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Great Recession and disability insurance in Spain

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Abstract In this paper, we explore the relationship between economic conditions and disability insurance (DI) participation in Spain during the Great Recession. Using individual-level longitudinal data, we show that DI awards are procyclical, contrary to the countercyclical behavior found in most of the previous literature. We show that DI applications are not responsive to the business cycle and that economic conditions have no effect on the composition of new DI awardees, suggesting that DI participation in Spain is not driven by partially disabled individuals resorting to the DI program as a result of bad labor market conditions. Furthermore, we argue that the procyclical behavior of DI awards may be driven by an informal increase in screening stringency and by an improvement in the health status of the population as a result of worse economic conditions.

Keywords Disability insurance · Business cycle · Great Recession · Procyclical health

JEL Classification H55 · I10 · J14

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1 Introduction

Disability insurance (DI) programs are the largest income support programs devoted to working-age individuals in most developed countries. For the mean of OECD countries in 2007, DI program expenditures represented 1.2% of GDP. Including also sickness benefits, expenditures represented 1.9% of GDP and almost tripled the resources devoted to unemployment benefits (OECD 2010). In the recent decades, the number of DI beneficiaries has grown considerably in many developed countries, with 6% of the OECD working-age population receiving benefits in 2008 (OECD 2010). The rise in DI rolls has been especially important in the USA, where the number of Social Security Disability Insurance (SSDI)[1] beneficiaries has more than doubled since 1990, with 8.8 million adult Americans receiving SSDI benefits at the end of 2012 (Mueller et al. 2016), creating concerns about the financial sustainability of the program (see, for example, Autor and Duggan 2006 or Autor 2015).

The deterioration of economic conditions is identified as one of the factors contributing to the rise in DI beneficiaries. Especially in the USA, a substantial literature documents a countercyclical behavior of participation in SSDI and SSI, the two public DI programs in that country. Rupp and Stapleton (1995) summarize the results of a number of earlier studies that, using aggregate time-series data, document a positive relationship between the unemployment rate and the number of claimants, awardees and beneficiaries of SSDI and SSI. Black et al. (2002) show that plausibly exogenous shocks in labor market conditions arising from the cool boom and bust of the 1970s and 1980s resulted in changes in SSDI and SSI awards in a group of US states characterized by variation in the value of coal reserves between counties. Similarly, Autor and Duggan (2003) show that the sensitivity of DI claims, awards and beneficiaries to exogenous shocks in labor demand increased after the 1984 reform that reduced the screening stringency of the DI program. Using aggregate time-series data, Duggan and Imberman (2009) show that business cycle effects alone can explain 23 percent of the increase in the SSDI enrollment rate between the years 1984 and 2003 for men and 12 percent of the increase for women. This increase in DI participation as a result of bad labor market conditions is also documented in other OECD countries (see, for example, Rege et al. 2009 or Benítez-Silva et al. 2010).

The main finding of the previous studies resides in the identification of a conditional applicant. That is, an individual with moderate health problems that is able to work but turns to DI in bad times as a result of a decrease in his/her future labor market expectations. This increase in DI participation as a result of bad labor market conditions is problematic because these individuals entering the DI rolls in bad times would not probably return to the labor market when economic conditions recover.[2] The DI program is specially designed to provide long-term income support for disabled individuals unable to work. Therefore, this utilization of the program by individuals in need of transitory assistance poses a problem to the financial sustainability of the

[1] SSDI is the public contributory DI program in the USA. Supplemental Security Insurance (SSI) is a means-tested program administered also by the US Social Security Administration (SSA).

[2] The outflow from DI is very low in most countries. For several OECD countries in 2008, only around 12% of all DI beneficiaries left the program for reasons other than death or retirement (OECD 2010).

program and weakens the link with the labor market of partially disabled individuals who still keep some remaining capacity to work.

Although much less than in the USA, the countercyclical behavior of DI participation has also been documented in Spain. Jiménez-Martín and Vall Castelló (2009) show a positive effect of the unemployment rate (a negative effect of the GDP growth rate) on the individual probability to transit from employment to the DI program for individuals aged 50–64 years between 1992 and 2007. Also for the Spanish case, Benítez-Silva et al. (2010) use aggregate regional time-series data and estimate a positive effect of the unemployment rate on the DI award rate for the period 1992–2009.

In this paper, we explore the relationship between the business cycle and DI participation during the Great Recession in Spain. First, we use panel data on individuals provided by the Spanish Social Security Administration to estimate the effect of the business cycle on the DI award rate. We estimate regressions of the individual probability of transiting to DI, controlling for time and region fixed effects as well as for demographic and labor market individual characteristics, where the effect of economic conditions is identified with variation in the unemployment rate between time and regions. The results show that higher unemployment rates are associated with a reduction in the probability of being awarded benefits, a reduction that is concentrated in women. This procyclical behavior of the DI award rate is contrary to what we would expect and is indeed opposite to the countercyclical behavior found in previous literature.

Given this counterintuitive result, we then explore possible mechanisms that could be driving the procyclicality in DI awards. First, we use the individual data to investigate whether the business cycle has had an effect on the composition of new DI awardees. If the effect of the business cycle on DI participation is driven by partially disabled individuals that resort to DI as a result of lower returns to labor market participation, we should observe that worse economic conditions are associated with a shift in the composition of new awardees toward individuals with better health and higher labor market attachment, a result found in several papers exploring this avenue in the case of the USA (Coe and Rutledge 2013; Maestas et al. 2015; Lindner et al. 2017). Using individual longitudinal data, we show that during the Great Recession in Spain, higher unemployment rates are unrelated to the health status or the degree of labor market attachment of new DI awardees, suggesting that DI participation in Spain is not driven by conditional applicants entering the program as a result of lower labor market expectations.

Second, we use aggregate data provided also by the Spanish Social Security Administration to estimate the effect of the business cycle on the number of DI applications and denials. The results show that DI applications are not responsive to economic conditions in Spain, providing further evidence that behavioral responses of partially disabled individuals play a little role in explaining DI participation. Furthermore, we find that during the Great Recession higher unemployment rates are associated with an increase in the number of applications that are denied. Together with the insensitivity of applications, this countercyclical behavior of the number of denials suggests there may have been an increase in the screening stringency of the program, possibly as a result of budgetary restrictions arising from the Great Recession. To provide evidence supporting this hypothesis, we show that the procyclical behavior of DI awards is concentrated in provinces where the importance of the construction sector was lower

before the start of the recession, provinces therefore characterized by a higher proportion of applicants with plausibly less observable disabilities for which informal restrictions are easier to implement. We also show that women have a higher probability of suffering from a less observable type of disability, which helps explain why the procyclicality of DI awards is concentrated in women.

Finally, we explore the possibility that the procyclical behavior of DI awards is driven by a procyclical behavior of health in the general population. Ruhm (2000), estimating fixed effects models similar to the ones used in this paper, shows that higher state unemployment rates are associated with lower mortality rates in the USA during the period 1972–1991. Since Ruhm (2000), an increasing number of studies have documented the same procyclical behavior of mortality for several countries and time periods (see Neumayer 2004 for Germany, Buchmueller et al. 2007 for France, Gonzalez and Quast 2011 for Mexico or Ariizumi and Schirle 2012 for Canada). Importantly, using the same methods, Tapia Granados (2005) shows that mortality rates have been procyclical in Spain during the years 1980–1997, and Regidor et al. (2016) show that the reduction in mortality occurred in Spain during the last years (2004–2011) has been more pronounced in the years of the Great Recession (2008–2011) than in the years before (2004–2007). There is, therefore, considerable evidence that worse macroeconomic conditions are associated with decreases in mortality, a relationship that has also been documented for Spain. Although the mechanisms driving the procyclical behavior of mortality are still not fully understood, studies point to worse macroeconomic conditions leading to a decrease in risky health behaviors (Ruhm 2000; Ruhm and Black 2002; Ruhm 2005), a decrease in traffic accidents due to less traffic congestion or less drinking when driving (Ruhm 2000), a decrease in pollution (Heutel and Ruhm 2016) or less incidence of health deterioration resulting from harsh working conditions (Sparks et al. 1997).

Importantly, some papers have shown that measures of disability also show a procyclical behavior (Ruhm 2003), which suggests that procyclical disability may play a role in explaining the relationship between the business cycle and DI participation. However, to the best of our knowledge, the only paper that has explored this avenue is Haaland and Telle (2015), which shows that the probability of participating in DI in Norway during the years of the Great Recession is negatively related to the unemployment rate, and this procyclical relationship is also observed for mortality, obesity and traffic accidents. Interestingly, the authors find that the procyclical behavior of DI participation is stronger for older individuals and that the procyclical behavior of mortality is stronger for individuals receiving DI benefits, pointing to the importance of health deterioration in already unhealthy individuals in explaining the procyclicality in mortality rates.

Consistent with the findings in Haaland and Telle (2015), we show that the procyclical behavior of DI awards during the Great Recession in Spain is concentrated in older individuals. Together with the procyclical mortality rates in Spain documented in Tapia Granados (2005) before the Great Recession and the larger decrease in mortality during the Great Recession shown by Regidor et al. (2016) , these results provide evidence supporting the hypothesis that the procyclical behavior of DI awards observed in Spain during the Great Recession may be the result of an improvement in the health status of the general population resulting from worse macroeconomic conditions.

The rest of the paper is organized as follows: Section 2 describes the Spanish DI system and provides descriptive evidence on DI participation and the business cycle in Spain. Section 3 describes the data and Sect. 4 the empirical strategy. Section 5 presents the results of the analysis, and Sect. 6 concludes.

2 The Spanish DI program and the business cycle

2.1 Structure of the DI program

In Spain, there are two types of permanent disability benefits: (i) contributory, which are given to individuals who have generally contributed to the Social Security system before the onset of the disabling condition, and (ii) non-contributory, which are given to individuals who are assessed to be disabled but have never contributed to the Social Security system (or do not reach the minimum contributory requirements to access the contributory system). Non-contributory disability benefits are means-tested and managed at the regional level.[3]

The size of the non-contributory system is relatively small compared to the contributory one. In 2014, the number of beneficiaries was 916529 in the contributory system and 198366 in the non-contributory one. In the same year, the mean monthly benefit (paid in 14 installments) was 915.56 euros in the contributory system and 365.90 euros in the non-contributory one. In this paper, we focus on the contributory system as it represents the largest part of the DI system beneficiaries and expenditures.[4]

The Social Security defines the permanent contributory disability benefit as the income used to compensate the individual for losing a certain amount of wage or professional earnings when affected by a permanent reduction or complete loss of his/her working ability due to the impact of a pathologic or a traumatic process derived from an illness or an accident.

In order to capture the different situations in which a person can be after suffering from a disabling condition, the Spanish Social Security Administration uses a classification of three degrees of disability that depend on the working capacity lost[5]:

(i) Partial disability: The individual is impaired to develop all or the fundamental tasks of his/her usual job or professional activity, but he/she is still capable of developing a different job or professional activity.
(ii) Total disability: The individual is impaired for the development of any kind of job or professional activity.

[3] In the non-contributory system, income is evaluated yearly. The income threshold for the year 2016 was set at 5150.6 euros per year for an individual living alone. This amount is adjusted if the individual lives with other members.

[4] The total amount of non-contributory benefits paid in 2014 was a 9.21% of the amount paid in contributory benefits.

[5] Historically there was also a fourth degree, permanent limited disability for the usual job, which has practically fallen into disuse. Very few disabled individuals currently belong to this category. Among all individuals that were receiving a disability benefit at some point during the years 2008 to 2013, only 0.11% of them were classified into this degree. Individuals in this level of disability only receive a one-time lump-sum payment.

(iii) Severe disability: Individuals who, as a result of anatomic or functional loses, need the assistance of a third person to develop essential activities of daily living such as eating and moving.

The eligibility requirements and the benefit amount depend on the source of the disability (ordinary illness, work-related or work-unrelated accident, or occupational illness), the level of the disability and the age at disability onset. Table 1 summarizes the main parameters of both the eligibility criteria and the benefit formula. The total amount of the benefit is obtained by multiplying a percentage to the regulatory base. The percentage varies depending on the type and degree of the disability (as shown in the last row of Table 1), on the age at onset as well as on the number of years contributed to the system. The regulatory base depends on the source of the disability and on previous salaries. The number of years used to compute the regulatory base depends on the source of the disability.

2.2 DI participation and the business cycle

Figure 1 shows the number of yearly DI applications and awards (per 1000 persons aged 16–64) and the national unemployment rate for the years 1977–2014.[6] Shaded areas mark the four last recessions of the Spanish economy as dated by the *Comité de Fechado del Ciclo Económico Español* (Committee for the Dating of the Spanish Business Cycle). The relationship over time between the unemployment rate and the application and award rates is not as strong as in other countries (see, for example, Maestas et al. 2015 for the case of the USA). However, both applications and awards seem to move in the same direction as the unemployment rate during the years before the Great Recession in Spain. In line with this observation, several papers have documented a positive effect of the regional unemployment rate on the DI award rate in Spain (Jiménez-Martín and Vall Castelló 2009; Benítez-Silva et al. 2010) for the years before the Great Recession, which was a period characterized by a rapid and continuous improvement of economic conditions.

Interestingly, this positive relationship changes drastically during the years of the Great Recession. The rapid and pronounced increase in the unemployment rate during the years of the Great Recession is accompanied by a continuous reduction in DI application and award rates (see Fig. 1). This is surprising in light of the evidence documenting a countercyclical behavior of DI applications and awards in the years before the Great Recession both in Spain and in the USA and other OECD countries. To analyze this counterintuitive behavior of DI participation in more detail, in the following sections we formally estimate the direct impact of economic conditions (measured with variation in regional unemployment rates) on the participation in the DI program in Spain during the years of the Great Recession.[7]

[6] Data on applications are only available from the year 1996.

[7] Note that there is no relevant reform of the DI program affecting the entrance to the system during the Great Recession, our analysis period.

Table 1 Eligibility requirements and benefit amount of permanent contributory disability insurance in Spain

	Ordinary illness	Work-unrelated accident	Work-related accident or professional illness
Eligibility	Age $\geq$ 31	No minimum contributory period required	No minimum contributory period required
	Contributed 1/4 time between 20 years old and disabling condition		
	Age $<$ 31		
	Contributed 1/3 time between 16 years old and disabling condition. No minimum number of years required		
Regulatory base	Age $\geq$ 52 and $<$ 65	Average annual wage of 24 months within the last 7 years of work	Average wage last year of work
	Average wage last 8 years of work[a]		
	Age $<$ 52		
	Average wage calculated over the number of minimum contributory years required[a]		
Percentage applied to the regulatory base	Partial disability: 55%		
	Individuals older than 55 with difficulties to find a job due to lack of education or characteristics of the labor market of the region where they live: 75%		
	Total disability: 100%		
	Severe disability: 100 + 50%		

[a]To form the regulatory base, this average wage is multiplied by a percentage that depends on the number of years contributed at the onset of the disability (considering as contributed the number of years remaining from the onset of the disability to the ordinary retirement age)

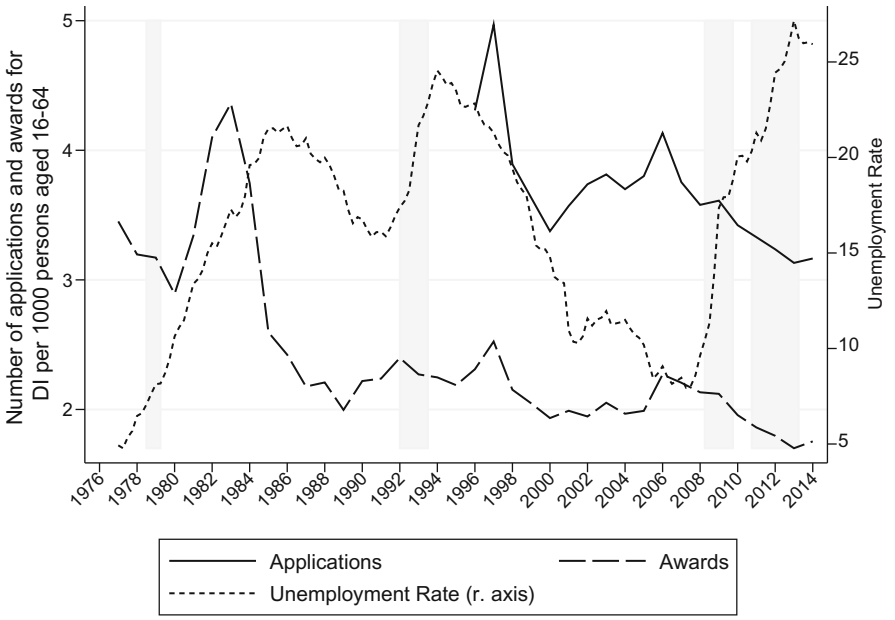

Fig. 1 Disability insurance participation and unemployment rate. Applications and awards are divided by population ages 16–64. Data on applications and awards are taken from the Spanish Social Security Administration. Data on the unemployment rate and population are taken from the Spanish National Institute of Statistics

3 Data

To analyze individual transitions to the DI rolls, we use the *Muestra Continua de Vidas Laborales* (Continuous Sample of Working Lives), an administrative dataset built from individual contributory registers to the Spanish Social Security Administration (SSA). For each year since 2004, the dataset contains information on a 4% sample of all the individuals that, at some point during that year, contributed to the SSA by working, receiving unemployment benefits, or receiving another type of contributory benefits (old age, survivor or disability benefits). For those individuals, there is retrospective information of their entire contributory history from their first labor market experience. We have information on several characteristics of each employment and unemployment spell (sector of employment, wage, type and amount of benefit, etc.) as well as information on demographic characteristics (age, gender, skill, etc.).

We pool the sample for the years 2007–2013 and construct a panel dataset with quarterly observations between the second quarter of 2007 and the fourth quarter of 2013. That is, our panel dataset is composed of a 4% sample of all the individuals that contributed to the SSA or received a contributory benefit for at least 1 day between 2007 and 2013. We follow them from the second quarter of 2007 to the fourth quarter of 2013. With this dataset, we can identify the exact moment (and region) in which an individual enters the DI program. We restrict our sample to non-disabled working-age

individuals (ages 16–64). In order to exclude very inactive individuals that would be very insensitive to labor market conditions, we further restrict our sample to include only individuals that have had at least one previous employment spell before the period of observation. This excludes young individuals that have still not entered the labor market as well as very inactive individuals with a very low attachment to the labor market. Our final sample contains 405,438 individuals (of which 45% are women) and a total of 8,909,653 observations, distributed along the 27 quarters that conform our study period.

To analyze the effect of the business cycle on DI applications and denials, we use aggregate data on the number of DI applications provided by the Social Security Administration. Disaggregated at the level of the Autonomous Community[8] (AC), the data contain, for each year in the period 1996–2014, the number of total applications for DI and the percentage of those applications that have been accepted or denied.

4 Empirical strategy

To identify the effect of the business cycle on the DI award rate, we use the individual panel data to model transitions to the DI rolls and estimate regressions of the form:

$$Y_{itr} = \beta_1 UR_{tr} + \beta_2 X_{itr} + \gamma_t + \theta_t + \delta_r + \upsilon_{itr} \quad (1)$$

where Y_{itr} is a dummy variable taking the value 1 if individual i living in region r[9] transits to the DI rolls from period t to period $t+1$. Economic conditions are measured with UR_{tr}, the unemployment rate in period t and region r. γ_t are year fixed effects that control for time-varying factors that vary uniformly across regions, δ_r are region fixed effects that control for time-invariant factors that differ across regions, X_{itr} is a vector of time-varying individual controls, θ_t are quarterly dummies (one for each quarter in the calendar year) to control for the seasonality of business cycle conditions and DI participation and υ_{itr} is the error term. Standard errors are clustered at the region level.

We measure economic conditions with the unemployment rate at the province level (UR_{tr}). The strength of the Great Recession in Spain has resulted in a high degree of variation in economic conditions both over time and between the different provinces. Figure 2 shows the variation in the unemployment rate over time for 5 Spanish provinces with different degrees of economic performance during the Great Recession (2007q2–2013q4). We can see how, before the start of the crisis (second quarter of 2007), the spread in the unemployment rate among provinces was of about 10 percentage points. The differential strength of the recession across provinces has resulted in a difference in the unemployment rate between the least and the most

[8] Autonomous Communities are the 17 administrative divisions corresponding to the first level of administrative decentralization in Spain. Data on applications disaggregated at the province level are not available.

[9] Regions refer to provinces, which are the 50 administrative divisions corresponding to the second level of administrative decentralization in Spain. They also constitute the regional units in which agencies in charge of granting DI benefits are decentralized.

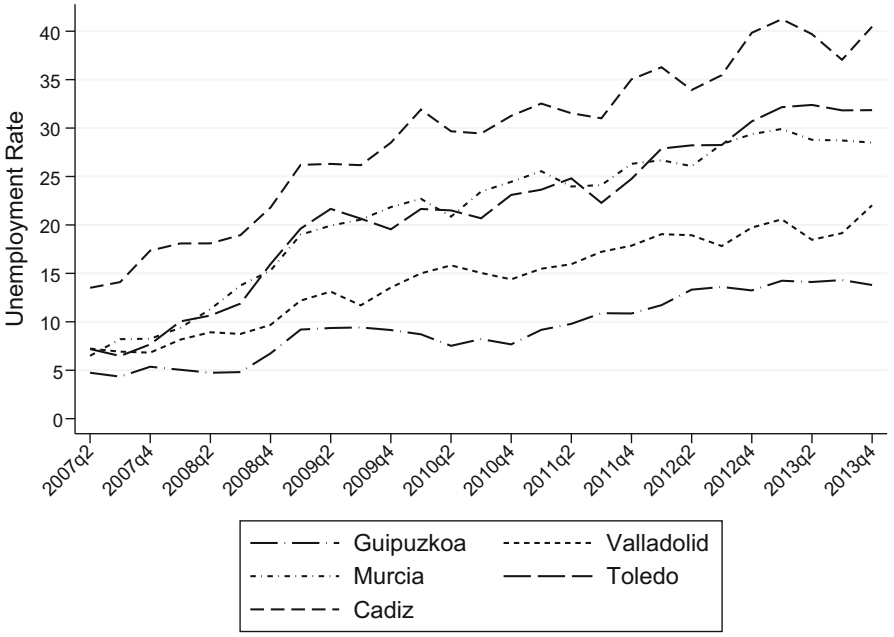

Fig. 2 Unemployment rate in 5 Spanish provinces during the Great Recession. Data on unemployment rates are taken from the Spanish National Institute of Statistics

affected provinces of about 25 percentage points in the fourth quarter of 2013. This high variability in the unemployment rate over time and between provinces ensures that UR_{tr} is identifying enough variation in local economic conditions.[10] Our coefficient of interest, β_1, measures the change in the DI award rate (the probability of transiting to the DI rolls) that results from a 1 pp increase in the unemployment rate.

The individual controls included in X_{itr} are demographic characteristics (age, gender and skill level), variables capturing the employment situation of the individual[11] (wage and sector of employment), an index capturing the amount of labor market experience of the individual and variables capturing characteristics of the local labor market the individual faces (an index capturing the degree of wage compression and an index capturing the degree of education mismatch between unemployed and employed individuals[12]). Table 2 shows a description of all covariates included in the model. The inclusion of these individual controls is important in order to purge the regional unemployment rate from factors correlated with both the individual propensity to tran-

[10] The total variation of the provincial unemployment rate in our study sample ranges from 2.48 to 41.24, with a mean of 18.37 and a standard deviation of 8.32.

[11] If the individual is not employed, these variables refer to the employment situation of the individual in his/her last employment spell.

[12] The education mismatch variable is constructed as the sum of the squared differences in the distribution of education (considering three levels of education) between unemployed and employed individuals in each region.

Table 2 Description of covariates

Covariate	Description
Age	Age in years
Women	Binary indicator equal to 1 if woman
Skill	Three binary indicators reflecting the skill level of the individual according to his contributory group
Education mismatch	Index measuring the degree of education mismatch between unemployed and employed individuals at the regional level
Wage	Logarithm of the monthly contributory base of the individual, in euros
Sector	Four binary indicators reflecting the employment sector of the individual (agriculture, industry, construction or services)
Labor market experience	Logarithm of the number of years the individual has been in employment
Wage compression	Difference between the 20th and the 50th percentile of the wage distribution at the regional level. It is an indicator of the degree of wage compression in the lower part of the wage distribution

sit to DI and economic conditions, and is something that most previous studies using aggregate data are unable to do.

To estimate the effect of the business cycle on the composition of new DI awardees, we use the individual data to estimate similar regressions for the sample of new awardees. In particular, we estimate regressions of the form:

$$Y_{itr} = \beta_1 UR_{tr} + \gamma_t + \theta_t + \delta_r + \upsilon_{itr} \tag{2}$$

where Y_{itr} is a particular characteristic of awardee i in time period t and region r (that enters the DI program in period $t + 1$). The other covariates are the same as in Eq. 1, with the only difference that here we do not include the individual controls (X_{itr}). The coefficient of interest, β_1, measures the effect of a 1 pp increase in the unemployment rate on each particular characteristic of the awardee. The characteristics analyzed are the age of the individual (in years), the gender, the degree of disability,[13] the degree of labor market experience,[14] the previous wage and the skill level.[15]

Finally, to estimate the effect of economic conditions on the number of DI applications and denials, we use the aggregate data on DI applications and estimate similar

[13] Measured with a dummy variable taking the value 1 for individuals with a degree of disability classified by the SSA as "Total" or "Severe," and taking the value 0 for individuals with a degree classified as "Partial." See Sect. 2.1 for information on degrees of disability.

[14] Measured with the logarithm of the amount of years the individual has been in employment before entering the DI program.

[15] Measured with a dummy variable taking the value 1 for individuals with a SSA contributory group considered "high skilled." For individuals that are not working, we take the contributory group of the last employment spell.

regressions of the form:

$$ln(I_{tr}) = \beta_1 UR_{tr} + \gamma_t + \delta_r + \upsilon_{tr} \quad (3)$$

where I_{rt} is the number of total applications (or number of applications denied) in year t and region r,[16] UR_{rt} is the unemployment rate in year t and region r, δ_r are region fixed effects, γ_t are year fixed effects and υ_{rt} is the error term. The regressions are weighted by the working-age population (ages 16–64) in each region and year, and the standard errors are clustered at the region level. To differentiate the period of the Great Recession, regressions are estimated separately for the whole period (years 1996–2014), for the years 1996–2007 and for the years 2008–2014. The coefficient of interest, β_1, measures the percentage increase in the number of applications (denials) that results from a 1 pp increase in the unemployment rate.

5 Results

5.1 Effect of the business cycle on DI award rate and composition of awardees

Table 3 presents the results of the estimation of Eq. 1, where we investigate the effect of the unemployment rate on the individual probability of entering the DI rolls. Regressions are estimated with and without controls, and differentiated by gender. The table shows the coefficient on the unemployment rate, which measures the change in the probability of entering the DI rolls (the DI award rate) that results from a 1 pp increase in the unemployment rate. For easy of exposition, the award rate is multiplied by 1000 to represent the number of awards per 1000 individuals. We also show the percentage increase that the marginal effect represents with respect to the sample mean award rate.

The inclusion of individual controls (columns 4–6) changes the significance and magnitude of the coefficients, which highlights the importance of controlling for demographic and employment individual characteristics. From this point, all regressions shown will be estimated including the vector of individual covariates. From columns 4–6, we see that higher unemployment rates are associated with a reduction in the DI award rate for the whole sample and also for each gender, although the effect is not statistically significant in the case of men. For the whole sample, a 1 pp increase in the unemployment rate is associated with a 0.92% decrease in the award rate, significant at the 1% level. The effect is stronger for women, for whom a 1 pp increase in the unemployment rate results in a 1.84% reduction in the DI award rate, significant at the 1% level. These results show that DI awards are procyclical during the Great Recession in Spain, contrary to the behavior documented by previous literature.

Table 4 shows the results of the estimation of Eq. 2, where we investigate the effect of the unemployment rate on the composition of new DI awardees. The different columns show regressions for each of the individual characteristics analyzed. Regressions are

[16] In this case, regions refer to Autonomous Communities, which are the 17 administrative divisions corresponding to the first level of administrative decentralization in Spain. Data on applications and denials disaggregated at the province level are not available.

Table 3 Effect of unemployment rate on DI award rate

	(1) Both genders	(2) Men	(3) Women	(4) Both genders	(5) Men	(6) Women
Unemp. rate	− 0.0034983	0.0001807	− 0.0074521	− 0.0070010*	− 0.0045885	− 0.0106213*
	(0.0036653)	(0.0055651)	(0.0052865)	(0.0040873)	(0.0061294)	(0.0054428)
Percent increase	− 0.52%	0.02%	− 1.60%	− 0.92%	− 0.54%	− 1.84%
Constant	0.7567734***	0.9078206***	0.5636482***	− 2.0422869***	− 2.4281499***	− 1.5970297***
	(0.0262407)	(0.0345806)	(0.0368467)	(0.2122056)	(0.2839368)	(0.1813892)
Observations	8,909,653	4,821,121	4,088,532	8,909,653	4,821,121	4,088,532
R-squared	0.0000802	0.000118	0.0000621	0.00096123	0.0011906	0.0006272
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	Yes	Yes	Yes

Standard errors (in parenthesis) are clustered at the province level. If included, region fixed effects are at the province level. The table shows the effect of the unemployment rate (expressed in percentage points) on the DI award rate (expressed as number of awards per 1000 individuals) as well as the percentage increase that effect represents with respect to the sample mean award rate. The controls included in regressions of columns 4–6 are defined in Table 2

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 4 Effect of unemployment rate on composition of DI awardees

	(1) Age	(2) Women	(3) High disability degree	(4) Lab. Mark. Exp.	(5) Wage	(6) High skilled
(A) Both genders						
Unemp. rate	0.05160	− 0.00528*	− 0.00253	0.00163	5.46383	− 0.00014
	(0.05126)	(0.00275)	(0.00274)	(0.00424)	(4.13154)	(0.00181)
Percent increase	0.10%	− 1.53%	− 0.68%	0.05%	0.42%	− 0.13%
Constant	50.65267***	0.34749***	0.30951***	3.23058***	1,701.13693***	0.14751***
	(0.42038)	(0.01393)	(0.01853)	(0.02774)	(30.49581)	(0.01121)
Observations	7666	7666	7666	7666	7652	7304
R-squared	0.01325	0.01898	0.03802	0.01316	0.06691	0.01088
(B) Men						
Unemp. rate	0.08522		− 0.00294	0.00211	3.37511	− 0.00179
	(0.05951)		(0.00376)	(0.00414)	(5.03937)	(0.00210)
Percent increase	0.17%		− 0.79%	0.07%	0.24%	− 1.59%
Constant	50.96790***		0.23065***	3.33536***	1,768.16721***	0.12535***
	(0.53635)		(0.02568)	(0.03159)	(36.67245)	(0.01252)
Observations	5035		5035	5035	5031	4890
R-squared	0.01977		0.03654	0.02249	0.07948	0.01426
(C) Women						
Unemp. rate	0.00111		− 0.00364	− 0.00495	3.90505	0.00238
	(0.09159)		(0.00500)	(0.00875)	(6.66663)	(0.00229)

Table 4 continued

	(1) Age	(2) Women	(3) High disability degree	(4) Lab. Mark. Exp.	(5) Wage	(6) High skilled
Percent increase	0.00%		− 0.97%	− 0.17%	0.35%	2.65%
Constant	49.42198***		0.48947***	2.97736***	1576.15439***	0.20234***
	(0.73203)		(0.03692)	(0.05601)	(42.82440)	(0.02817)
Observations	2631		2631	2631	2621	2414
R-squared	0.03383		0.06964	0.03175	0.08463	0.02619

Standard errors (in parenthesis) are clustered at the province level. Regressions include fixed effects at the year and at the province level. Each regression shows the effect of the unemployment rate (expressed in percentage points) on the corresponding individual characteristic, as well as the percentage increase that effect represents with respect to the sample mean of the dependent variable

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 5 Effect of unemployment rate on DI applications and denials

	(1) 1996–2014	(2) 1996–2007	(3) 2008–2014
Applications	0.00202	0.00462	0.00440
	(0.00437)	(0.00432)	(0.00671)
Denials	0.00062	0.00197	0.01527*
	(0.00734)	(0.00864)	(0.00860)

Standard errors (in parenthesis) are clustered at the AC level. Regressions include fixed effects at the year and at the AC level. The table shows the effect of the unemployment rate (expressed in percentage points) on the logarithm of applications (denials)
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

estimated separately for the whole sample and by gender, and we show only the effect of the unemployment rate and the percentage increase that effect represents with respect to the sample mean of each dependent variable. Except for the proportion of women, all coefficients are not statistically different from zero and of a small magnitude. The unemployment rate has a significant effect only on the proportion of women, which is consistent with the concentration of the procyclicality of the award rate on women found in the previous regressions. Overall, these results show that the business cycle has no effect on the age of new awardees, on their health status (measured by their degree of disability) or on their degree of labor market attachment (measured by their labor market experience, their previous wage and their skill level), in contrast to the findings of previous studies for the USA (Coe and Rutledge 2013; Maestas et al. 2015; Lindner et al. 2017) which find that worse economic conditions are associated with healthier awardees with a higher degree of labor market attachment. Therefore, contrary to what is observed in the USA, DI participation in Spain seems not to be driven by behavioral responses of partially disabled individuals that resort to the DI program as a result of a worsening of their labor market expectations, which possibly explains why we do not observe a countercyclical behavior of DI awards.

5.2 Effect of the business cycle on DI applications and denials

Table 5 presents the results of the estimation of Eq. 3, where we analyze the effect of the unemployment rate on the number of DI applications and denials. We highlight two main findings. First, the unemployment rate has no significant effect on the number of applications, providing further evidence that DI participation in Spain does not change as a result of conditional applicants with moderate health problems that turn to the DI program when labor market conditions worsen, a phenomenon that has been shown specially in the USA (Black et al. 2002; Autor and Duggan 2003; Maestas et al. 2015).

Second, the unemployment rate has a positive and significant effect on the number of denials. A 1 pp increase in the unemployment rate is associated with a 1.5% increase in the number of applications that are denied. This countercyclical behavior of denials is also found in Maestas et al. (2015), where the authors analyze the behavior of applications and denials in the USA during the period 1992–2012. In this paper, estimating

also aggregate regressions of the number of applications, allowances and denials for the SSDI program in the USA on the regional unemployment rate, the authors find that SSDI applications are highly countercyclical, both before and during the Great Recession, and interestingly, awards are also procyclical, contrary to what was previously found in the USA. Furthermore, the authors find that higher unemployment rates are associated with an increase in the amount of time that passes between the individual becomes disabled and the moment he/she applies for the benefit. This observation, the high countercyclical behavior of applications in the USA and the other evidence for the USA that worse economic conditions are associated with applicants with better health and more labor market attachment, suggest that the countercyclical behavior of denials in that country (and the procyclical behavior of allowances) is the result of an automatic response of the DI program that restricts the entrance to healthier applicants that do not qualify for benefits induced to apply because of worse labor market conditions.

Here, we argue that the procyclical behavior of awards in Spain during the Great Recession is the result of other factors. Because we have shown that applications are not countercyclical in Spain and that the composition of awardees is not affected by the business cycle, the countercyclical behavior of denials cannot be the result of healthier applicants resorting to the program in bad times. Rather, we argue that the increase in denials may be the result of an informal increase in stringency resulting from worse macroeconomic conditions. The Great Recession in Spain has been characterized by large increases in public deficits and by the implementation of substantial government expenditure cuts and, although there has been no formal reform of the DI program increasing the screening stringency of the program, it may be the case that DI evaluators have informally increased stringency as a result of worse economic conditions. To support this claim, we take advantage of the strong incidence of the housing crisis in the Great Recession in Spain. The contribution of the construction sector to total value added in Spain increased from 7% in 1997 to 12% in 2006 (Aparicio-Fenoll 2016). This increase in the importance of the construction sector was unequally distributed across Spanish regions. Thus, when the Spanish economy collapsed in 2008, some of the regions were very dependent on the construction sector, while others had a more diversified economy. As the type of jobs in the construction sector is characterized by being very physically demanding and by being concentrated among low educated men, the disabilities of individuals applying to DI that come from this sector would be more observable. Therefore, if the procyclical behavior of DI awards is the result of an increase in screening stringency, we would expect the procyclicality to be lower in provinces where the importance of the construction sector before the beginning of the Great Recession was higher, because individuals applying to DI in these provinces would have more observable disabilities for which an informal increase in stringency would be more difficult to implement.

Thus, following Aparicio-Fenoll (2016), we differentiate Spanish provinces according to the magnitude of the increase in the contribution of the construction sector to total value added during the pre-crisis years 1996–2007. Provinces are classified in three groups according to whether the contribution of the construction sector to total value added less than doubled, more than doubled and less than tripled, or more than tripled during 1996–2007. It is important to note that the three types of provinces expe-

Table 6 Growth in unemployment rate by type of province according to the importance of the construction sector

	Low growth (10 provinces)	Medium growth (34 provinces)	High growth (8 provinces)
UR in 2007q2 (mean)	7.43	8.47	8.43
UR in 2013q4 (mean)	24.32	25.38	29.17
Difference in pp	16.89	16.91	20.74

Low growth refers to provinces in which construction to total value added less than doubled between 1997 and 2006. Medium growth refers to provinces in which it more than doubled and less than tripled. High growth refers to provinces in which it more than tripled.

Table 7 Effect of unemployment rate on DI award rate. By importance of construction sector

	(1) Low growth	(2) Medium growth	(3) High growth
Unemp. rate	− 0.0311392**	− 0.0023404	0.0035048
	(0.0135414)	(0.0056664)	(0.0144921)
Percent increase	− 3.53%	− 0.30%	0.80%
Constant	− 1.5944897***	− 1.5823628***	− 2.7815795**
	(0.4050921)	(0.1966800)	(0.8331288)
Observations	940,236	7,765,207	929,678
R-squared	0.0011933	0.0009147	0.0011802

Standard errors (in parenthesis) are clustered at the province level. Regressions include fixed effects at the year and at the province level as well as the controls described in Table 2. The table shows the effect of the unemployment rate (expressed in percentage points) on the DI award rate (expressed in number of awards per 1000 individuals) as well as the percentage increase that effect represents with respect to the sample mean award rate. Low growth refers to provinces in which construction to total value added less than doubled between 1997 and 2006. Medium growth refers to provinces in which it more than doubled and less than tripled. High growth refers to provinces in which it more than tripled
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

rienced a similarly strong economic recession from 2008. This is listed in Table 6, which shows the change in the mean unemployment rate for the three groups of provinces during the Great Recession. The unemployment rate increased by 16.89 percentage points for provinces that experienced a low increase in the importance of the construction sector before the onset of the economic crisis, while it increased by 16.91 and 20.74 percentage points for those that experienced a medium and a strong growth, respectively.

Table 7 presents the results of the estimation of the models analyzing the effect of the unemployment rate on the DI award rate (Eq. 1), differentiated by these three types of provinces. As expected, the procyclicality of the award rate is concentrated in provinces where the construction sector was less important. For the provinces with a lower growth of the importance of the construction sector before the crisis, a 1 pp increase in the unemployment rate is associated with a 3.53% reduction in the DI award rate, significant at the 5% level. The effect for provinces with a medium

growth is a reduction of 0.3%, and for provinces of high growth an increase of 0.80%, both effects not statistically different from 0. The concentration of the procyclicality of DI awards in provinces with a lower importance of the construction sector, where disabilities of DI applicants are arguably less observable and more difficult to medically diagnose, supports the hypothesis that the procyclicality of DI awards during the Great Recession in Spain may be the result of an informal increase in the screening stringency implemented by DI evaluators.

These results may also help explain why the procyclicality of DI awards is concentrated in women. If the disabilities of women are characterized by being less observable, it is reasonable to expect the increase in stringency to be more effective in women. We check this possibility by using data from *El Empleo de las Personas con Discapacidad* (The Employment of People With Disabilities), a dataset provided by the Spanish National Institute of Statistics that contains a representative sample of individuals in possession of a disability certificate,[17] with information on the type of disability of the individual. We classify disabilities in two groups according to whether they are less observable (osteomuscular and mental disabilities) or more observable (the other types of disabilities[18]). Using this classification, the data show that, for the year 2009 (one year after the beginning of the Great Recession[19]), disabled women are 3 pp more likely to suffer from a less observable disability, a gender difference statistically significant at the 1% level. This higher prevalence of less observable disabilities in women may result in a higher feasibility for DI evaluators to apply restrictions in entrance to the program, and this may help explain why the procyclicality of DI awards is higher for women.

5.3 The role of procyclical health

As explained in Sect. 1, there is growing evidence that mortality is procyclical, as an increasing number of studies show that increases in the unemployment rate are associated with reductions in the mortality rate for all causes and for several specific causes of death. Furthermore, several studies have shown that the reduction in mortality is the result of improvements on physical health (Ruhm 2003). Most importantly, although some papers have shown that worse macroeconomic conditions have a positive effect on measures of disability, there is scarce evidence analyzing the role that procyclical disability may play in explaining participation in DI. To the best of our knowledge, the only paper exploring this avenue is Haaland and Telle (2015). In this study, the authors show that, as in other countries, higher unemployment rates are associated with reductions in the mortality rate. Importantly, the authors show that worse

[17] The disability certificate is the main administrative accreditation in Spain that provides access to rights and services targeted to people with disabilities. Individuals have to go through a different evaluation process in order to be granted DI benefits, but in practice the eligibility criteria for the disability certificate and DI benefits are similar.

[18] Which include neuromuscular, intellectual, visual, hearing, cardiovascular, immunological, respiratory, digestive, metabolic, endocrine and other disabilities.

[19] Data before the beginning of the crisis in 2007 is not available, and therefore we use the earlier year available.

macroeconomic conditions are also associated with a reduction in the prevalence of obesity, traffic accidents and, interestingly, in the probability of receiving DI benefits. Crucially, the authors find that the negative effect of the unemployment rate on the probability of receiving DI benefits is concentrated in older individuals, suggesting that the effects of macroeconomic conditions on DI participation may be driven by improvements of health in individuals in worse health conditions. Supporting this, the authors also find that the procyclicality in mortality is stronger for individuals receiving DI benefits.

The findings of Haaland and Telle (2015), the procyclical behavior of mortality rates found in Spain during the years 1980–1997 in Tapia Granados (2005) and the stronger reduction in mortality in the Great Recession as compared to the years before the crisis found by Regidor et al. (2016) suggest that procyclical health in the general population may be a factor explaining the procyclical behavior of DI awards in Spain during the Great Recession. To provide preliminary evidence supporting this possibility, here we explore whether there are heterogeneous effects of the unemployment rate on the DI award rate with respect to age. Table 8 shows the regressions estimated separately for younger individuals (ages 16–39) and older individuals (ages 40–64), differentiated also by gender. Consistently with the findings in Haaland and Telle (2015), the procyclicality of the award rate is concentrated in older individuals. For the sample including both genders, the effect of the unemployment rate is bigger and only statistically significant for older individuals, for whom a 1 pp increase in the unemployment rate is associated with a 1.85% reduction in the award rate, significant at the 5% level. Consistent with the previous results, while the unemployment rate is not significant for men (irrespective of the age group), the stronger procyclicality of the award rate for older individuals is more evident in the sample of women. While the coefficient for younger women is not significant, for older women a 1 pp increase in the unemployment rate results in a 3.83% reduction in the award rate, significant at the 5% level. Overall, the concentration of the procyclicality of the award rate to DI in older individuals suggests that the reduction in the award rate may be driven by a health improvement effect of the business cycle, as one would expect that business cycle effects have a larger effect on the health of older individuals.

6 Conclusions

Previous literature has documented a countercyclical behavior of disability insurance (DI) applications and allowances in developed countries. It is thought that bad economic conditions reduce the value of labor market participation and induce partially disabled individuals to apply for DI. In turn, this translates into an increase in the DI rolls that threatens the financial sustainability of a program that is not designed to cover the risk of transitory labor market problems (Black et al. 2002; Autor and Duggan 2003; Maestas et al. 2015).

In this paper, we investigate the relationship between the business cycle and DI participation during the Great Recession in Spain. Using individual-level panel data, we show that higher unemployment rates are associated with a reduction in the probability of entering the DI program, a reduction that is concentrated in women. This procycli-

Table 8 Effect of unemployment rate on DI award rate. By age groups and gender

	(1) Both genders	(2)	(3) Men	(4)	(5) Women	(6)
	Ages 16–39	Ages 40–64	Ages 16–39	Ages 40–64	Ages 16–39	Ages 40–64
Unemp. rate	− 0.0039032	− 0.0157188**	− 0.0064178	− 0.0067302	− 0.0012119	− 0.0285629**
	(0.0028239)	(0.0072256)	(0.0048871)	(0.0113326)	(3.4494)	(0.0123148)
Percent increase	− 1.12%	− 1.85%	− 1.57%	− 0.81%	− 0.51%	− 3.83%
Constant	− 0.1861894*	− 2.4112016***	− 0.2149108	− 2.9902601***	− 0.1461191**	− 1.5592751***
	(0.0943071)	(0.2674149)	(0.1751994)	(0.3789027)	(0.0694378)	(0.3301284)
Observations	4,926,523	3,983,130	2,614,699	2,206,422	2,311,824	1,776,708
R-squared	0.000274	0.0008555	0.0003752	0.0011135	0.0001693	0.0004681

Standard errors (in parenthesis) are clustered at the province level. Regressions include fixed effects at the year and at the province level, as well as the controls described in Table 2. The table shows the effect of the unemployment rate (expressed in percentage points) on the DI award rate (expressed as number of awards per 1000 individuals) as well as the percentage increase that effect represents with respect to the sample mean award rate

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

cal behavior of DI awards contrasts with the countercyclicality of DI applications and awards found in most of the previous literature. Therefore, we explore possible mechanisms that could be driving this counterintuitive behavior of DI awards.

Contrary to what has been found in the USA, we show that in Spain during the Great Recession, worse economic conditions are not associated with a change in the composition of new DI awardees in relation to their health status and labor market attachment, suggesting that DI participation in Spain is not driven by partially disabled individuals resorting to DI as a consequence of a worsening of their labor market expectations. We also show that DI applications are insensitive to economic conditions in Spain, providing further credence to this conclusion.

While applications are not responsive to the business cycle, we find that higher unemployment rates are associated with an increase in the number of applications denied, a result that has also been found for the USA (Maestas et al. 2015). We argue that, while the countercyclical behavior of denials in the USA is probably the result of an automatic response of the program to an increase in applications by healthier applicants, the increase in denials in Spain is possibly the result of an informal increase in the screening stringency implemented by DI evaluators. To provide further evidence supporting this hypothesis, we show that the procyclical behavior of DI awards is not present in provinces where the importance of the construction sector was higher before the Great Recession, provinces in which DI applicants have more observable and easy to diagnose disabilities for which restrictions in access are more difficult to implement. We further show that women are more likely to suffer from less observable types of disabilities, which helps explain why the procyclicality of DI awards is concentrated in women.

Finally, we argue that the procyclical behavior of DI awards may also be the result of a procyclical behavior of health in the general population. We show that the procyclicality of DI awards is concentrated in older individuals, a result consistent with the findings in Haaland and Telle (2015), who show that the probability of receiving DI benefits is also procyclical for older individuals in Norway. This result, together with the increasing evidence documenting a procyclical behavior of health in developed countries (including Spain), suggests that the procyclical behavior of DI awards in Spain during the Great Recession may be driven by a decrease in the incidence of disability as a result of worse economic conditions.

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