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Great Recession and Disability Insurance in Spain*

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Abstract

In this paper, we exploit the strong incidence of the Great Recession in Spain to estimate the effect of economic conditions on participation in Disability Insurance (DI). Using individual panel data, we show that increases in the local unemployment rate are associated with a reduction in the individual probability to enter the DI program during the Great Recession in Spain. Using aggregate data on applications, we show that this procyclical behavior of DI awards comes from an increase in the proportion of applications that are denied. Thus, contrary to the previous literature that has extensively reported a countercyclical behavior of DI participation, our results provide new evidence that, in periods of extremely recessionary conditions, DI participation may turn procyclical.

JEL classification: H55; I10; J14
KEYWORDS: Disability; Great Recession; Labour market transitions

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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 working-age population receiving benefits in 2008 for the mean of OECD countries (OECD 2010). The rise in DI rolls has been especially important in the US, 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).

One of the factors contributing to the rise in DI beneficiaries is attributed to a deterioration of economic conditions. Especially in the US, 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 labour 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 labour 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 labour market conditions is also documented in other OECD countries (see, for example, Rege et al. 2009 or Benitez-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 loses his/her job when economic conditions deteriorate and turns to DI for an alternative source of income. This increase in DI participation as a result of bad labour market conditions is problematic because these individuals entering the DI rolls in bad times would not probably return to the labour market when economic conditions recover[2]. The DI program is specially

[1] SSDI is the public contributory DI program in the US. 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 1-2% of all DI beneficiaries left the program for reasons other than death or retirement (OECD 2010).

designed to provide long term income support for disabled individuals unable to work. This use of the program by individuals in need of transitory assistance poses a problem to the financial sustainability of the program and weakens the link with the labour market of partially disabled individuals who still keep some remaining capacity to work.

Although much less than in the US, the countercyclical behavior of DI participation has also been documented in Spain. Jiménez-Martín and Vall (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 old during the years 1992 and 2007. Also for the Spanish case, Benitez-Silva et al. (2010) use aggregate regional time-series data and estimate a positive effect of the unemployment rate on the inflow rate to DI for the period 1992-2009.

In this paper, we build on these studies to provide new evidence on the relationship between the business cycle and DI participation. We use individual panel data for the years of the Great Recession to model individual transitions to the DI rolls. We identify the incidence of the business cycle with variation in the unemployment rate between time and Spanish provinces[3]. Additionally, we use aggregate data to estimate the effect of the local unemployment rate on the number of applications for DI. We contribute to the literature that studies the effect of economic conditions on DI participation in several ways. First, unlike most previous studies, which use data aggregated at the regional level, we use individual panel data and model individual transitions to the DI rolls. This allows us to control for individual characteristics correlated both with the individual propensity to participate in DI and business cycle conditions, which is something that most previous studies are unable to do with aggregate data. Second, this is one of the few papers that analyzes the cyclicality of DI participation during the period of the Great Recession. Spain is one of the countries where the Great Recession has been strongest, with very high levels of employment destruction. Although the crisis has had a very strong national component, Spanish regions present substantial variation in the incidence of the crisis. This generates large variation in unemployment rates both over time and between Spanish provinces that we exploit to identify the effect of economic conditions on participation in the DI program.

Our results show that the local unemployment rate is associated with a reduction in the individual propensity to enter the DI program in Spain during the Great Recession. This is a surprising result in light of the large previous literature documenting a countercyclical behavior of DI awards in developed countries. We further show that this procyclicality of the inflow rate comes from an increase in the proportion of denied claims while the probability of applying to the system remains unchanged. This increase in stringency may by induced by pressures to reduce public spending in regions most affected by the crisis. This result is in line with recent evidence for the US showing that almost all applications induced by

[3]Provinces are the 50 administrative divisions corresponding to the second level of administrative decentralization in Spain. They also constitute the units in which agencies in charge of granting DI benefits are decentralized.

bad economic conditions are initially denied (Maestas et al 2015). This stricter criteria when granting DI benefits could constitute a problem if it leaves out of the program individuals with severe health limitations who will not be able to return to work even when the labour market recovers. In order to explore this, we perform an additional exercise in which we test the existence of heterogeneous effects across regions. In order to do that, following Aparicio-Fenoll (2016), we classify Spanish provinces in three groups according to the size of the increase in the contribution of the construction sector to total value added during the pre-crisis years 1996-2007. We expect lower increases in stringency in DI benefits in those regions in which the construction sector is more important. This is so because the construction sector is a strongly physically demanding sector in which disability problems may be more evident and observable. Indeed, we find that the procyclicality of DI awards is not present in regions with a relatively large construction sector.

The rest of the paper proceeds 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 Section 4 outlines the econometric approach used to estimate the effect of economic conditions on DI awards and applications. Section 5 presents the results of the estimation, and Section 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 requirement period to access the contributory system). Non-contributory disability benefits are means-tested and managed at the regional level[4].

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[5].

[4]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.

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

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[6]

(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.

(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, moving, etc.

The eligibility requirements and the benefit amount depend on the source of the disability (ordinary illness, work related or 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[7]. 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

benefits.

[6]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.

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

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 US). 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 inflow to the DI program in Spain (Jiménez-Martín and Vall 2009; Benitez-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 Figure 1). This is surprising in light of the evidence documenting a countercyclical behaviour of the inflow rate to DI in the years before the Great Recession both in Spain as well as in the USA and other OECD countries. To analyze this new finding in more detail, in the following sections we formally estimate the direct impact of economic conditions (measured with variation in local unemployment rates) on the participation in the DI program in Spain during the years of the Great Recession.

3 Data

To analyze individual transitions to the DI rolls, we use the Muestra Continua de Vidas Laborales (Continuous Sample of Working Lives (CSWL)), 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 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 the entire contributory history from their first labour 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 to 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 individuals that contributed to the SSA or received a contributory benefit for at least one 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 labour 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 labour market as well as very inactive individuals with a very low attachment to the labour market during all their live. Our final sample contains 411433 individuals (of which 45% are women) and a total of 9635121 observations.

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

4 Econometric approach

To identify the effect of economic conditions on the inflow to DI, we use the quarterly panel dataset to model transitions to the DI rolls. We estimate regressions of the form:

$$Y_{it} = \beta_1 UR_{t-1,r} + \beta_2 X_{i,t-1} + \gamma_{t-1} + \delta_r + \theta_{t-1} + \upsilon_{i,t-1} \tag{1}$$

Where Y_{it} is a dummy variable equal to 1 if individual i enters the DI rolls in period t. $UR_{t-1,r}$ is the unemployment rate in period t-1 and province r. $X_{i,t-1}$ are individual controls. γ_{t-1} are time fixed effects at the year level that control for national trends in DI participation as well as for reforms in the DI program. δ_r are region fixed effects at the AC level that control for regional trends in DI participation as well as for specific regional policies affecting the entrance to the DI rolls[9]. θ_{t-1} are quarterly dummies to control for the seasonality of business cycle conditions and DI participation and $\upsilon_{i,t-1}$ is the error term. Standard errors are clustered at the individual level. Note that all independent variables are specified in period t-1. That is, we capture the effect of variables in t-1 on the transition of individual i from period t-1 to period t.

We measure local economic conditions with the unemployment rate at the province level ($UR_{t-1,r}$). 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

[8] Autonomous Communities (AC) are the 17 administrative divisions that constitute the first level of administrative decentralization in Spain.

[9] Although the disability agencies in charge of granting disability benefits are managed at the province level, the political control of most decentralized welfare policies (health, education, etc.) is at the AC level.

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 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 $UR_{t-1,r}$ is identifying enough variation in local economic conditions[10]. Our coefficient of interest (β_1) measures the increase in the inflow rate to DI (the probability of transiting to the DI rolls) that results from a 1 pp increase in the local unemployment rate.

The individual controls included in $X_{i,t-1}$ 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 labour market experience of the individual and variables capturing characteristics of the local labour 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 transit to DI and the local labour market conditions the individual faces, and is something that most previous studies using aggregate data are unable to do.

We estimate additional regressions in which we take into account the initial labour market situation of the individual at the moment that the transition is made. For employed individuals, following Arellano et al. (2002) and García Pérez (1997), we estimate a competing risk model, applied to discrete time transitions, with the following hazard specification:

$$\varphi_{it}^{j} = F(\beta_1^j UR_{t-1,r} + \beta_2^j X_{i,t-1} + \gamma_{t-1}^j + \delta_r^j + \theta_{t-1}^j) \quad \text{for} \quad j = (ed, en) \tag{2}$$

Where φ denotes a hazard function, *ed* refers to the alternative in which the individual transits from employment to the DI rolls and *en* from employment to non-employment[13]. Likewise, for non-employed individuals, we estimate a competing risk model with the following hazard specification:

$$\varphi_{it}^{l} = F(\beta_1^l UR_{t-1,r} + \beta_2^l X_{i,t-1} + \gamma_{t-1}^l + \delta_r^l + \theta_{t-1}^l) \tag{3}$$

[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 non-employed, this 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.

[13]In the CSWL, we cannot identify whether individuals that are not working are actively looking for a job or not. That is, we cannot differentiate between unemployed and inactive individuals. Therefore, we consider non-employed individuals, referring to individuals in either of both situations.

$$\text{for} \quad l = (nd, ne)$$

Where nd refers to the alternative in which the individual transits from non-employment to the DI rolls and ne from non-employment to employment. As we are considering a competing risk framework, the exit from a given state (either employment (e) or non-employment (n)) to any of the two conditional available states (non-employed or disabled when employed in the first case, and employed or disabled when non-employed in the second case), is specified as:

$$\varphi_e(t) = \varphi^{en}(t) + \varphi^{ed}(t) \tag{4}$$

$$\varphi_n(t) = \varphi^{ne}(t) + \varphi^{nd}(t) \tag{5}$$

A natural specification for this competing risk model is a multinomial model, in which each risk considers the exit to a particular destination state, conditional on not having exited to the alternative one.

The covariates included in specifications 2 and 3 are the same as in the model that does not differentiate by the initial labour market situation of the individual (equation 1). We include, however, additional covariates that refer to the specific characteristics of the labour market situation of the individual. Specifically, for the model of transitions from employment, we include a variable that measures the size of the firm and a dummy variable indicating whether the individual is working in the public sector. For the model of transitions from non-employment, we include the type of unemployment benefit received (no benefit, contributory benefit or non-contributory benefit).

Finally, to estimate the effect of economic conditions on the number of applications, we use our aggregate dataset on DI claims, and estimate regressions with regional and time variation of the form:

$$ln(I_{rt}) = \beta_1 UR_{rt} + \delta_r + \gamma_t + \upsilon_{rt} \tag{6}$$

Where I_{rt} is the number of total applications (or number of applications denied) in year t and AC[14] r. UR_{rt} is the unemployment rate in year t and AC r. δ_r are region fixed effects at the AC level. γ_t are time fixed effects at the year level 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 AC level. To differentiate the period of the Great Recession, regressions are estimated separately for the years 1996-2014, 1996-2007 and 2008-2014. Our coefficient of interest, β_1, measures the percentage increase in the number of claims

[14]Data on applications disaggregated at the province level, as in the case of the data for transitions, is not available.

(denials) that results from a 1 pp increase in the local unemployment rate.

5 Results

5.1 Effect of economic conditions on DI awards

Table 3 shows the results of the model of individual transitions to the DI rolls (estimation of equation 1). The regressions are estimated separately for men and women in order to account for their potential different labour market behavior and the potential different incidence of the crisis on both genders. We only show the coefficient (the marginal effect) of our variable of interest, the local unemployment rate, as well as the percentage increase that this marginal effect represents with respect to the sample predicted probability of transiting to the DI rolls (or inflow rate) calculated at the mean of covariates. The coefficient for the whole sample is negative and non-significant. When we differentiate by gender, however, the coefficient for women is negative and statistically significant at the 5% level. For women, an increase of 10 pp in the unemployment rate results in a reduction of 0.01 pp in the inflow rate (which represents a 1.52% decrease with respect to the predicted inflow rate at the sample mean).

Table 4, Panels A and B show the results of the competing risk models that further differentiate the transition to DI by the initial labour market situation of the individual. The results for the transitions from employment (estimation of equations 2) are presented in Panel A and the results for the transitions from non-employment (estimation of equations 3) are shown in Panel B. We present both the odd ratio and the marginal effect[15] of the local unemployment rate. We see that the negative effect of the unemployment rate observed in the previous regressions is concentrated among non-employed individuals. The odd ratios (and marginal effects) for the model of non-employed individuals are all negative, and significant at the 5% level for the whole sample as well as for the specifications for women. For the whole sample, a 10 pp increase in the unemployment rate reduces the inflow rate to DI by 18.7%. For women, the inflow rate is reduced by 37.7%. For employed individuals (Panel A), all effects are positive but non-significant.

We make an additional exercise of heterogeneity in order to take into account 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 are characterized by being

[15]Marginal effects are presented as the percentage increase they represent to the sample predicted transition rate calculated at the mean of covariates.

very physically demanding and by being concentrated among low educated men, those workers could potentially be more likely to enter DI when their sector of employment collapses. 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 experienced a similarly strong economic recession from 2008. This can be seen 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. Thus, the difference between the three types of provinces is really the degree of specialization in the construction sector of their economies, which is not related to the strength of the economic crisis that they have experienced since 2008.

Results of the transition model (equation 1) differentiated by these three groups of provinces are presented in Table 6. Table 7, Panels A and B present the results for the transitions from employment (equation 2) and from non-employment (equation 3), respectively. For the model that does not differentiate by initial labour market status, the coefficient for the provinces in which the housing boom was less important is negative and statistically significant at the 10% level, with a marginal effect representing a reduction of 39% in the inflow rate to DI as a result of a 10 pp increase in the unemployment rate. The coefficients are non-significant for the other two groups of provinces. In line with the previous results, effects are non-significant for the model of transitions from employment. In the case of transitions from non-employment, the odd ratios and marginal effects are negative and statistically significant at the 5% level for the two groups of provinces where the incidence of the housing boom was lowest, and the effect is positive and non-significant for the group of provinces in which the housing boom was more important. More specifically, a 10 pp increase in the unemployment rate results in a 29.6% reduction in the inflow rate for provinces in which the contribution of construction more than doubled and less than tripled, and a 49.5% reduction in the provinces in which the contribution of the construction sector less than doubled. Thus, our results show that the procyclicality of DI awards during the economic crisis was concentrated in regions that did not base their economic growth on the construction sector. This result is consistent with the fact that the construction sector is a strongly physically demanding sector in which disability problems may be more evident and observable. Thus, restricting access to the DI system for disabled workers coming from the construction sector may not be an option for DI evaluators.

Overall, these results show that during the Great Recession in Spain, the deterioration of economic conditions has resulted in a decrease in the inflow rate to the DI rolls for non-employed

individuals, especially for women and in regions were the housing boom was less important. This procyclicality of DI awards contrasts with the countercyclical relationship found in Spain during the years before the Great Recession (Jiménez-Martín and Vall 2009; Benitez-Silva et al. 2010) as well as in the US and other OECD countries more generally (see, for example, Black et al. 2002, Autor and Duggan 2003 or Benitez-Silva et al. 2010).

5.2 Effect of economic conditions on DI applications and denials

The reduction in the inflow to the DI rolls must be the result of either a decrease in the number of applications or an increase in the proportion of applications that are denied (or both). To see which one of these options is driving the procyclicality of the inflow rate observed in the previous regressions, we use aggregate regional data on applications for the DI system provided by the SSA. We estimate the effect of the local unemployment rate on both the number of total claims and the number of total denials. The results (estimation of equation 6) are presented in Table 8, which shows the coefficient on the local unemployment rate. We estimate separate regressions for the years 1996-2014, 1996-2007 and 2008-2014 to see whether there is a different cyclical behavior of DI claims and denials during the Great Recession as compared with previous periods.

We see that the total number of applications for DI is unrelated to changes in the local unemployment rate. However, during the Great Recession, an increase in the unemployment rate is associated with an increase in the number of denied applications (and consequently with an increase in the proportion of total applications that are denied, or denial rate). A 10 pp increase in the local unemployment rate is associated with a 15.3% increase in the total number of denied applications. This increase in the denial rate resulting from higher unemployment rates is consistent with the procyclical behavior of the DI inflow rate observed in the previous regressions. Furthermore, this result is in line with recent evidence in the US which shows that almost all of the applications induced by the Great Recession were initially denied (Maestas et al. 2015). Thus, although there was no official policy to restrict access to the disability system, it seems that inflow to the system was indeed restricted in practice (as the probability of applying to the system was not reduced during the Great Recession). Another potential explanation that would be consistent with the reported increase in denials would be that the health status of DI applicants has improved during the economic crisis. However, there are several papers in the literature that document worse health outcomes for Spanish individuals as a results of the Great Recession. This finding is especially true for unemployed individuals which show strong deterioration in mental health problems as a result of the economic crisis (see for example Urbanos-Garrido and Lopez-Valcarcel 2015).

6 Conclusions

Previous literature has documented a countercyclical behavior of applications and allowances for Disability Insurance (DI) programs in developed countries. It is thought that bad economic conditions reduce the value of labour 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 labour market problems (Black et al. 2002; Autor and Duggan 2003). Recent evidence for the US, however, shows that while increases in the regional unemployment rate are indeed associated with large increases in the number of applications, the effect on the number of allowances is negative, and almost all applications induced by bad economic conditions are initially denied (Maestas et al. 2015).

In this paper, we exploit the strong incidence of the Great Recession in Spain to provide new evidence on the relationship between local business cycle conditions and DI participation. Unlike most previous studies, which use aggregate data, we use individual panel data on DI beneficiaries to estimate the effect of the local unemployment rate on the individual probability to enter the DI system in Spain. This approach allows us to net out the effect of the local unemployment rate from that of individual characteristics which are potentially correlated with the individual propensity to transit to the DI rolls. Our results show that increases in the local unemployment rate result in a statistically significant reduction in the inflow rate to DI for non-employed women, especially in regions were the incidence of the housing boom has been lowest. To the best of our knowledge, together with Maestas et al. (2015), this is the first paper that documents a procyclical behavior of DI awards.

To investigate the origin of the observed procyclical behavior of DI awards during the Great Recession, we use aggregate regional data to estimate the effect of the local unemployment rate on the number of applications and denials for DI. The results show that during the Great Recession increases in the unemployment rate are associated with an increase in the total number of denials (and with an increase in the denial rate). Although there has not been any formal policy change in DI, this evidence suggests that the procyclical behavior of the inflow rate to DI observed during the Great Recession in Spain is partially explained by an increase in screening stringency as the probability of applying to the system has not increased and the health of the population has worsened (as shown by, for example, Urbanos-Garrido and Lopez-Valcarcel 2015). This is consistent with the strong pressures to reduce public spending in Spain as a result of the economic crisis. This practice is not necessarily bad if the denials are concentrated in conditional applicants with partial disabilities that will probably be able to return to work when economic conditions improve. However, it will constitute a problem if individuals with severe health limitations unable to work are left out of the program. In any case, the fact that we do not find any procyclical behavior of DI inflows in regions with an economy more based on the construction sector provides some indirect evidence that the increase

in stringency might have been somewhat targeted to less severe (or at least less observable) disabling conditions.

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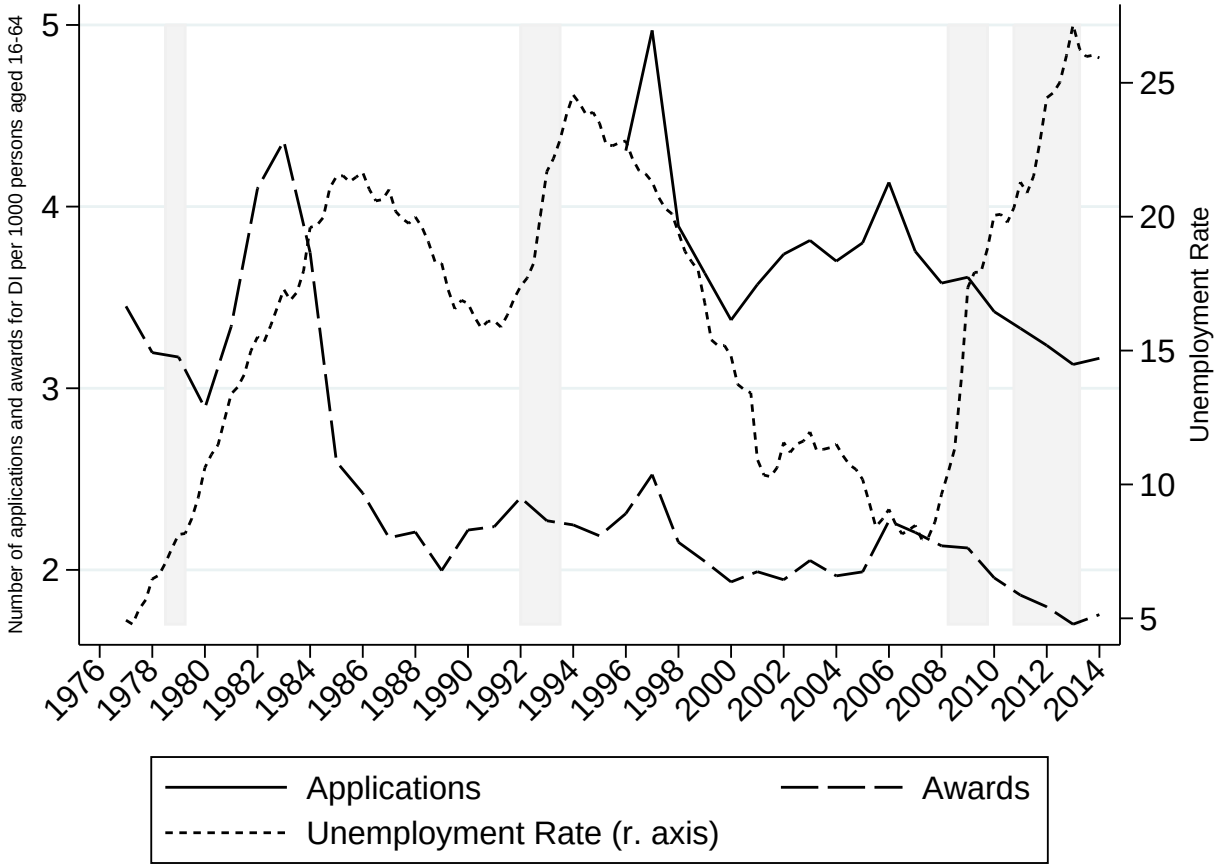
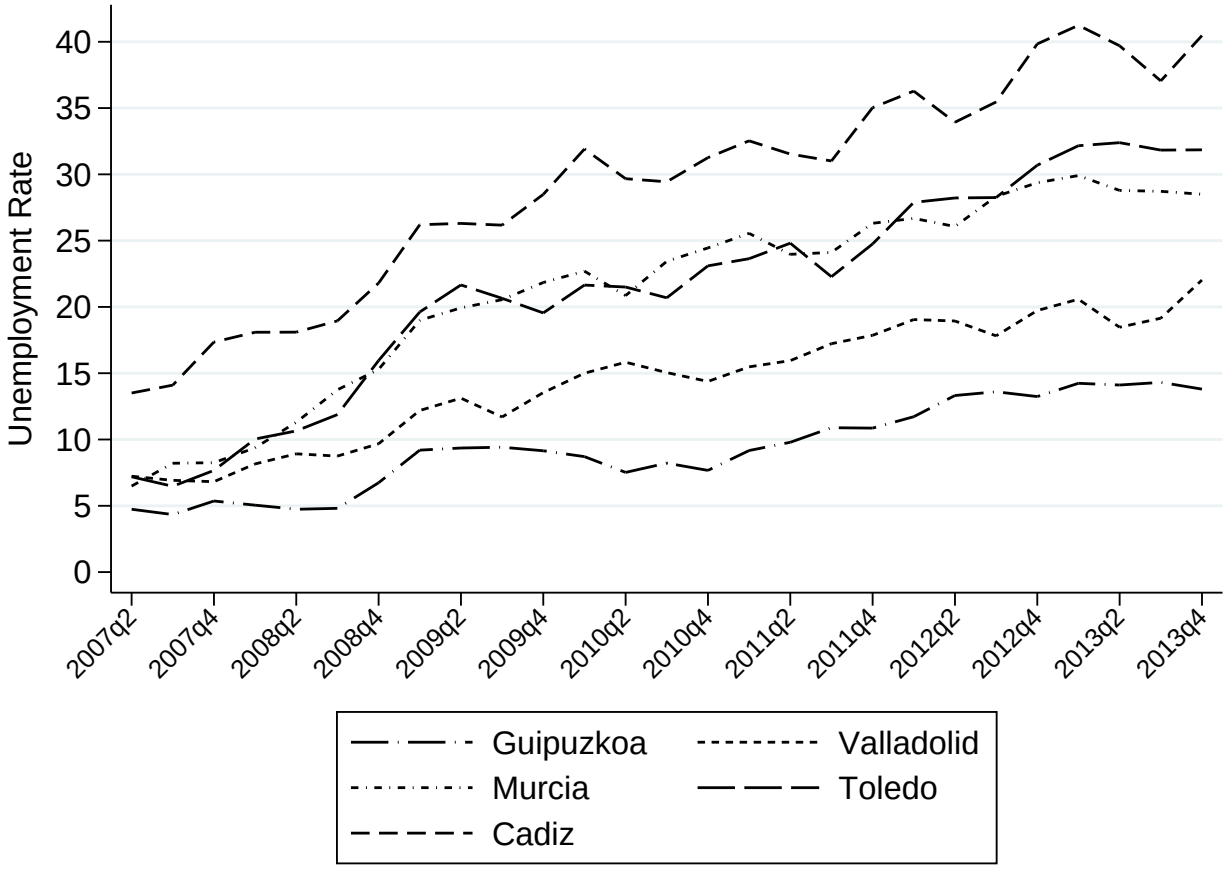
Figures and Tables

Figure 1: Disability Insurance participation and Unemployment Rate. Years 1977-2014



Notes: Applications and awards are divided by population aged 16-64.
Source: Applcations and awards: Social Security Administration; Unemployment Rate: National Institute of Statistics.

Figure 2: Unemployment Rate in 5 Spanish provinces during the Great Recession.



Source: National Institute of Statistics.

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≥31: 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	No minimum contributory period required	No minimum contributory period required
Regulatory Base	Age≥52 and <65: Average wage last 8 years of work* Age<52: Average wage calculated over the number of minimum contributory years required*	Average annual wage of 24 months within the last 7 years of work	Average wage last year of work
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 labour market of the region where they live: 75% Total Disability: 100% Severe Disability: 100%+50%		

*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).

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	Index measuring the amount of labor market experience of the individual.
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.
Company's size*	Three binary indicators for the size of the company in which the individual works (less than 50, between 50 and 199, and 200 or more employees).
Public Sector*	Binary indicator equal to 1 if individual works in the Public Sector.
Unemployment Benefits**	Three indicators reflecting whether the individual receives unemployment benefits and their type (no unemployment benefits, contributory unemployment benefits, non-contributory unemployment benefits).

*Variable is only included in the model of transitions from employment.
**Variable is only included in the model of transitions from non-employment.

Table 3: Effect of Unemployment Rate on transition rate to DI. By gender

	All sample	Men	Women
Coeficient	-0.00001	-0.00000	-0.00001**
	(0.00001)	(0.00001)	(0.00000)
Percentage increase	-1.20%	-0%	-1.52%
Observations	9,635,121	5,229,035	4,406,086

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

Notes: Standard Errors (in parenthesis) are clustered at the individual level. Regressions include fixed effects at the year and at the AC levels, as well as the individual controls described in Table 2. The table shows the change in the probability of transiting to DI resulting from a 1 pp increase in the unemployment rate (coefficient) as well as the percentage increase that change represents with respect to the sample mean predicted probability.

Table 4: Multinomial logit models for transitions from employment and non-employment. Odd Ratio and Marginal Effect of the Unemployment Rate. By gender

	All sample		Men		Women	
Panel A. Transitions from employment						
	Non-employment	Disability	Non-employment	Disability	Non-employment	Disability
Odd Ratio	0.00688***	0.01314	0.00749***	0.01605	0.00541***	0.00790
	(0.00105)	(0.00897)	(0.00148)	(0.01158)	(0.00149)	(0.01413)
Marginal Effect	0.58%***	1.28%	0.63%***	1.57%	0.46%***	0.76%
Observations	4,386,122	4,386,122	2,330,656	2,330,656	2,055,503	2,055,503
Panel B. Transitions from non-employment						
	Employment	Disability	Employment	Disability	Employment	Disability
Odd Ratio	-0.00013	-0.01885**	-0.00465***	-0.01433	0.00464***	-0.03731**
	(0.00095)	(0.00801)	(0.00131)	(0.00940)	(0.00138)	(0.01529)
Marginal Effect	-0.01%	-1.87%**	-0.39%***	-1.36%	0.40%***	-3.77%**
Observations	3,305,922	3,305,922	1,745,106	1,745,106	1,560,816	1,560,816

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

Notes: Standard Errors (in parenthesis) are clustered at the individual level. The base category corresponds to the alternative in which the individual remains employed in Panel A, and non-employed in Panel B. The regressions include fixed effects at the year and at the AC levels, as well as the individual controls described in Table 2. Marginal effects (calculated at the mean of covariates) are presented as the percentage increase they represent with respect to the sample mean transition rate of each alternative.

Table 5: Growth in Unemployment Rate by type of province according to the growth of the construction sector (to total value added) between 1997 and 2006

	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

Notes: 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 6: Effect of Unemployment Rate on transition rate to DI. By type of province according to the growth of the construction sector (to total value added) between 1997 and 2006

	Low growth (10 provinces)	Medium growth (34 provinces)	High growth (8 provinces)
Coefficient	-0.00003*	-0.00001	0.00000
	(0.00001)	(0.00001)	(0.00001)
Percentage increase	-3.90%	-1.23%	0.00%
Observations	940,236	7,765,207	929,678

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

Notes: 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. Standard Errors (in parenthesis) are clustered at the individual level. Regressions include fixed effects at the year and at the AC levels, as well as the individual controls described in Table 2. The table shows the change in the probability of transiting to DI resulting from a 1 pp increase in the unemployment rate (coefficient) as well as the percentage increase that change represents with respect to the sample mean predicted probability.

Table 7: Multinomial logit models for transitions from employment and non-employment. Odd Ratio and Marginal Effect of the Unemployment Rate. By type of province according to the growth of the construction sector (to total value added) between 1997 and 2006

	Low growth (10 provinces)		Medium growth (34 provinces)		High growth (8 provinces)	
	Panel A. Transitions from employment					
	Non-employment	Disability	Non-employment	Disability	Non-employment	Disability
Odd Ratio	0.01312***	-0.00631	0.00134	-0.00011	0.00715**	0.00323
	(0.00310)	(0.03024)	(0.00126)	(0.01139)	(0.00313)	(0.02772)
Marginal Effect	1.10%***	-0.70%	0.11%	-0.02%	0.59%**	0.28%
Observations	417,351	417,351	3,601,967	3,601,967	366,804	366,804
	Panel B. Transitions from non-employment					
	Employment	Disability	Employment	Disability	Employment	Disability
Odd Ratio	-0.01334***	-0.05135**	0.00081	-0.02968***	-0.01652***	0.00183
	(0.00284)	(0.02257)	(0.00114)	(0.01026)	(0.00266)	(0.02566)
Marginal Effect	-1.11%***	-4.95%**	0.07%	-2.96%***	-1.39%***	0.39%
Observations	324,518	324,518	2,635,117	2,635,117	346,287	346,287

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

Notes: 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. Standard Errors (in parenthesis) are clustered at the individual level. The base category corresponds to the alternative in which the individual remains employed in Panel A and non-employed in Panel B. The regressions include fixed effects at the year and at the AC levels, as well as the individual controls described in Table 2. Marginal effects (calculated at the mean of covariates) are presented as the percentage increase they represent with respect to the sample mean transition rate of each alternative.

Table 8: Effect of Unemployment Rate on applications and denials for DI

	1996-2014	1996-2007	2008-2014
Total applications	0.00202	0.00462	0.00440
	(0.00437)	(0.00432)	(0.00671)
Applications denied	0.00062	0.00197	0.01527*
	(0.00734)	(0.00864)	(0.00860)

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

Notes: The dependent variable is the logarithm of the number of applications (denials). Standard Errors (in parenthesis) are clustered at the AC level. The regressions are weighted by population aged 16-64, and include fixed effects at the year and at the AC level.

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