Table 4 APE for the interacted effects of disability and disability benefit by country, the Heckman model, 2007–2010

		Poland	Lithuania	Czech Republic	Slovak Republic	Hungary	Romania
Time *t*	Disability	−0.031***	−0.071***	−0.039***	−0.031***	−0.011	−0.020*
	Disability*receiving disability benefit	−0.106***	−0.120***	−0.109***	−0.083***	−0.159***	−0.227***
	Strong disability	−0.107***	−0.144***	−0.074**	−0.056*	−0.059**	−0.116***
	Strong disability*receiving disability benefit	−0.052	−0.254**	−0.291***	−0.233***	−0.215***	n.a.
Time *t*−1	Disability	−0.011	0.002	−0.001	−0.001	−0.024**	−0.023*
	Disability*receiving disability benefit	0.009	−0.050*	0.002	0.007	−0.015	−0.044
	Strong disability	−0.031	−0.085**	−0.081**	−0.060**	−0.032	−0.034
	Strong disability*receiving disability benefit	−0.048	−0.037	0.082***	0.071***	−0.029	n.a.

Note: Second, fourth, sixth, and eight rows refer to estimated coefficients of interaction dummy variables between disability status and disability benefit
Source: our elaborations of EU SILC data
n.a. not available
*Significant at the 10 % level; **significant at the 5 % level; ***significant at the 1 % level

In the Appendix, Table 9 reports the estimated coefficients of the initial condition equations, and it also includes the estimated θ parameters, which provide us with a measurement of the correlation between initial employment status and unobserved factors. Their significance suggests the relevance of adopting a random effects dynamic probit model accounting for endogenous initial conditions (as suggested by Heckman 1981), rather than assuming exogenous initial conditions.

Estimation of the control variables is presented in the Appendix (Table 10), and we found quite standard effects with few exceptions. These findings include evidence of state dependence (even after controlling for endogenous initial conditions) ranging from 0.35 in Poland to 0.47 in Slovakia and decreasing to 0.12 in Lithuania, perhaps because of the strong increases in unemployment rates in the period under investigation.[14] We also find evidence of lower employment probabilities for women (negative impact ranging from 1.3 % in Lithuania to 7.2 % in Poland) and for older workers, a negative impact of having children aged 0–3 years old in the household, and greater employment opportunities for better educated and higher-income individuals. The demand side indicator (the local unemployment rate), also catching the economic slowdown effects, shows the expected negative sign. When focusing on disability effects, it is essential to note the high significance and magnitude of both current and strong disability. As shown in Table 3, the impact of current disability on employment opportunities ranges from −2.6 % in Slovakia to −11.1 % in Lithuania. We find intermediate effects in Romania (−3.8 %), Hungary (−4.9 %), Poland (−5.8 %), and the Czech Republic (−7.1 %). The negative impact is much greater when focusing on strong disability, ranging from −11.1 % in Romania to −25 % in Lithuania.[15] Intermediate impacts exist in Slovakia (−11.8 %), Hungary (−13.6 %), Poland (−14.4 %), and the Czech Republic (−19 %). Comparing these effects with those reported in the related literature (e.g., Gannon 2005; Oguzoglu 2010 and Agovino et al. 2014), we find that the detrimental impact of disability is greater in the CEEC analyzed than in the Western nations (Mussida and Sciulli 2015).[16]

It should also be noted that strong disability is the most negative factor impacting employment opportunities among those considered in our analysis. Relevant negative impacts have also been found for individuals limited in daily activities but not severely. These preliminary considerations should suggest to policy makers the relevance of adopting specific policies aimed at increasing the integration and retention of disabled people in the labor market, especially of women, older people, less educated people, and people with strong activity limitations,[17] as a potential factor promoting the social inclusion of individuals and higher effectiveness of Central and Eastern European economies. Labor market participation and especially employment are indeed considered relevant factors of integration into society (Warren 2005).

The relevant impact of disability on labor market outcomes is also confirmed when examining the longer-term effects of disability. With the exception of the Czech and Slovak Republics and Lithuania, for a non-strong disability level, we find that past disability significantly and negatively affects current employment opportunities. The negative effect ranges between 2.7 % for Poland and up to 3.5 % for Romania and 4.3 % for Hungary. When focusing on strong disability, the negative impact is 4.9 % for Romania and increases to up to 9.3 % for Hungary, 10.6 % for Poland, and 14.7 % for Lithuania. The magnitude is smaller when compared to that related to the shorter-term effects of disability, suggesting that partial integration into the labor market of disabled people involves working overtime. Given this interpretation, the integration process over the medium-to-long term would be particularly effective in the Czech and Slovak Republics, possibly indicating the implementation of powerful labor policies for disabled individuals (for instance, the Czech Republic has promoted both long-term support during job searches and training courses for disabled people in recent years).

Our results also indicate that mechanisms involving a negative impact of disability on employment, on average, prevail over positive impacts. For example, we cannot discard the hypothesis that disabled people would be likely to increase their labor supply (even more if not strongly disabled) to meet their special consumption requirements better and that employment policies (e.g., active labor market policies, including training schemes and employment subsidies) contribute to the (partial) integration and inclusion of disabled individuals in the labor market.[18] Nevertheless, negative mechanisms prevail, and the total net negative effect of disability on employment varies across countries, according to the different magnitude of each specific factor at work in each country.

On the one hand, people receiving disability benefits are likely to reduce their labor supply, also according to the level of monetary transfers. On the other hand, there are a number of underlying mechanisms possibly decreasing the employment opportunities of disabled people that deserve active governmental interventions. Among the factors lowering the employment prospects of disabled people, we numbered supply and demand side factors concerning the higher opportunity costs of working and the higher mobility costs for disabled people. Public support for workplace adjustments to firms would be helpful in increasing the employment probabilities of disabled people (e.g., Newton and Ormerud 2005). It has also been shown that individuals with mobility problems are those who atone for a greater reduction in re-employment opportunities (Sciulli et al. 2012). This finding suggests that policies removing obstacles/barriers to the mobility of people with disabilities would be effective in promoting their employability, especially in CEEC, where disability because of reduced mobility is relevant.

In addition, because disabled people require special time requirements for self-care/rehabilitation activities, flexible and/or reduced working hours would better fit the needs of disabled people, and they would be helpful in increasing their integration into the labor market. It is relevant to note that part-time work is common among disabled people who are employed.

Recent labor market and welfare policy developments in European countries have seen an increased focus on the possibilities of partial work and job flexibility, including shorter working hours (e.g., part-time job), and possibilities for more flexible attendance (OECD 2007). In Poland, for instance, legal rights were enacted to ensure, depending on the degree of disability, the right to work of disabled people. Additional efforts for flexible working hours and conditions, therefore, will be crucial for the labor market participation of disabled people.

Finally, although anti-discriminatory policies have been implemented in many countries (as recommended by the EU Directive of 2000),[19] and the UN Convention on the Rights of Persons with Disabilities has been largely ratified, monitoring their actual implementation seems to be necessary.[20]

4.2 The role of disability benefits

This section presents evidence on the role of receiving disability benefits in the employment opportunities of disabled individuals in CEEC. There are remarkable institutional differences in the procedures adopted in these countries for the diagnosis and certification of disability and the provision of disability benefits. For these reasons, we offer a detailed description of the eligibility criteria for disability benefits (either temporary or permanent and from work injuries as well), diagnosis/certification and delivery of disability benefits, accumulation of earnings from work, employment quotas reserved for disabled individuals, and incentives for employers in Table 5 in the Appendix.

Table 4 reports related the average partial effects of explanatory variables, obtained by interacting disability dummy variables (disability and strong disability, respectively) with a dummy variable taking the value of one in case the individual is receiving a disability benefit and zero otherwise (disability and benefit interaction and strong disability and benefit interaction).

Generally speaking, when focusing on the shorter-term effects of disability, we find that receiving a disability benefit strongly reduces the probability of being employed for both disabled and highly disabled individuals. The negative impact ranges from −8.3 % (Slovakia) to −22.7 % (Romania) for disabled people and from 21.5 % (Hungary) to 29.1 % (Czech Republic) for highly disabled people. Receiving a disability benefit, in the short term, reduces the employment probabilities of disabled individuals by up to three or four times. It is also relevant to combine these results with the differences between countries in the opportunities for the accumulation of disability benefits with earnings from work or, in other words, whether it is possible to accumulate wages and disability benefits when a disabled individual starts working/performs gainful activity. The evidence is mixed. Whereas the accumulation is possible in Lithuania, the Czech Republic, and Slovakia, in the other three countries analyzed, we find some restrictions. These data help to explain the

strong negative impact on employment in Romania and Hungary. The disabled in these countries might therefore prefer to remain in their conditions and receiving benefits (either temporary or permanent) instead of starting to work and losing their benefits, even if partially in some cases (see Table 5).

It should be noted that, although receiving disability benefits contributes importantly to reducing the employment opportunities of disabled people, disability per se preserves a significant role in determining the employment prospects of individuals. The employment probability of disabled individuals not receiving a disability benefit is 2 % less than that of non-disabled individuals in Romania and increases to up to 7.1 % in Lithuania. When focusing on strong disability, this *pure* negative effect ranges from 5.6 % (Slovakia) to 14.4 % in Lithuania.

Our findings about the role of disability benefits are in agreement with theoretical predictions, for which receiving monetary transfers lowers the labor supply of disabled individuals (e.g., Gruber 2000), especially in countries where the accumulation of disability benefits and earnings is not possible or is limited.

However, although this finding is well founded theoretically, we must consider that this explanation is not completely exhaustive. In fact, receiving a disability benefit is usually conditioned on a medical decision certifying the existence of an impairment, limiting individual activities in a serious and permanent manner.[21] This conclusion indicates that, while the self-reported information about daily activity limitations is also determined by the interaction of impairments with external factors, focusing on the subsample of individuals receiving disability benefits involves a shift toward a medical conception of disability, for which only seriously impaired individuals are considered. An empirical consequence of this definition would be the increase in the extent of the negative impact of disability on employment probabilities. From another perspective, because the medical certification consists of an external evaluation of disability, its exogeneity ensures us considerably regarding the reduced risk of incurring self-reporting bias.[22]

When focusing on past disability indicators, we find more mixed effects. First, we find a *pure* negative effect of disability or strong disability on employment opportunities. In particular, as a longer-term effect of disability (associated with the absence of disability benefits), we find a reduction in employment opportunities by 2.3 % in Romania and 2.4 % in Hungary. In addition, the longer-term effect of disability on the highly disabled (but not receiving disability benefits) reduces employment opportunities by 6 % in Slovakia, 8.1 % in the Czech Republic, and 8.5 % in Lithuania. Interestingly, among the longer-term effects of disability, we find the canonical negative impact because of the receiving of disability benefits only for Lithuanian disabled individuals (−5 %). Conversely, we find a positive longer-term impact on the employment opportunities of highly disabled individuals receiving disability benefits in the Czech and Slovak Republics (respectively, by 8.2 and 7.1 %), countervailing the negative impact due to disabling conditions.

In summary, the analysis of the role of disability benefits in the employment prospects of disabled people is revealing in different aspects. First, according to the standard interpretation and consistent with theoretical predictions, receiving disability benefits strongly reduces the employment opportunities of disabled individuals, possibly raising questions about the nature and structure of monetary

transfers in the perspective of building incentive schemes to increase the labor supply of disabled people, as well as because, as we have explained above, the impossibility or limitations of the accumulation of disability benefits and earnings strongly reduce employment opportunities.

Second, although the impact of receiving disability benefits is sizeable, we still find evidence of *pure* negative effects because of disabling conditions. In other terms, disability per se significantly reduces the employment opportunities of the analyzed individuals. Third, when examining the longer-term effects of disability, the impact seems to be mixed across countries.

5 Conclusions

Disabled people are disadvantaged in many socioeconomic dimensions, and their conditions are particularly difficult in Central and Eastern European Countries, which have suffered a worsening of their standards of living during the transition era. Despite these considerations, the related evidence has been scarce.

This paper contributes to fill this gap by offering new empirical evidence for the relationship between employment opportunities and disability in CEEC. Disability has been defined according to the self-reported information about limitations in daily activities, in the spirit of the social model of disability. Robustness checks for self-reporting bias have been provided.

The importance of promoting employment for disabled people is twofold because, first, it favors social inclusion and increases the income of disabled individuals and, second, it provides for a more productive labor supply and has positive effects on economic output in the long term.

Our empirical approach offers the estimation of a random effects probit model accounting for state dependence and endogenous initial conditions, to assess the shorter- and longer-term effects of disability in six CEEC. In this context, we consider different levels of disability and evaluate the joint impacts of disability and disability benefits. We find evidence of a negative impact of disability on employment probabilities, with different extents across the countries analyzed. The negative effect sometimes almost doubles that found in Western and Anglo-Saxon countries. The negative impact is greater in cases of strong disability. In addition, the shorter-term impact of disability being greater the longer-term effects on disabled individuals suggests partial integration into the labor market of disabled people over time. Receiving disability benefits strongly contributes to reducing the employment opportunities of disabled people, consistent with theoretical predictions of the role of monetary transfers in the labor supply. Nevertheless, we also find that disabled people not receiving disability benefits are significantly penalized in terms of employment opportunities, suggesting a predominant role of disability per se in determining a negative impact on employment probability.

Our results suggest that there is space in CEEC to reduce the employment gap between disabled and non-disabled people, resulting in positive effects in different dimensions of socioeconomic activities, including the social inclusion of disabled people and the economic performances of countries involved in the integration process.

As shown in the related literature, this integration process requires the implementation of specific policies. Our results suggest that interventions might affect the structure of disability benefits because they support incomes, but they might also decrease the labor supply of disabled people and their relatives. In addition, as suggested by other studies, best practices to favor the inclusion of disabled people might include removing barriers to the mobility of disabled people, flexible jobs/working conditions and working hours, support for employers making workplace adjustments, and the enforcement of anti-discrimination legislation.

Endnotes

[1]Eurostat statistics confirm that social expenditure, particularly related to sickness and health care, is lower in CEEC and that no significant changes have been implemented during the economic downturn.

[2]For a detailed description of the institutional differences in procedures adopted in these countries for diagnosis, certification of disability and provision of disability benefits, see Table 5 in the Appendix.

[3]The negative effect of strong disability on employment is, on average, approximately 9 % in Italy, 4 % in France (Mussida and Sciulli 2015), and 8 % in Australia (Oguzoglu 2010). In the UK, the effect increases to approximately 27 % (Berthoud 2011) and in Ireland to 18 % (Gannon 2005).

[4]The definitions of employment and non-employment do not match the ILO definitions. On the EU-SILC questionnaire, the respondents are indeed asked to self-define the main economic status of the current year. They are asked whether they are working, unemployed, or in retirement or early retirement, have given up business, or are another category of inactive person (Eurostat 2010).

[5]Disability and therefore the probability of reporting activity limitations, as also emphasized by the European Commission (2010), increase with individual age. We therefore decided not to include in our analysis elderly people, i.e., people older than 60 years old. We also attempted to reduce our upper age limit further to 55 years old, but given that the results of our estimates did not change, we decided to keep 60 years of age as the upper limit.

[6]The equalized household income is computed starting from the total disposable household income, variable HY020, using the within-household non-response inflation factor, HY025, and the equalized household size, hhsize. The income is computed in thousands as follows: eqhhincome = (HY020*HY025)/(hhsize*1000). It is also deflated using the Consumer Price Index (CPI), gathered by ISTAT.

[7]These figures are available on the Internet athttp://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfst_r_lfu3rt&lang=en.

[8]Based on this information, we built our dummy variables on disability status (see Section 4).

[9]Reporting bias has been a concern in the literature and can be defined as the differential reporting of disability (activity limitations) across individuals or groups of individuals with the same disability status.

[10]The variable PH010 provides information about self-perceived health, which is classified as very good, good, fair, bad, and very bad.

[11]The variable PH020 indicates whether the individual suffers from any chronic (long-standing) illness or condition. Like health (PH010), it is self-perceived.

[12]The estimation results are not reported for the sake of brevity. Nonetheless, they are available upon request.

[13]Table 8 reports the estimates by gender. For the sake of brevity, we did not report the results for age and education. Nonetheless, they are available upon request.

[14]The unemployment rate increased in all of the countries analyzed during the period under investigation, especially in Lithuania and Slovakia. In Lithuania, the unemployment rate increased from 4.2 % in 2007 to 17.8 % in 2010, whereas in Slovakia, it increased from 11.1 % in 2007 to 14.4 % in 2010. These figures are available on the Internet athttp://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfst_r_lfu3rt&lang=en. See Cuestas et al. (2011) for a study of transition countries.

[15]Interestingly, the employment rate remained stable in Romania during the period analyzed (approximately 58.8 %), whereas it decreased significantly in Lithuania, ranging from 65 % in 2007 to 57.6 % in 2010, suggesting that the reduction in employment rates primarily affected the employment opportunities of (strongly) disabled individuals in Lithuania. These figures are available on the Internet athttp://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfst_r_lfu3rt&lang=en.

[16]Cross-country differences, both within CEEC and between West and East-Central, have various explanations, including differences in labor demand structure and the distribution of disability types. For example, disabled people, because of workplace characteristics, might experience lower employment rates in those countries where the agricultural and industrial sectors are particularly relevant. In addition, employment probabilities might vary because of different types of disability, according to adaptability to workplaces, related mobility difficulties, and social stigma.

[17]These findings are confirmed by the ANED (2009) national reports and by detailed studies of the situations of disabled people (e.g., APPLICA et al. 2007).

[18]According to ANED (2009), while sheltered employment increased in many EU countries, it decreased in others, including Poland.

[19]The Council Directive 2000/78/EC of 27 November 2000, among other things, affirms that the "provision of measures to accommodate the needs of disabled people at the workplace plays an important role in combating discrimination on the grounds of disability."

[20]Country-specific recommendations concerning the implementation and the effectiveness of anti-discriminatory policies have been sent to many countries. For details, see ANED (2009).

[21]This is somewhat confirmed by examining the distribution of disability benefits across different disability statuses, for which only 1/3 of disabled individuals receive a disability benefit, while the number of recipients increases to approximately 2/3 when focusing on greatly disabled individuals.

[22]It should be noted that applying for disability benefits usually requires effort and ability to negotiate bureaucracy. It follows that less educated individuals are less likely to apply for disability benefits, possibly contributing to underestimating the negative impact of receiving a disability benefit for disabled individuals.

Appendix

Table 5 Institutional differences across countries in procedures for the diagnosis, certification of disability, and provision of disability benefits

	Poland	Lithuania	Czech Republic	Slovak Republic	Hungary	Romania
Disability pension-eligibility criteria[a]						
Type of program	Social insurance system	Social insurance and social assistance system	Social insurance system	Social insurance and individual account system	Social insurance and individual account system	Social insurance and individual account system
Disability pension	Permanent or partial disability pension: paid for a total disability (incapacity for any work) or partial disability (greatly impaired earning capacity or total incapacity for usual work).	Permanent or partial disability pension: paid for a total disability (loss of working capacity of 75 to 100 % or 55 to 74 %) or partial disability (loss of working capacity is from 45 to 54 %).	Permanent or partial disability pension: Paid for a total disability (70 % loss of earning capacity) or partial disability (from 50 to 69 % loss of earning capacity).	Permanent of partial disability pension: Paid for a total disability (at least a 70 % loss of earning capacity) or partial disability (at least a 40 % loss of earning capacity).	Permanent or partial disability pension: paid for a total disability, 100 % loss of working capacity and need for permanent care by others; 100 % loss but no need for permanent care; partial disability for at least a 67 % loss.	Permanent or partial disability pension: Paid for a total disability (assessed with a permanent disability and incapacity for any work) or partial disability (loss of at least 50 % of working capacity).
Diagnosis/ certification and delivery of disability benefits	Social Insurance Institution	The Disability and Capacity for Work Establishment Office	Czech Social Security Administration	A medical examiner of the Social Insurance Agency and a general practitioner	The national medical board	National Pension and Social Insurance Fund
Work injury: temporary and permanent disability benefits	Temporary: 100 % of average earnings in the 6 months before the disability began is paid from the first day for up to 26 weeks.Permanent: if the insured has a total disability, the benefit is based on national average earnings, insured's earnings and number of contribution years.	Temporary: 100 % of the insured's average earnings and paid from the first day of disability until the date of certification of permanent disability.Permanent: for a loss of working capacity of at least 30 %, benefit is based on 50 % of the percentage of loss in working capacity, compensation coefficient and insured income level.	Temporary: lump sum is paid equal to the difference between the insured's average earnings before work injury and full amount of sickness benefit.Permanent: full pension paid for a total permanent disability (66.7 % loss of earning capacity or more). The monthly pension is based on average gross earnings before disability.	Temporary: from the 1st to the 3rd day of incapacity, 55 % of the insured's daily assessment basis is paid; thereafter, 25 %.Permanent: if the insured has an assessed loss of earning capacity of at least 40 %, the monthly benefit is the product of 80 % of the assessment.	Temporary: monthly benefit 75 % of old-age pension paid to the insured at the normal retirement age. Permanent: value of pension varies: 100 % loss of working capacity and need for permanent care provided by others; 100 % loss but no need for permanent care; and at least a 67 % loss.	Temporary: The benefit is 80 % of the insured's average wage in the 6 calendar months before the disability began and is paid from the first day of disability for up to 180 days a year.Permanent: the pension is based on the insured's average lifetime accumulated pension points.
			No limitations			

Table 5 Institutional differences across countries in procedures for the diagnosis, certification of disability, and provision of disability benefits *(Continued)*

Accumulation with earnings from work	Pension suspended or reduced if the beneficiary works: a) earnings below 70 % national average wage: no effect on pension; b) earnings between 70 and 130 % national average wage: basic amount of the pension reduced by 24 or 18 % in case of partial disability pension; c) earnings over 130 % national average wage: pension suspended.	No restrictions, full accumulation is possible.		Accumulation possible: disability pensioners may continue to work, wages are paid.	Disability benefit terminated in cases where the eligible person performs gainful activity and his/her income regarding 3 consecutive months respectively exceeds 150 % of the minimum wage.	Those with permanent disability pension: cumulation not permitted. Those with temporary disability Pension: cumulation not permitted with earnings from work if employed for more than half of the full working time for a particular job.
Employment quotas reserved for disable individuals/ incentives for employers	Employers with 25 or more employees must meet a quota of 6 % disabled persons. In case of non-compliance with quota, employers face a penalty of 40.65 % of average wages for each disabled person that should have been hired. For workers disabled from work injury, employers must arrange suitable workplace within 3 months after the employee declares readiness to return to work. In case of dismissal of such employee, the employer must pay a fee equal to 15 month' s salary.	Enterprises with 50 or more workers are obliged to employ 2–5 % of disabled persons with a reduction in capacity for work by at least 60 % or disabled with moderate disability. If employers do not fulfill this obligation, they pay a contribution equal to 15 times the official minimal wage.Every additionally created workplace for a disabled person is subsidized by the Employment Fund by an amount related to the national minimum wage for a maximum period of 1 year and a half.	Employers with a workforce of over 25 employees are obliged to employ disabled persons in a proportion of 4 % of the total number of the employees.Employers comply with this obligation by employing disabled persons, purchasing products/services from employers whose workforce includes more than 50 % of disabled, or making payments to the State budget.Employers whose workforce includes more than 50 % of disabled receive a contribution to support the employment of these persons.	Employers with 20 or more employees (with the exception of the police and security forces of the State) must employ at least 3.2 % disabled persons. If not, the employer pays 0.9-times the total average wage per year per vacancy for which a disabled person should have been hired.Calculation: 1 person whose capacity for work has been reduced by more than 70 % compared to a healthy person = 3 disabled persons. Employers pay lower health insurance contributions for their disabled employees: 5 % instead of 10 %.	It is mandatory for each employer with 25 or more employees, to fill 5 % of all posts with persons with disability. If this obligation is not met, the employer must pay contribution.Support from the Central Budget: for employers who hire persons with disability (who have lost at least 50 % of their working capacity and do not receive pension benefits in respect of their invalidity or old-age) for at least 1 year. The amount of the support varies according to the duration of employment.	A standard quota (4 %) is directed to both public and private employers. The small employers (with less than 50 employees) are exempted from the quota obligation. The employers who fail to meet the quota obligation are charged compensatory levies for each person with disabilities under the quota level or buying for the same amount products and services from the sheltered enterprises.The employers are entitled to tax incentives and wage subsidies.

[a]In all countries, the provision of benefits is related to seriousness of disability. In all countries, with the exception of Hungary, the disability pension ceases at the normal pensionable age and is replaced by the old-age pension

For additional information, see http://www.missoc.org/MISSOC/INFORMATIONBASE/COMPARATIVETABLES/MISSOCDATABASE/comparativeTableSearch.jsp and https://www.ssa.gov/policy/docs/progdesc/ssptw/

Table 6 Characteristics of disability benefit by seriousness of disability

Sample	Indicator	Poland	Lithuania	Czech Republic	Slovak Republic	Hungary	Romania
Whole sample	Incidence	0.082	0.114	0.100	0.071	0.136	0.079
	Average amount	2274.12	1702.93	3494.44	2374.18	2273.91	1178.33
Disability	Incidence	0.314	0.373	0.464	0.181	0.426	0.291
	Average amount (AAD1)	2230.77	1833.29	3280.07	2288.23	2268.97	1214.67
Strong disability	Incidence	0.651	0.712	0.651	0.578	0.702	0.653
	Average amount (AAD2)	2446.04	1837.78	4037.86	2649.11	2294.34	1135.93
H0: AAD2 > AAD1 (*P* value T stat)		0.002	0.488	0.000	0.004	0.368	0.947

Table 7 Endogeneity test: correlation between error terms of employment and disability equations

	rho	s.e.	
Poland	−0.202	0.032	***
Romania	−0.294	0.057	***
Hungary	−0.241	0.036	***
Czech Republic	−0.293	0.049	***
Slovak Republic	−0.239	0.048	***
Lithuania	−0.340	0.052	***

*Significant at the 10 % level; **significant at the 5 % level; ***significant at the 1 % level
Source: our elaborations of EU SILC data

Table 8 Average partial effects on probability of reporting activity limitations for dynamic random effects ordered probit by gender

	Men			Women		
	APE	s.e.		APE	s.e.	
Poland						
Lag disability	0.310	0.005	***	0.307	0.005	***
Age: reference—[25, 34]						
[35, 44]	0.005	0.010		0.020	0.011	*
[45, 54]	0.040	0.009	***	0.056	0.010	***
[55, 60]	0.067	0.010	***	0.077	0.011	***
Education: reference—primary						
Medium education	−0.023	0.009	*	−0.029	0.009	***
High education	−0.056	0.012	***	−0.056	0.010	***
Lithuania						
Lag disability	0.292	0.009	***	0.295	0.009	***
Age: reference—[25, 34]						
[35, 44]	0.040	0.021	*	0.039	0.022	*
[45, 54]	0.054	0.020	***	0.084	0.020	***
[55, 60]	0.083	0.021	***	0.109	0.021	***
Education: reference—primary						
Medium education	−0.035	0.016	*	−0.045	0.021	*
High education	−0.081	0.017	***	−0.087	0.020	***
Czech Republic						
Lag disability	0.291	0.010	***	0.295	0.009	***

Table 8 Average partial effects on probability of reporting activity limitations for dynamic random effects ordered probit by gender *(Continued)*

Age: reference—[25, 34]						
[35, 44]	0.008	0.018		0.011	0.019	
[45, 54]	0.047	0.017	***	0.061	0.017	***
[55, 60]	0.076	0.017	***	0.088	0.017	***
Education: reference—primary						
Medium education	−0.043	0.018	*	−0.038	0.015	*
High education	−0.055	0.023	*	−0.050	0.022	*
Slovak Republic						
Lag disability	0.358	0.008	***	0.383	0.007	***
Age: reference—[25, 34]						
[35, 44]	0.038	0.017	*	0.082	0.018	***
[45, 54]	0.093	0.015	***	0.115	0.016	***
[55, 60]	0.157	0.017	***	0.155	0.018	***
Education: reference—primary						
Medium education	−0.046	0.022	*	−0.039	0.020	*
High education	−0.057	0.025	*	−0.059	0.022	*
Hungary						
Lag disability	0.334	0.007	***	0.332	0.007	***
Age: reference—[25, 34]						
[35, 44]	0.055	0.015	***	0.044	0.016	***
[45, 54]	0.114	0.015	***	0.118	0.015	***
[55, 60]	0.161	0.016	***	0.152	0.015	***
Education: reference—primary						
Medium education	−0.044	0.013	***	−0.076	0.011	***
High education	−0.079	0.016	***	−0.128	0.013	***
Romania						
Lag disability	0.297	0.008	***	0.319	0.008	***
Age: reference—[25, 34]						
[35, 44]	0.027	0.014	*	0.078	0.017	***
[45, 54]	0.073	0.014	***	0.115	0.016	***
[55, 60]	0.121	0.014	***	0.176	0.016	***
Education: reference—primary						
Medium education	−0.016	0.011		−0.030	0.010	***
High education	−0.031	0.013	*	−0.064	0.014	***

Unbalanced samples
*Significant at the 10 % level; **significant at the 5 % level; ***significant at the 1 % level
Source: our elaborations of EU SILC data

Table 9 Estimated coefficients of initial employment status equation of the Heckman model by country, 2007–2010

	Poland		Lithuania	Czech Republic		Slovak Republic		Hungary		Romania	
Age [35–44]	0.394	***	0.055	3.245	**	0.903	**	0.828	***	0.220	
Age [45–54]	0.021		−0.171	3.557	***	0.490		0.709	*	−0.554	**

Table 9 Estimated coefficients of initial employment status equation of the Heckman model by country, 2007–2010 *(Continued)*

Age [55–60]	−0.854	***	−0.302		−0.775		−0.999	**	−0.105		−2.044	***
Upper secondary	0.585	***	0.281		0.409		1.826	***	1.352	***	0.881	***
Post-secondary or tertiary	1.182	***	0.700	*	−1.467		2.144	***	1.169	***	2.026	***
Married	0.453	***	0.464	*	0.349		0.671	**	−0.134		0.230	
Number of kids 0–3	−0.289	*	−0.756	*	−7.988	***	−0.922	**	−2.024	***	−0.878	*
Number of kids 4–15	0.039		−0.021		−1.683	*	−0.040		−0.271	*	−0.043	
Local unemployment rate	−0.110	*	−0.040		0.110		−0.005		0.746	*	−0.349	
Equivalised household income (.000)	0.150	***	0.317	***	1.235	***	0.483	***	0.758	***	0.779	***
Female	−1.133	***	−0.463	*	−10.911	***	−0.780	***	−1.326	***	−1.503	***
Disability	−0.928	***	−0.668	***	−14.386	***	−0.897	**	−2.456	***	−1.935	***
Strong disability	−2.533	***	−2.422	***	−17.768	***	−3.284	***	−4.188	***	−3.522	***
Change in local unemployment rate 2006–2007	0.023	*	−0.068	**	0.070		−0.132	***	−0.333	*	0.013	
Constant	2.261	***	0.315		14.601	**	−1.533		−8.031	*	2.160	
ρ	0.39	***	0.61	***	0.079	**	0.086		0.16	***	0.209	**
θ	1.92	***	0.94	***	5.577	**	5.962	*	5.54	***	4.380	**

*Significant at the 10 % level; **significant at the 5 % level; ***significant at the 1 % level
Source: our elaborations of EU SILC data

Table 10 APE for the control variables of the Heckman model by country, 2007–2010

	Poland	Lithuania	Czech Republic	Slovak Republic	Hungary	Romania
Employment $t-1$	0.354***	−0.119***	0.441***	0.472***	0.358***	0.426***
Female	−0.072***	−0.015	−0.045***	−0.030***	−0.033***	−0.039***
Age: reference—[25, 34]						
Age [35, 44]	0.017	0.017	0.025**	0.024**	0.004	0.013
Age [45, 54]	−0.006	−0.002	0.023*	0.015	−0.020*	−0.024**
Age [55, 60]	−0.112***	−0.025***	−0.053***	−0.051***	−0.087***	−0.079***
Education—reference: primary						
Upper secondary	0.042***	0.039*	0.029**	0.061***	0.026*	0.039***
Post-secondary or tertiary	0.086***	0.104***	0.040**	0.071***	0.041***	0.060***
Married	0.038***	0.023*	0.002	0.004	−0.005	−0.006
Number of kids 0–3	−0.026*	−0.044*	−0.180***	−0.092***	−0.134***	0.023
Number of kids 4–15	0.003	0.001	0.001	0.000	−0.007	−0.001
Local unemployment rate	−0.006***	−0.003***	−0.003**	−0.005***	−0.002*	−0.004
Equivalised household income	0.008***	0.013***	0.006***	0.017***	0.028***	0.015***
# observations	11,796	3580	4996	5524	6740	6388

*Significant at the 10 % level; **significant at the 5 % level; ***significant at the 1 % level
Source: our elaborations of EU SILC data

Competing interest
The IZA Journal of Labor & Development is committed to the IZA Guiding Principles of Research Integrity. The authors declare that they have observed these principles.

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