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Promoting employment of disabled women in Spain; Evaluating a policy

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ABSTRACT

Even though the Disability System in Spain is designed to allow partially disabled individuals to combine the receipt of the benefits with a job, their employment rates have remained very low since 1996. The aim of this paper is to evaluate the results of an employment promotion policy introduced in Spain in 2004 which increased the deductions to the Social Security contributions paid by employers that hired disabled women. We apply difference-in-difference models and estimate a recursive bivariate probit model to evaluate the existence of shifts in employment trends in the women relative to the men sample conditioning on the existence of preexisting trends. We find that the impact of the policy is significant and we estimate an average elasticity of employment of 0.14 for partially and of 0.08 for totally disabled women relative to the deductions in the employer Social Security contributions. Finally, when we extrapolate the results beyond our sample, we estimate that 7100 disabled women were able to find a job in Spain due to the policy with an associated cost of 10,997.900 euro for the government.

1. Introduction

Many OECD countries have tightened the conditions to access the unemployment and social assistance schemes while, at the same time, early retirement schemes have been limited (or even abolished) because of their well-documented disincentives to work. These events have resulted in increasing numbers of pre-retirement individuals entering the disability schemes which, together with the aging process of the population and the economic crisis, raises concerns about the mid-term effects of disability expenses on the government's budget (OECD, 2007a, 2007b, Benitez-Silva et al., 2010). On the other hand, several studies have stressed the need to promote the labor market integration of disabled individuals as a way of facilitating their broader integration in the society (OECD, 2003). For these reasons, the possibility of increasing the number of disabled people that work is regarded as a good way to both decrease the pressures on the financial stability of the social security system and to reach the social integration of disabled individuals.

A number of policy initiatives have been introduced in different countries in order to promote the integration of disabled workers into the labor market (employment quotas, subsidies, antidiscrimination legislation, deductions to the social security contributions) but the literature analyzing the effects of these policies seems to suggest that the employment effects are relatively small (if they exist). For example, Wagner et al. (2001) analyze the impact of employment quotas on job dynamics in 400 small firms in Germany and they find no effect of the quota threshold whereas Lalive et al. (2009) estimate an elasticity of substitution between disabled and non-disabled workers of 2.4 for employment quotas in Austria. Similarly, a number of studies have focused on the employment effects of anti-discrimination legislation (ADA; American with Disabilities Act in the USA and the Disability Discrimination Act in the UK) and have found opposing results. On the one hand, DeLeire (2000), Acemoglu and Angrist (2001) and Beegle and Stock (2003) conclude that ADA has not increased employment for disabled individuals in the USA and Bell and Heitmueller (2005) find similar results for the UK. On the other hand, Jolls and Prescott (2004) and Jolls (2004) find that the main effect of ADA was to increase the returns on education which, in turn, raised education participation of disabled individuals as well as their employment prospects.

Therefore, this paper tries to shed some light to this debate by studying one of these policies that was introduced in Spain in 2004 to promote employment among disabled women. In particular, we apply difference-in-difference methods to evaluate the employment effects of an increase in the deductions of employer's social security contributions to hire disabled women. In order to do that, we first explore the characteristics and evolution of the labor market participation of disabled individuals in Spain from 1996 until 2007. We realize that employment trends between men and women in our sample are not homogeneous before the implementation of the policy in 2004 so that the basic assumption of traditional difference-and-difference

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models would not be fulfilled. Therefore, we apply a new econometric model introduced by Autor and Duggan (2008) to analyze the effectiveness of the policy measure conditioning on any preexisting trends.

The present work contributes to the literature in two dimensions. First, by analyzing the employment effects of the policy in 2004, we get a measure of the elasticity of employment for partially and totally disabled women relative to the deductions in the employer social security contributions, which has never been calculated before. Second, it fills in the information gap existing in Spain with regards to the labor market behavior of disabled individuals and its evolution over time. There are only three cross-sectional surveys focusing on disabled individuals in Spain and only one of them pays special attention to the relation between disability and work. Therefore, there is a lack of information on employment rates of disabled individuals and their movements over time. To the best of our knowledge, we are the first ones to use a longitudinal administrative database on disability pensions (Muestra Continua de Vidas Laborales) to shed some light on the composition and labor market situation of permanent disability pensioners and to perform an evaluation of an employment promotion policy for disabled individuals in Spain.[1]

Our results show an average elasticity of employment of 0.08 for totally disabled women with respect to the deductions to the Social Security contributions paid by the employer and an elasticity of employment of 0.14 for partially disabled women. However, we realize that there are important non-linear effects in the implementation of this type of policies so that we do not claim the generalization of our results to increases in the deductions of different size. If we extrapolate the results of our model to the Spanish population, we estimate an increase in employment by 1775 totally and by 5325 partially disabled women in Spain due to the policy, with an associated cost of 10,997.900 euro for the government.

The rest of the paper is structured as follows. The next section describes the disability system in Spain and the reform of 2004, Section 3 explains the database and Section 4 the econometric approach. Section 5 outlines the results of the estimation while some robustness checks are performed in Section 6 and the conclusions are presented in Section 7.

2. The disability system and the reform

The OECD published a report in 2007 in which the promotion of employment for disabled individuals was identified as the most "formidable" challenge facing the Spanish government with respect to disability policies. Employment rates of individuals with a disability in Spain have remained quite low at a 30% level, which is one of the lowest in the OECD. These low employment rates have occurred despite a GDP growth which has been quite high at around 2–6% for the last decade until 2008 and a general unemployment rate which has dropped from 20% to 9.2%. Therefore, it seems clear that good economic conditions are not enough to improve the labor market integration of disabled individuals in Spain and that some policy initiatives are necessary to help disabled individuals benefit from a booming business cycle environment.

The disability system in Spain is divided between sickness leave (temporary disability) and permanent disability.[2] Permanent contributive disability pensions are defined as the economic benefits that aim at compensating the individual for losing a certain amount of wage or professional earnings when the person is affected by a reduction or a complete loss of his/her working ability in a way that is assumed to be permanent due to the effects of a pathologic or traumatic process derived from an illness or an accident.[3]

Table 1
Eligibility rules and amount of disability benefits.

Source of the disability	Eligibility	Amount: regulatory base∗percentage	
	Years contributed	Regulatory base: average wage	Percentage
Ordinary illness	1/3 time between 20-disabled minimum 5 years	Last 8 years of work	150% if severe disability 100% if total disability 55–75% if partial disability
Work-unrelated accident	0	24 months chosen of last 7 years of work	
Work accident or professional illness	0	Last year work	

In order to capture the different situations in which a person can be after suffering from a disabling condition, the Spanish Social Security administration differentiates between four degrees of disability that depend on the amount of working capacity that has been lost; Limited disability, partial disability (PD), total disability (TD) and severe disability. As our interest lies on the effectiveness of a policy initiative in increasing employment of disabled individuals, we restrict our analysis to disabled individuals in the partial and total disability schemes, which represent 97% of all disability claimants in Spain.[4] Partial disability is given to individuals who are unable to develop his usual job but who are still capable of developing a different job whereas total disability is given to individuals who are unable to develop any kind of job.

We have included total disability holders in the analysis because, even if these individuals have more restrictions to work, we observe in the data that some of them do work.[5] We do not include Limited disability holders because they are allowed to continue in their previous job and the benefit given is paid in only one installment so that there are no incentives/disincentives to work to analyze. The amount of pension received varies according to the disability degree in which the individual is classified and is explained in Table 1 below.

Table 2 contains a summary of the major reforms implemented by the Spanish central government in order to provide incentives for firms to hire disabled individuals. The majority of these incentives were first established in 1983 by the law "Ley de Integracion Social de los Minusvalidos" (Social Integration of the Disabled). The LISMI, as it was later called, set up the basic pillars of public policies toward disabled individuals in terms of anti-discrimination and employment promotion measures. As employment promotion measures, it established a subsidy for each disabled worker that the firm hired as well as a 70% deduction of the social security contributions for each disabled worker younger than 45 years old that was hired and a 90% deduction if the individual was older than 45 years old.

[1] We are aware of only one paper by Malo et al. (2007) that uses Spanish data and focuses on the possibilities for disabled individuals to combine the receipt of the benefits with the development of a job. However, that paper uses a cross-sectional sample for 2006 and is mainly a descriptive study which does not include any analysis of employment promotion policies.

[2] In this paper, we only focus on contributive pensions due to data availability problems for non-contributory pensioners and the idea that disabled individuals that have worked before are in a better position to find a new job. Also, the non-contributory disability system is comparatively smaller in size (205,319 people received non-contributory disability benefits in Spain in 2007) compared to the contributory system (868,026 people).

[3] Own translation from the definition of the Spanish Social Security administration; www.seg-social.es.

[4] Only 0.4% of claimants in 2007 were classified as Limited Disability. Partial Disability holders represented 57%, Total Disability 40% and Severe Disability 2.6% of claimants in 2007.

[5] When the Social Security defines the compatibilities of the benefits, it states that the receipt of a total disability pension will not impede the development of those activities (both paid and unpaid) that do not represent a change in the working ability of the individual.

Table 2
Reforms in firm's incentives.

Years	Type of incentive	Permanent and full-time contract	Temporary contract (part/full-time)	Permanent and part-time contract	Self-employed
Status quo: 1983	Subsidy 1	500,000 ptas/contract			
	Subsidy 2	Avoid accidents			
	Deductions SS contributions	70% if <45 90% if >=45			
1999 (Jan)	Subsidy 1	650,000 ptas/contract		Proportional to h	
	Deductions SS contributions			70% if <45 90% if >=45	
2002 (Dec) (April)	Deductions in firm's taxes	6000 euro for each person/year of increase over the mean of disabled workers wrt mean of non-disabled		6000 for each person/year of increase over mean disabled workers wrt mean of non-disabled	
	Deductions SS contributions				50% for 3 years
2004 (Jan)	Deductions SS contributions	90% if <45 and women 100% if >=45 and women		90% if <45 and women 100% if >=45 and women	
	Subsidy 1	3907 euro/contract (no change)		Proportional to h[a]	
	Subsidy 2	Avoid accidents and adjust working space (max. 901,52 euro)	Avoid accidents and adjust working space		
2006 (Dec)	Deductions SS contributions	375 euro/month 425 if severe disability +100 if >=45 years +70,83 if women	291,66 euro/month 341,66 if severe disability +50 if >=45 +50 if women	[b]100% of full-time if h=3/4 75% if 1/2>h<3/4 50% if 1/4>h<1/2 25% if h<1/4	50% for 5 years
2007 (June)	Subsidy 3				Establish; max. 10.000 euro External Services; 75% of cost, max. 2.000 euro Education; 75% of cost, max. 3.000 euro
	Interest rate reduction				4 points : loans for investment

[a] Number of working hours.
[b] Also for temporary and part-time contracts.

After the LISMI was implemented, only some minor changes were introduced up until 2004, when the deductions to the Social Security contributions to hire disabled women were increased. In this reform in 2004, the deductions increased from 70 to 90% for women below 45 years old and from 90 to 100% for women aged 45 and over. The aim of this paper is to analyze whether these increases in the deductions to the Social Security contributions raised the probability of employment for disabled women in Spain. Furthermore, as we know that the deductions increased by 20% and 10% respectively, we will also get an estimate of the elasticity of employment for disabled women relative to the deductions in the Social Security contributions paid by the employer.

Apart from this reform in 2004, there was a substantial reorganization of the packet of firms' incentives in 2006 when deductions were changed from a percentage to a fixed amount of the monthly contribution that the employer has to pay. However, this reform in 2006 did not introduce any additional differential change between the men and women groups and, as it was passed in December 2006, it was not implemented until 2007, when our sample period ends. Therefore, we are confident that this reform will not interfere in our identification strategy of the policy effects of the increase in the deductions for disabled women in 2004.

3. Data

The study will use the Continuous Sample of Working Lives ("Muestra Continua de Vidas Laborales", MCVL) which is a microeconomic data set based on administrative records provided by the Spanish Social Security Administration. It contains a random sample of 4% of all the individuals who, at some point during 2007, had contributed toward the social security system (either by working or being in an unemployment scheme) or had received a contributory pension. The random sample selected contains over one million people.

There is information available on the entire employment and pension history of the workers, including the exact duration of employment, unemployment and disability pension spells, and for each spell, several variables that describe the characteristics of the job or the unemployment/disability benefits.[6] There is also some information on personal characteristics such as age, gender, nationality and level of education. The macroeconomic variables used to capture the economic business cycle are derived from the Spanish "Instituto Nacional de Estadistica".

We select in our sample all individuals who are receiving a disability or old-age pension in 2007 and everybody who received a partial or total disability pension at some point during 1996–2007. From the ones that are receiving an old-age pension in 2007, we only keep those individuals who received a total or partial disability during 1996–2007.[7] The pooled sample contains 49,989 individuals, of which 34,357 are men and 15,632 women. As new individuals become disabled and start receiving disability pensions each year, the sample is growing from an initial size of 19,961 individuals in 1996 up to 31,737 individuals in 2007.[8] We include individuals from 17 to 64 years old. We do not include ages above 64 years old as all disabled individuals are automatically transferred to old-age pensions when they reach age 65. Therefore, individuals leave the sample mainly because they reach age 64 and also few individuals leave because they stop receiving the disability pension (only 0.15% of the sample).

[6] When there is more than one employment spell per person per period, we include the longer spell. The self-employed are not included in this sample as they are not subject to the policy analyzed in the paper.
[7] We want to have in our sample those individuals that received disability benefits at some point during 1996–2007 even if they turned 65 and were automatically transferred to old-age benefits during our sample period.
[8] See Table 4 in the Appendix A to see the number of individuals each year in the sample.

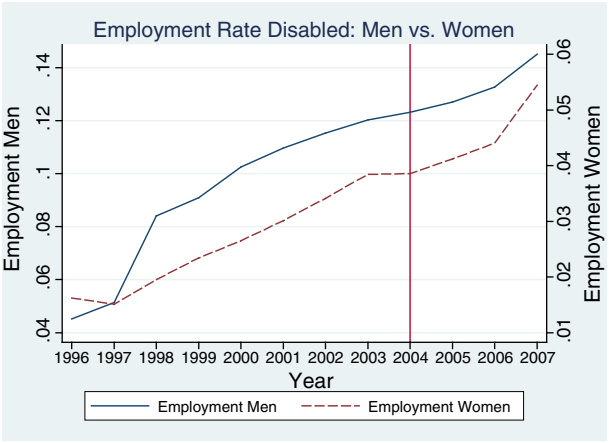

Fig. 1. Evolution of the probability of working for disabled women and men.

4. Econometric model

Given that, as explained above, individuals can receive two different types of pensions which are defined according to the remaining capacity to work kept by the disabled individual, we have chosen to use a recursive bivariate probit model as the estimation method. This model allows us to estimate movements in the labor market and between types of pension simultaneously and to incorporate the correlation in residuals of the two equations due to unobserved characteristics.

We proceed by first doing a graphical inspection of the data to look for any preliminary evidence of the effect of the policy on employment rates. Fig. 1 plots the probability of having a job for individuals in the sample for each calendar year from 1996 until 2007 by gender. This figure seems to suggest an acceleration of the increase in the probability of having a job for disabled women from 2004 onward while the probability of having a job for disabled men seems to grow at a relatively constant rate during that period.

Thus, in order to identify the extent to which the policy introduced in 2004 induced a differential change in employment for disabled women relative to disabled men, we estimate a difference-in-difference model. The key identifying assumption in traditional difference-in-difference models is that the change in the outcome variable of interest in recent years, Y, would have been the same for women as it was for men in the absence of the 2004 policy change. If this assumption is correct, then the parameters β's capture the policy-induced change in the outcome variable Y. However, to the extent that differential trends in Y between the group of men and women are present even prior to the policy change, this would suggest that the identifying assumptions are questioned. If we inspect Fig. 2, which plots the ratio of employment for disabled women to men, we can see that this ratio is not stable during the pre-treatment period so we have reasons to suspect that differential trends existed for employment of disabled women and men in our sample even if the policy wouldn't have been implemented.

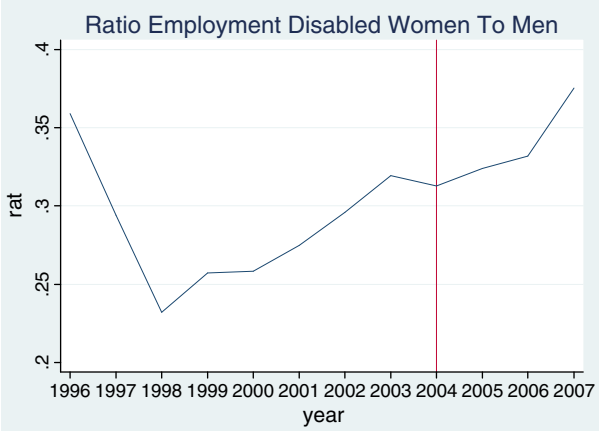

Fig. 2. Ratio employment disabled women/men.

Therefore, and following the methodology in Autor and Duggan (2008), we estimate a model that evaluates the existence of any shift in the trend of the outcome variable in the women relative to men sample following the policy change and conditional on any trends existing before the introduction of the policy.

The baseline model is a recursive bivariate probit model that incorporates the methodology from Autor and Duggan described above and is given by the following two equations:

$$y_{jt}^1 = \alpha^1 + \sum_{t=1997}^{2007}\left(a_t^1 \times J_t^1\right) + \gamma^1 F_j^1 + \sum_{t=1997}^{2007}\left(\beta_0^1 \times F_j^1 \times (t-1996)\right) + + \sum_{t=2004}^{t=2007}\left(\beta_1^1 \times F_j^1 \times (t-2003)\right) + \rho^1 z_{jt} + \theta^1 x_j + \varepsilon_{jt}^1$$

$$y_{jt}^2 = \alpha^2 + \sum_{t=1997}^{2007}\left(a_t^2 \times J_t^2\right) + \gamma^2 F_j^2 + \sum_{t=1997}^{2007}\left(\beta_0^2 \times F_j^2 \times (t-1996)\right) + + \sum_{t=2004}^{t=2007}\left(\beta_1^2 \times F_j^2 \times (t-2003)\right) + \rho^2 z_{jt} + \theta^2 x_j + \sigma y_{jt}^1 + \varepsilon_{jt}^2$$

$$[\varepsilon_{1i}, \varepsilon_{2i}] \text{distributed BVN}[0, 0, 1, 1, \rho]$$

$$\text{with } y_{jt}^1 = \begin{cases} 1 \text{ if total disability pension} \\ 0 \text{ if partial disability pension} \end{cases}$$

$$\text{with } y_{jt}^2 = \begin{cases} 1 \text{ if he/she is working} \\ 0 \text{ if he/she is not working.} \end{cases}$$

The first dependent variable, y_{jt}^1, captures the type of pension that individual j is receiving at time t and equals 0 if he/she receives a partial disability pension and 1 when he/she receives a total disability pension. The second dependent variable,y_{jt}^2, is 0 if the individual j is not working at time t and 1 when he/she has a job.[9]

F_j is an indicator variable that equals 1 if individual j is a female and 0 otherwise, while J_t is a vector of twelve indicator variables for each of the years included in our sample. The z_{jt}'s represent personal characteristics that vary over time (like age, the level of disability benefits and the two variables that act as exclusion restrictions) whereas the x_j's represent individual characteristics that do not vary over time. In this last group of covariates we include the variables that capture the individual employment trajectory before becoming disabled (number of job interruptions and number of years contributed), age at which individuals became disabled, immigrant from other regions in Spain, 3 dummies for special professional schemes (agriculture, self-employed and working accident), regional fixed effects for each of the 17 Autonomous Communities in Spain, a dummy that is 1 if the individual lives in a town of less than 40,000 citizens and a number of variables that describe the working experience of the individual in the last job before becoming disabled (temporary job, part-time job, professional category and number of workers in the firm).[10] Finally, the ε's characterize the corresponding BVN error terms.[11]

[9] The individual is considered as working if he/she is observed as working for at least one month in the corresponding year. We choose this definition because we are interested in determining whether the policy provides any incentives to employers to hire disabled women independently of the length of the contract offered. In the section of robustness checks, we also try other definitions of employed.

[10] These variables are explained in more detail in the Appendix A section.

[11] We do not include individual unobserved heterogeneity because the difference-in-difference method controls for unobserved time-invariant differences between eligible and ineligible individuals. Therefore, the policy parameter (B1) is consistently estimated (see Garcia-Perez and Rebollo-Sanz, 2009).

Table 3
Summary statistics.

	Men		Women		All	
	Pre-2004	Post-2004	Pre-2004	Post-2004	Mean	Std.Dev.
Female					0.288	0.452
Age	53.40	53.31	53.93	53.27	53.45	8.801
Age disability	45.85	45.65	47.02	46.92	46.12	10.11
Pension high	0.385	0.534	0.211	0.379	0.396	0.489
Pension top	0.033	0.085	0.016	0.046	0.046	0.211
Regime pension; self-employed	0.102	0.116	0.139	0.134	0.116	0.320
Regime pension; agriculture	0.178	0.123	0.205	0.162	0.165	0.371
Regime Pension; professionals	0.154	0.149	0.039	0.044	0.120	0.326
Andalucia	0.226	0.224	0.215	0.229	0.224	0.417
Aragon	0.031	0.027	0.023	0.023	0.028	0.165
Asturias	0.045	0.042	0.035	0.035	0.041	0.200
Baleares	0.020	0.020	0.026	0.025	0.021	0.146
Canarias	0.030	0.031	0.027	0.031	0.030	0.172
Cantabria	0.015	0.017	0.014	0.013	0.015	0.123
Castilla Leon	0.068	0.060	0.041	0.033	0.057	0.233
Castilla Mancha	0.038	0.041	0.020	0.024	0.034	0.183
Extremadura	0.027	0.027	0.015	0.015	0.024	0.153
Galicia	0.073	0.078	0.094	0.082	0.079	0.270
Murcia	0.033	0.033	0.040	0.031	0.034	0.181
Navarra	0.014	0.013	0.011	0.012	0.013	0.116
Pais Basco	0.054	0.053	0.044	0.042	0.051	0.220
Rioja	0.008	0.007	0.006	0.005	0.007	0.085
Catalunya	0.146	0.151	0.216	0.206	0.166	0.372
Valencia	0.082	0.088	0.086	0.107	0.087	0.282
National immigrant	0.251	0.245	0.282	0.279	0.258	0.437
Lives in town	0.514	0.522	0.505	0.491	0.512	0.499
#Job interruptions	3.371	5.199	2.087	3.734	3.704	4.153
#Years contributed	8.373	10.56	5.193	7.945	8.395	8.954
Temporary last job	0.066	0.161	0.066	0.142	0.101	0.302
Part-time last job	0.013	0.017	0.033	0.070	0.024	0.154
Administrative workers	0.446	0.518	0.262	0.367	0.425	0.494
Bachelor degree or higher	0.039	0.049	0.027	0.047	0.041	0.199
# Workers firm last job	0.574	0.719	0.440	0.699	0.607	0.927
% Evaluation offices/province	0.189	0.174	0.177	0.159	0.179	0.123
% Pensions/autonomous comm.	2.554	2.025	2.581	2.044	2.351	0.970
Employed	0.091	0.132	0.026	0.046	0.086	0.280
Receiving total disability	0.408	0.420	0.380	0.404	0.406	0.491
# Observations	128.878	80.671	48.672	36.145	294.366	294.366

The parameters of interest are captured by the β's; β_0 represents the pre-existing trend in the women relative to the men group during the sample period and β_1 captures any shift in the women relative to the men trend following the policy change.[12] Therefore, β_1 represents a trend shift in 2004 and is estimated relative to β_0, the pre-existing trend. Furthermore and to the extent that the policy introduced different deductions to the SS contributions for women above and below age 45, we could expect to detect a differential effect of the policy for these two age groups. We will examine this possibility by estimating separate models of the recursive bivariate probit for two separate groups of disabled individuals (< or =>age 45).

Finally, as we estimate a recursive bivariate probit model, we also include the type of pension received as an explanatory variable in the employment equation in order to control for the fact that the type of pension received affects employment prospects of disabled individuals in a direct way as well as indirectly through the unobserved heterogeneity term. Accordingly, we also include in the first equation two additional variables that are only related to the type of pension received. These variables act as exclusion restrictions in order to improve the identification of the parameters of the model. The first of these variables is the percentage of Disability Evaluation Offices (DEO), which is obtained by dividing the number of disability evaluation offices in each of the 52 provinces by the population in that province. The second one is the percentage of disability pensions granted in each Autonomous Community (AC), which is obtained by dividing the number of pensions granted each year in each AC (17) by the population in each autonomous community. This last variable is introduced with the aim of capturing the way (rigorous/flexible) in which health conditions are evaluated in each region.[13]

This choice of exclusion restrictions is based on two things; first, it seems reasonable to accept the assumption that these two variables will have an effect on the probability of being classified as partial/totally disabled while not affecting employment probabilities. Second, we've run simple probit models for both equations separately and we have checked that these variables are, in effect, not significant when included in the employment equation and significant when included in the type of pension equation.

5. Results

Our data confirms some of the observations highlighted in the OECD reports (OECD 2007a, 2007b). For example, disabled individuals in Spain are relatively old as their average age in our sample is 53.4 years old. They also appear to be a relatively low income group, as our data shows that the average monthly pension is 620 euro. However, this quantity varies substantially among individuals, as 55.8% of them receive a pension below 500 euro/month, 39.6% get between 500 and 1500 euro/month and 4.6% receive a pension above 1500 euro/month (See descriptive statistics in Table 3).

[12] We take 2004 to be the first year after the policy because the measure was passed in January 2004.

[13] These two variables are time variant. We have also tried to estimate the models with only one of the two exclusion restrictions and results remain the same.

Table 4
Probabilities of working and number of individuals in the sample.[a]

Year	Pred. prob. working	Number of individuals	Number ind. women	Number ind. men	Ind. total disab. pensions	Pred. prob working partial dis.	Pred. prob working total dis.
1996	0.0377	19961	5279	14682	11825	0.0558	0.0113
1997	0.0422	20259	5348	14911	12216	0.0632	0.0101
1998	0.0673	20803	5505	15298	12565	0.1021	0.0143
1999	0.0732	21530	5776	15754	12954	0.1118	0.0149
2000	0.0818	22293	6075	16218	13428	0.1253	0.0159
2001	0.0876	23140	6402	16738	13886	0.1365	0.0148
2002	0.0922	24121	6839	17282	14324	0.1434	0.0173
2003	0.096	25443	7448	17995	15147	0.1488	0.0182
2004	0.098	26978	8082	18896	15892	0.1540	0.0176
2005	0.101	28064	8576	19488	16418	0.1606	0.0171
2006	0.105	30037	9388	20649	17520	0.1683	0.0164
2007	0.1163	31737	10099	21638	18438	0.1859	0.0198

[a] The probability of working has been calculated performing a series of cross-sectional probit estimations and predicting the probability of working for each year.

Therefore, if these individuals do not have any other source of income, such as a job, we can expect to have high poverty rates among disabled individuals, as more than half of the sample earn a monthly pension well below the Spanish minimum wage, which was set at 624 euro for 2009.[14]

We can see in Table 4 that, even if the probability of working is increasing during the sample period for disabled individuals, this probability is quite low and has a maximum value of only 11.6%. Furthermore, disabled women have a much lower probability of working than disabled men (approximately half), which can be graphically compared in Fig. 1. This observation reinforces the idea of the need to introduce policy initiatives that are particularly targeted to disabled women and that are designed to increase their labor market prospects.

Table 3 presents the summary statistics according to gender and pre-post reform period. It can already be observed in this table that the apparent increase in employment was relatively higher for disabled women than for disabled men after the policy reform. Employment increased by 2% for women and so, relative to the average employment rate for disabled women in our sample (3.4%), represents an increase of 5.88%. For the case of men, employment increased by 4.1% comparing the after-before policy period, which relative to the average employment rate for disabled men (10.7%) represents an increase of 3.83%. However, we will have to test with the econometric model whether these apparent differences in employment between disabled men and women due to the policy are statistically significant or not.

If we take a look now at the evolution of some of the variables in our sample from 1996 until 2007, we can see that the number of disabled individuals (both men and women) has increased over time (see Table 4) but the percentage of disabled men/women has remained quite stable. Similarly, the proportion of individuals with a partial/total disability pension in the sample has also remained constant during these years (see Fig. 3). This stability in the composition of the sample supports the idea that no major changes have occurred which would have significantly changed the characteristics of the sample during this period.

Table 5 presents the coefficient results of the recursive bivariate probit model for all the variables included in the model and for individuals aged 17 to 64. As results show, employment was significantly lower for women than for men at the start of the sample period in 1996 as captured by the negative coefficient of the "Female" variable. This labor market disadvantage widened between the two genders in the years prior to the policy change (as captured by the negative and

[14] The minimum wage in Spain was 390.18 euro in 1996; 424.8 in 2000 and 490.80 in 2004.

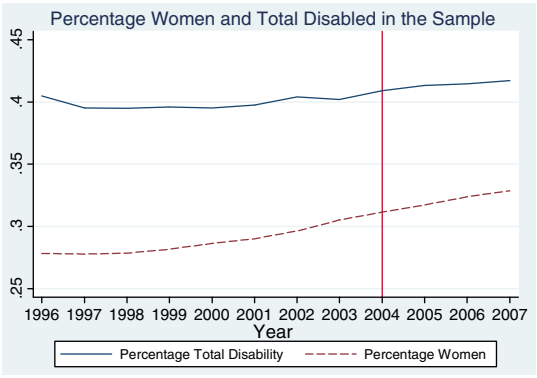

Fig. 3. Evolution of the percentages of women and absolute disability pensioners in the sample.

significant β_0 coefficient). However, after the policy was launched, this trend reversed considerably with a positive and significant coefficient for β_1 suggesting that the policy managed to introduce incentives for employers to hire disabled women.[15]

At the same time, results show that the policy also had an impact on the probability of receiving a total disability pension for women. At the beginning of the period, women were receiving less total disability pensions than men. However, the positive and significant β_0 coefficient suggests that this disparity was reduced during the years before the introduction of the policy with women receiving more total disability pensions than men. Once the policy was initiated, this trend reversed and women received less total disability benefits but this β_1 coefficient is very small and not significant.

In order to take into account the potential endogeneity of the type of pension received on the probability of working, we include the dependent variable of the first equation as a covariate in the second equation (recursive bivariate probit model). We can see that this variable is negative and significant capturing the fact that individuals receiving a total disability pension have a lower probability of working because they have a higher degree of disability. Results of the Wald test suggest that we can reject the hypothesis of no endogeneity at the 1% level so that the type of pension received affects employment prospects of disabled individuals both directly and through unobserved factors (as the correlation coefficient is still negative and significant). The two variables that act as exclusion restrictions are also significant which ensures the relevance of these variables in determining the type of pension received.

In general, all other covariates that capture personal characteristics show the expected sign. Almost all the variables that capture the employment history and the characteristics of the last job are significant for the employment equation and many of them are also significant for the type of pension equation.[16]

Table 6 shows results for the recursive bivariate probit specification for two separate samples of individuals; younger than 45 years old, and individuals who are 45 or older. The effect of the policy in reversing the negative employment trend and increasing the labor market opportunities for disabled women is much stronger and very significant for the group of individuals below age 45. In contrast, the impact of the policy seems to be smaller and not significant for individuals who are 45 years old or more.

In order to get a better sense of the quantitative importance of the treatment effect, after the estimation of our model we calculate the

[15] We argue that displacement effects for disabled men were not important in this case as the employment rate of disabled men did not decrease due to the implementation of the policy (see Fig. 1).

[16] In Table 9 we present results from the linear model in which the variable that captures the effect of the policy is the interaction between Female and Year Equal or Post 2004. We can see that the estimates are very imprecise for the working equation and not significant.

Table 5
Estimation recursive bivariate probit: all ages. Coefficients.

	Total disability	Working
Age	0.022***	−0.007***
	(0.001)	(0.001)
Age>45	0.021	0.116***
	(0.020)	(0.024)
B0: Pre-existing trend	0.018***	−0.022**
	(0.003)	(0.008)
B1: Policy effect	−0.005	0.040***
	(0.006)*	(0.015)
Female	−0.115***	−0.410***
	(0.022)	(0.053)
Age disability	−0.033***	−0.055***
	(0.001)	(0.002)
Pension high	1.281***	−0.418***
	(0.016)	(0.039)
Pension top	2.283***	−0.770***
	(0.031)	(0.075)
Self-employed last job	0.084***	0.473***
	(0.024)	(0.038)
Agriculture last job	0.022	0.164***
	(0.024)	(0.038)
Professional last job	−1.542***	0.328***
	(0.029)	(0.042)
National immigrant	−0.090***	0.114***
	(0.017)	(0.022)
Lives in town	−0.140***	−0.024
	(0.014)	(0.019)
# Job interruptions	−0.018***	0.052***
	(0.002)	(0.002)
# Years contributed	−0.029***	0.056***
	(0.001)	(0.001)
Last job temporary	0.137***	−0.117***
	(0.024)	(0.029)
Last job part-time	0.045	0.422***
	(0.045)	(0.051)
Administrative workers	−0.008	−0.029
	(0.017)	(0.022)
Bachelor degree or higher	0.026	0.066
	(0.036)	(0.052)
# Workers firm last job	0.006	−0.104***
	(0.008)	(0.010)
%Evaluation offices/province	0.172**	
	(0.073)	
% Pensions/autonomous community	−0.038***	
	(0.012)	
Y1: partial-total dis		−0.685***
		(0.107)
Constant	0.353***	0.614***
	(0.067)	(0.086)
Rho	−0.167***	
	(0.061)	
# Observations	294,366	294,366

(Standard errors are clustered at the individual level).
*** p<0.01.
** p<0.05.
* p<0.1.

Table 6
Estimation recursive bivariate probit: by ages. Coefficients.

	Age<45		Age>=45	
	Partial–Total	Working	Partial–Total	Working
B0: Pre-existing trend	0.041***	−0.039**	0.013***	−0.017*
	(0.010)	(0.015)	(0.003)	(0.010)
B1: Policy effect	−0.018	0.086***	−0.002	0.022
	(0.018)	(0.028)	(0.007)	(0.018)
Female	−0.065	−0.383***	−0.128***	−0.401***
	(0.062)	(0.088)	(0.024)	(0.064)
Year dummies and covariates	Yes	Yes	Yes	Yes
# Observations	49745		244621	

(Standard errors are clustered at the individual level).

Table 7
Predicted conditional probabilities for females.

	Pr(Working|Total = 1)	Pr(Working|Partial = 1)
Before policy	1.8%	3%
After policy	3.1%	5.1%

predicted probabilities of having a job for disabled women before and after the implementation of the policy conditional on receiving either a partial or a total disability benefit. As we can see in Table 7 according to our estimated model, the predicted probability of working conditional on having a total disability pension increased from 1.8% to 3.1% for disabled women after the implementation of the reform.

Similarly, the predicted probability of working conditional on having a partial disability pension also increased from 3% to 5.1% for disabled women after the reform. As the deductions increased by 15% on average, this corresponds to an elasticity of 0.08 for totally disabled women and of 0.14 for partially disabled women.

There are 15,632 women in the sample, 5463 of them receiving a total disability benefit and 10,169 a partial disability pension. Therefore, this corresponds to an increase in employment of 71 totally disabled women in our sample and an increase in employment of 213 partially disabled women. As this database represents 4% of the Spanish population in the Social Security system, if we extrapolate the results to the population level, we get an estimate of an increase in employment of 1775 totally and 5325 partially disabled women in Spain due to the policy.

If we look at the differential effect of the policy for women above and below age 45 in Table 8, we can see that the predicted probability of having a job conditional on receiving a total (partial) disability benefit increased from 6.3% to 9.6% (8% to 11.9%) after the implementation of the policy for women below age 45. As the deductions increased by 20% for this group of women, this corresponds to an elasticity of employment of 0.16 for totally disabled and 0.19 for partially disabled women relative to the deductions. For the group of women of more than 45 years old, the predicted probabilities are much lower but the policy also increased them. For example, the predicted probability of working conditional on receiving a total (partial) disability pension increased from 0.9 to 1.8% (2.2% to 4%) due to the policy. This corresponds to an elasticity of employment of 0.09 for totally disabled and 0.18 for partially disabled women as the deductions increased by only 10% for disabled women of more than 45 years old. This larger employment effect of the policy for the relatively younger group of disabled women confirm the existence of non-linear effects of the policy as the change in the deductions is larger for the group of women below age 45.

Finally, we perform a cost-benefit exercise in order to extract some policy conclusions about the program. We calculate an estimation of the cost of the program for the government; the Social Security contributions paid by employers are 23.6% in Spain and, in our sample, the average contributory base is 6564 euro/year for disabled women that work. This gives us an amount of 1549 euro that the employer has to pay per worker per year. As contributions are subsidized almost fully by the policy and we have estimated that 7100 disabled women are able to find a job due to the policy in Spain, this corresponds to a cost of the program of approximately 10,997.900 euro for the government.[17]

6. Robustness checks

6.1. Exogeneity of the policy

One potential concern about our estimation strategy is the fact that if employers knew that this new policy was to be enacted soon,

[17] Please be aware that this is an approximate calculation as official data for the cost of this program is not available.

Table 8
Predicted conditional probabilities for females by ages.

	Age<45		Age>=45	
	Pr(Work| Tot = 1)	Pr(Work| Part = 1)	Pr(Work| Tot = 1)	Pr(Work| Part = 1)
Before policy	6.3%	8%	0.9%	2.2%
After policy	9.6%	11.9%	1.8%	4%

they could act strategically and delay the hiring of new disabled individuals until the law was passed. If this was so, the results of our difference-in-difference model would not be reliable because the identifying assumption would not be fulfilled.

We do not think that this strategic behavior could have occurred in our setting as there have not been many changes in disability policies in Spain and, in general, the small changes that have been implemented have not received any media coverage (as for example, pensions or unemployment reforms have). Therefore, it seems pretty implausible that employers would be aware of the change in the policy before it was implemented. Nonetheless, in order to be sure that this strategic behavior did not occur, we perform an interrupted panel data model in which we mitigate the effect of any potential strategic behavior by dropping the year before and after the enactment of the policy. Table 10 shows the results of the interrupted panel data model which are very similar to our original estimates. The effect of the policy is still significant although the coefficient is larger than our original estimates (this is common in this type of models). This suggests that strategic behavior by employers is, indeed, unlikely to have occurred in our case (so that our original estimates are not upward biased) and our difference-in-difference estimation is capturing the real effect of the policy (Betcherman et al., 2010).

6.2. The definition of disability

As we have explained above, our definition of disability includes only disabled individuals who are receiving a permanent contributory disability pension as the MCVL administrative dataset is the only source of data available for disabled individuals in Spain which is presented as a panel. However, the disadvantage of this kind of data is that it does not cover all the population with a disabling condition (like surveys do); it only includes disabled individuals who have worked (and contributed) at some point in their life and who have qualified to receive a disability pension.

On the other hand, administrative data has the advantage of reducing the problems involved in self-reported measures of disability, which are commonly found in surveys.

If we compare our results with the ones obtained in EDAD (survey on disabilities, deficiencies and health status), which was conducted in Spain in 1999 and 2008, we can see that employment rates of self-reported disabled individuals are calculated to be 24% (16% for women and 32% for men) in 1999 and 27% (22% for women and 32% for men) in 2008.[18] Both figures are higher than the ones we find in this paper. This is quite reasonable if we take into account that there are many individuals that report having a disability in EDAD which will not qualify to receive a disability pension (and will not be included in our sample) for two main reasons:

1. Their disability level does not reach the medical threshold to become a pensioner.
2. They have not worked the necessary time to be eligible for the pension.[19]

[18] This is calculated for the population aged 16–64.

[19] The amount of contributory time required in order to be eligible for this type of pensions is explained in Table 1.

Table 9
Robustness check; Linear model. Standard errors in parenthesis.

Linear model	Coefficients	
	Partial–Total	Working
Fem * Post2004	0.091***	−0.002
	(0.014)	(0.028)
Female	−0.048***	−0.508***
	(0.017)	(0.031)
Year dummies and covariates	Yes	
# Observations	294366	

(Standard errors are clustered at the individual level).

Therefore, we think that our results have to be taken with care and have to be interpreted as only being representative of the population receiving a permanent disability pension and not of the whole population with some kind of disabling condition.

6.3. The definition of employed

As the interest of the paper is to determine whether the policy provides any incentive to employers to hire disabled women independently of the length of the contract, in the definition of employment used in the baseline model an individual is considered as employed if he/she is observed as working for at least one month in the given year.

However, in order to analyze the extent to which our results are robust to different definitions of employment, in this section we present the results of two additional recursive bivariate probit models in which we modify the definition of employment. The two models are the same than the one presented in Section 4 with the only difference that the individual is considered as employed if he/she is observed as working for at least 3 months (in the first model) or for at least 6 months (in the second model) in the given year. Table 11 reports the results of these two models and we can see that the coefficient that captures the effect of the policy (B1) remains highly significant and has almost the same size than the one in the baseline model. Therefore, we conclude that the positive effect of the policy is robust to different definitions of employment.

6.4. Alternative policy measures

The EDAD survey conducted in 2008 also allows us to explore a bit more the utilization of other policy measures that have been introduced to promote employment of disabled individuals in Spain. The survey is answered by 22,795 disabled individuals (only 9055 below age 65), from which 2669 are receiving a disability pension (29.5% of disabled persons below age 65).

Table 12 shows that only 0.8% of respondents say that they have benefited from an employment quota for disabled individuals in the public sector and 0.68% in the private one, 2.20% say that they have benefited from an employment contract for disabled individuals and 1.07% from another mechanism targeted to promote employment among disabled individuals.[20] Therefore, the incidence of these policy initiatives is rather small and, even if they are available, they seem to play a secondary role in determining employment probabilities for the disabled in Spain.

7. Conclusions

The analysis above has filled in an important information gap as it has presented the first evaluation of an employment promotion

[20] Of course, these numbers are probably bigger in reality as some of the respondents may not be aware (or may have forgotten) that the employer made use of one of these policies.

Table 10
Robustness check; interrupted panel model.

Interrupted panel model	Coefficients	
	Partial–Total	Working
B1: Policy effect	−0.003	0.061***
	(0.008)	(0.023)
Year dummies and covariates	Yes	
# Observations	201199	

(Standard errors are clustered at the individual level).

policy for disabled individuals in Spain. We make use of the availability of a 12 year bracket in our dataset in order to investigate the employment effects of the introduction of a policy reform in 2004 that increased the deductions to the Social Security contributions for employers who hired a disabled woman. In order to do so, we have first drawn a picture of the labor market situation of disability pensioners in Spain and its evolution from 1996 to 2007.

Our findings suggest that this increase in the deductions of the Social Security contributions proved to increase the probability of finding a job for disabled women in Spain and we estimate an average elasticity of employment of 0.08 for totally disabled women and of 0.14 for partially disabled women. Our results also show that the elasticity of employment is higher for the group of women below age 45 for both partially and totally disabled women. We interpret this as evidence of the existence of non-linear effects of the policy as the increase in the deductions was larger for women below age 45 (20%) than for women above age 45 (10%).

Finally, in order to get an estimate of the number of disabled women that were able to find a job in Spain due to the policy, we extrapolate the results beyond our sample and we find that 7100 disabled women were able to find a job in Spain due to the policy with an associated cost of 10,997.900 euro for the government.

We conclude that increasing the deductions to the Social Security contributions paid by the employer provides an incentive for employers to hire disabled women as we find that it increases their probability of finding a job. However, we also believe that the introduction of these measures should be complemented by other labor market initiatives embedded in a more comprehensive and far-reaching packet of reforms of the disability system. This is particularly important in countries like Spain, which exhibit very low employment rates of disabled workers. At the same time, utilization of all the available policy measures targeted to increase employment for disabled workers seems to be rather small and a biggest effort should be made from the administration to advertise and promote their use. In that sense, results from the EDAD survey show that there is room to improve employment prospects of disabled workers in Spain as 23.85% of the disabled are not looking for a job because they think that it would be difficult for them to find a job as a disabled worker. Similarly, 43.65% of the disabled who are looking for a job think that they cannot find a job because of their disability (see Table 12).

Special employment centers that would support and guide the job search process of disabled workers could also help in improving the labor market integration of disabled individuals as only 2.62% of them report having used a public employment service to find their current job.

As more updated databases become available, it will also be interesting to assess the effects of more recent reforms as well as to evaluate the extent to which employment rates of disabled individuals have been affected by the economic crisis of 2008–2010.

Table 11
Robustness checks; different definitions of working.

Coefficients	Work>3 months		Work>6 months	
	Partial–Total	Working	Partial–Total	Working
B0: Pre-existing trend	0.018***	−0.026***	0.018***	−0.024**
	(0.003)	(0.009)	(0.003)	(0.009)
B1: Policy effect	−0.005	0.043***	−0.004	0.036**
	(0.006)	(0.015)	(0.006)	(0.016)
Female	−0.115***	−0.369***	−0.128***	−0.388***
	(0.022)	(0.056)	(0.024)	(0.061)
Year dummies and covariates	Yes	Yes	Yes	Yes
# Observations	294366		294366	

Table 12
Selected results from EDAD survey 2008.

	Total	Men	Women
Percentage Working if ages 16–65	27% (2317)	32% (1287)	22% (1030)
Are you currently working or did you work in your last job in a Special Centre for Disabled workers?	1.7% (265)	1.97% (148)	1.44% (117)
Are you working or did you work in your last job in a non-for-profit institution related to the disability sector?	2.18% (341)	2.36% (177)	2.02% (164)
Have you ever benefited from an employment quota for disabled individuals in a public sector?	0.80% (125)	0.85% (64)	0.75% (61)
Have you ever benefited from an employment quota for disabled individuals in the private sector?	0.68% (106)	0.89% (67)	0.48% (39)
Have you benefited from an employment contract specific for disabled persons?	2.20% (344)	2.81% (211)	1.64% (133)
Have you benefited from an incentive for employment or deductions to the Social Security contributions for disabled workers?	0.84% (132)	0.92% (69)	0.77% (63)
Have you benefited from any other mechanism or intervention targeted to promote access to employment for disabled people?	1.07% (168)	1.15% (86)	1.01% (82)
How did you find your current job (or the last job you had)?	41.4% friend or family 18.7% directly to the firm 4.3% firm contacted him 2.62% public employment service 1.15% association people w/disability		
Are you looking for a job? Only if age <65	10.16% (610)		
Why do you think you are not finding a job if you are looking for one? Only if age <65	43.65% (of these 10%) because disability		
Why you are NOT looking for a job if age <65? (5157)	23.85% thinks it will be difficult to find a job as a disabled 50% cannot work		
Have you felt discriminated because of your disability in your job in the last 12 months?	9.42% (out of 2462)		
Have you felt discriminated to find a job because of your disability in the last 12 months?	20.8% (out of 2462)		

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Appendix A

Covariates included:

1) Characteristics of the individual and the pension:
   - Age at which he/she became disabled: even if we only have information on the characteristics of the pension from 1996, we do have an extra variable which captures the year in which the pension was granted. This is a very important piece of information as the age at which the individual became disabled proves to be a strong determinant of the labor market behavior of the individual during his/her disability spell.

- Internal Immigrant: A dummy variable that is 1 if the province in which the individual lives is different from the province in which he/she was born. Therefore, we are only considering internal migration.
- Amount of disability pension: There are 3 dummy variables capturing the amount of pension received by the individual in the last period (lagged values). Pension low is for values between 0 and 500 euro/month, pension high for individuals receiving between 500 and 1500 euro/month and pension top for amounts above 1500 euro/month.
- Regime of the pension: Dummy variables that identify the group of workers in which the individual has been included during his/her professional live: self-employed, agriculture (includes fishing and mining) and individuals that become disabled due to a work accident or professional sickness. The reference category excluded from the regressions is the general regime.
- Regional fixed effects: dummies for each of the 17 CCAA.[21]
- Town: is a dummy variable which is 1 if the town in which the individual lives (independently of the province or autonomous community) is smaller than 40,000 habitants. This variable captures spatial constraints affecting disabled individuals from small towns which make it more difficult for them to reach the Disability Evaluation Office, which is usually placed in the biggest cities of the province, or to find a job.
- Working history variables: number of job interruptions before becoming disabled and number of years contributed to the Social Security before becoming disabled. These two variables control for the different labor market history of individuals included in the sample.
- Last job characteristics: temporary contract in the last job before becoming disabled, part-time contract in the last job before becoming disabled and number of workers in the firm of the last job (less than 1000, between 1000 and 10000 and more than 10000).
- Professional category in the last job: 3 dummies for laborers (professional category 0), assistants and administrative workers (professional category 1) and individuals with a bachelor degree or more (professional category 2). The omitted category is professional category 0.

2) Variables only affecting the type of pension:
- Percentage of Disability Evaluation Offices: this variable is obtained by dividing the number of disability evaluation offices in each of the 52 provinces by the population in that province. We introduce this variable in order to capture differences between provinces in the service provided to disability claimants and to explore how these differences affect the probability of receiving a total/absolute type of pension. This variable will also be used as exclusion restriction as it has a clear effect on the type of pension diagnosed but it does not have an effect on the probability of disabled individuals to find a job.
- Percentage of Disability Pensions granted: this variable is the result of dividing the number of pensions granted each year in each autonomous communities (17) divided by the population in each autonomous community. It describes the way (rigorous/flexible) in which the health conditions are evaluated in each region. As the previous one, this variable affects the type of pension that the individual receives but is not going to affect the probability of working for disabled individuals either.

[21] There are 19 Autonomous Communities (CCAA) in Spain. However, we include both Ceuta and Melilla inside Andalucia because these are two small cities in the north of Africa that do not have enough observations to be included in the model as a separate variable. That is the reason why we only have 17 dummies for the CCAA.

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