Working conditions and health: Evidence on inequalities in Spain

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A mi familia

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Abstract

This thesis is concerned with the relationship between disability and working conditions. In the first two chapters we investigate how past and current working conditions, in conjunction with other socio-demographic variables, contribute to disability. We focus on differences by migrant status (first chapter) and by period or cohort (second chapter) specifically, by comparing successive cohorts of young people aged 25 to 34. In the third chapter we take up the opposite perspective and we analyse the effect of permanent disability on the working life of the individual. The main result of the first chapter is that migrant status – with differences among regions of origin – significantly affects both disability and the probability of being employed in a high-risk occupation. In spite of immigrants' working conditions being objectively worse, they exhibit lower probability of becoming disabled than natives because the impact of such conditions on disability is much smaller in their case. Our results also suggest that not only the risks of illness and injury, widely recognized, involve higher rates of disability. Unskilled labour and employment instability are also associated with increased risks of disability and its impact is greatest among later-born cohorts, as the second chapter reveals. Attending to differences by cohort, job insecurity has a significant and huge impact on disability for all birth cohorts. By contrast, the effect of temporary employment "per se" is controversial without considering other factors, like the changes in Employment Protection Legislation motivated by the labour market reforms of the last two decades. Finally, the results of the third chapter show that only 10% of disabled people remain in the labour market after the occurrence of the disability. The potential disincentives to employment are controversial. While it is true that higher disability pensions are associated with lower probabilities of employment, it is also observed that, in general, wages and income decreases as a result of a disability, being the decision of remaining out of the labour market not entirely attributable to the worker and his pension level. Conversely, it is plausible that the alleged disincentives to employment come too, and largely, from the labour market. The wage gap between workers with and without IP are high and significant, and only in part

can be explained by differences in productivity, so that the unexplained difference could be attributed to discrimination in the labour market against people with disability. The data sets employed in the three chapters have been elaborated from the Continuous Sample of Working Lives, known as the MCVL in Spanish (from "Muestra Continua de Vidas Laborales"), a Spanish administrative data set containing work histories of workers and pensioners available since 2004.

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Introduction

Permanent disability is one of the manifestations of ill health. Its definition belongs to the social security sphere and focuses mainly on the ability of a person to work, therefore involving medical aspects but also social ones. It can be defined as an injury or impairment that lessens or annuls the physical and/or mental ability of a person to perform his/her normal work or non-occupational activities supposedly for the remainder of his/her life. Permanent disability may be the result of a sudden impact on the individual's health (due to a work or non-work accident or any other life hazard) or it may come as the aftereffect of a chronic disease. In this regard, disability as a health measure has some advantages and disadvantages. First of all, it is an objective measure, avoiding some of the problems related to subjective health indicators, as heterogeneity in reporting of health by demographic and socioeconomic status -specially problematic when comparing immigrants and natives, for example. Moreover, its functional dimension -not present in other health measures- introduces an additional and interesting perspective, as far as in disability converge both biological and social aspects. The main disadvantage is that it does not capture less severe health problems that are not permanent and do not modify functional aspects of the person.

As evidence corroborates (detailed references will be provided in each chapter), the likelihood of the occurrence of disability depends, among other factors, on working conditions and work environment, not only because it affects risks but also because it may be the origin of chronic diseases and, more generally, it influences the rate at which health deteriorates. Material working conditions have their reflect on workplace injury and illness rates, but autonomy at work and job stability have also appeared in several studies related to specific diseases, apart from having an expected effect on mental health. Researchers have also documented differences in workplace risk exposures by country of origin or race within a broader discussion on the role of tastes and opportunities in assuming a certain level of risk at work. In this respect, the higher exposure to work related risk by immigrants has been

attributed to differences in market opportunities. The issue of contractual conditions and autonomy at work and their impact on health has attracted growing interest given the significant transformations undergone by the labour market over the past two decades that have led to greater flexibility and job insecurity. There may be differences between those individuals that were inserted in the labour market before the reform process and those that did it later, mainly young people and immigrants. In this regard, it is known that young people and immigrants are more exposed to job insecurity and "overeducation" problems.

The first two chapters focus on the differences in socio-demographic groups in the impact of working life on the likelihood of a permanent disability. Chapter 1 *Disparities in work, risk and health between immigrants and native-born Spaniards* analyses the impact of working and contractual conditions, particularly exposure to job risks, on the probability of acquiring a disability. We should remark that occupational risks have been investigated in the literature under two different and not connected points of view. In those studies exploring the relationship between socioeconomic status and health, job characteristics are treated as a risk factor and not as a choice variable explained by other individual characteristics and socioeconomic circumstances. These investigations take as starting point the occupational choice, but do not explain this choice. A second group of studies -usually in the field of labour economics or in the analysis of economic inequalities- focus on the factors behind choices of risk level: different wage compensations for risk, unmeasured productivity differences, discrimination, or differences in risk preferences. However, the analysis is restricted to work-related injuries and illness inequalities by demographic groups but do not stress the effects of these choices on overall health status.

We treat work related risk level choice as partially determined by taste and economic circumstances that may also affect health outcomes. Among them, migrant status is supposed to strongly affect the occupational choice and, at the same time, contribute to determine health outcomes, measured by

disability status. Under a health investment framework, differences in health investments by migrant status are assumed.

This approach is reflected in a model in which the impact of occupational risks is mediated by the choice of occupation, with a level of risk associated with it. We assume this choice is endogenous, and that it depends on preferences and opportunities in the labour market, both of which may differ between immigrants and natives. To test this hypothesis we apply a bivariate probit model, in which we control for personal and firm characteristics, to data for 2006 from the Continuous Sample of Working Lives provided by the Spanish Social Security system, containing records for over a million workers. As in the rest of the thesis, we use Spanish administrative data from the Continuous Sample of Working Lives known as the MCVL in Spanish (from "Muestra Continua de Vidas Laborales"). The sample consists of 4% of the reference population each year from 2004 (nearly 1.1 individuals), which includes employed workers and those on unemployment and other benefit. It contains information on the employment and SS contribution history of the selected individuals dating back to 1967. In chapter 1 we work with the 2006 sample.

We find that risk exposure increases the probability of permanent disability – arising from any cause – by almost 5%. Temporary employment and low-skilled jobs also have a positive impact. Increases in education reduce the likelihood of disability, even after controlling for the impact of education on the choice of (lower) risk. Migrant status – with differences among regions of origin – significantly affects both disability and the probability of being employed in a high-risk occupation. In spite of immigrants' working conditions being objectively worse, they exhibit a lower probability of becoming disabled than natives because the impact of such conditions on disability is much smaller in their case. Time elapsed since first enrolment in the Social Security system increases the probability of disability in a proportion similar to that of natives, which is consistent with the immigrant assimilation hypothesis. We finally conclude that our theoretical hypothesis that disability and risk are jointly determined is only valid for natives and not valid for

immigrants, in the sense that, for them, working conditions are not a matter of choice in terms of health.

Chapter 2, *Working, contractual conditions and disability among Spanish cohorts of young people,* analyzes the impact of working and contractual conditions on disability and how this relation has evolved during the period 1980-2010 in Spain. We focus on the impact of job insecurity and the exposure to physical hazards in successive cohorts of young people aged 25 to 34. Those factors have both undergone significant changes during the last two decades. The decline in manufacturing and manual jobs and the growth of service-oriented work imply the reduction of the importance of the traditional sources of adverse physical and environmental working conditions. On the other hand, the rise of atypical working arrangements, with the decline of "standard" full-time permanent contracts, has increased the scope for psychosocial job stressors and their consequent effects on health. Apart from controlling for other factors potentially related to working and contractual conditions (education, occupation and income) our analysis incorporates historical data of both experiences of unemployment and temporary contracts and exposure to physical hazards, through a measure of work-relate risk of accident and illness. Our strategy consists on estimating hazard rate models for selected cohorts. Specifically, we estimate a discrete time proportional hazard models with a gamma mixture distribution to incorporate unobserved individual heterogeneity.

We find that job insecurity -measured using an indicator of probability of job loss- has a significant and huge impact on disability for all cohorts. By contrast, the effect of temporary employment "per se" is controversial without considering other factors -holding a temporary contract is one of the main components that explain probability of job loss, but not the only one. Attending to the time trend, we find that having a temporary contract has changed from being positive for health to significantly increase the probability of disability for those born more recently. This finding is coherent with the idea that not all temporary jobs necessarily provide inferior status and high insecurity.

These two chapters reflect the drastic changes in the labour market that have drawn a new reality, probably involving changes in the relative weight of employment conditions compared to other socio-economic indicators in determining socioeconomic inequalities in health. Results of this part indicate a more predominant role of employment conditions in determining differences in disability (i.e. health) for younger cohorts and immigrants, when compared to older adults. These results would show an increasing weight of opportunities in the labour market in the occupational health of individuals, pointing to the need to combine strictly individual incentives - such as training - with broader measures in the labour market to prevent disability. In sum, the scenario that emerges from this first part of the study can be useful for public policy decisions especially in two respects: firstly, because highlighting the growing importance of working and employment conditions in determining health status can provide guidelines for reducing inequalities in health, and secondly, because it sheds more knowledge about what types of jobs (both in terms of working and contractual conditions) are associated with increased probabilities of future worker productivity losses.

The second focus of this thesis is the impact of disability on the subsequent work history of individuals. The loss of working capacity as a result of a permanent disability is usually accompanied (although it should not always be so) by a decline of the opportunities in the labour market. In this sense, there is evidence that people with disabilities face less favourable opportunities than do other workers: they are less likely to be employed and more likely to hold worse monetary working conditions. These differences might not be explained solely by differences in productivity, but also by the existence of discrimination in the labour market. The analysis of the professional life ensuing disability aims to elucidate, on the one hand, to what extent permanent disability involves an employment shock, while worsening working conditions and, on the other hand, what are the social and labour profiles that make it more likely for people to return to work. In this sense, the evidence

for different countries reveals that among people who enter the system of disability protection, very few return to employment.

The study of the impact of disability on performance in the labour market has motivated many investigations, mainly focused on changes in the probability of being employed, or the impact on wages. A large group of studies have attempted to decompose the gap between the employment rate of people with disabilities and without, finding that much of this gap is not explained by differences in worker or job characteristics being, therefore, attributable to the existence discrimination in the labour market. Previous evidence also makes it necessary to address the economic incentives as an explanation of participation in the labour market.

With regards to possible wage differentials between disabled workers and other workers, numerous studies have explored the existence of discrimination in the labour market as an explanatory hypothesis of these inequalities. These studies support the conclusion, for different countries, that disabled people earn significantly less than other workers, once controlling for human capital of the worker and job characteristics.

Following these notions, Chapter 3 *Wage discrimination and other determinants of the labour force participation of the disabled* explores the effects of permanent disability on labour market outcomes. Specifically, we examine the factors that account for the low labour force participation of the permanently disabled, with a particular focus on the possible disincentive effects of wage discrimination. Drawing on data from the Continuous Sample of Working Lives published by Spain's office of Social Security for the period 2005-2011, we apply decomposition techniques to pay differentials so as to observe what part of these wage differences is ascribable to differences in productivity and what part can be attributed to discrimination. These results are then used to estimate the effect of discrimination on the participation of those with a permanent disability in the labour market.

We find that disabled workers, on average, earn lower wages than those earned by other workers, while they are less likely to be in employment. We confirm that these differentials cannot be explained solely by differences in productivity, but are also attributable to labour market discrimination. The impact of wage discrimination on the labour force participation of those with a permanent disability is high, especially, for men. In this group, the estimated probability of employment without discrimination is almost five percentage points higher than the observed probabilities. These results should help in the design of policies that best combine the requisite level of protection with appropriate incentives for access to employment and, thus, avoid the exclusion of the disabled from the labour market.

To conclude, we should mention the implications of disability, and our research on it, on the Social Security System. The Spanish Social Security system provides for the social protection of disabled people and recognizes, under certain conditions, the right to a disability pension. This benefit tries to cover the loss of salary or professional income suffered by a person that has seen her work capacity reduced due to a pathological or traumatic process derived from an illness or accident. In 2010, the total number of individuals recognized by the Spanish Social Security as having a permanent disability of one degree or another was 935,514. They represented about 11.6% of contributory pensions and a cost of about 799 million euros. In terms of GDP, the pensions program represented an average of 1.5% of GDP in the period 1995-2000, seven decimals below the EU average of 2.2%. The recognition of a permanent disability has two direct effects on the social security system: through economic benefits, and through the implications for the future working life of people with disability. Knowledge about the socio-economic profile of people who acquire permanent disability can help predict the impact of this on the Social Security system, while useful for the design of employment and policies that incorporate appropriate incentives to prevent people end up having a disability.

Chapter 1. Disparities in work, risk and health between immigrants and native-born Spaniards.

Abstract

The probability of acquiring a permanent disability is partly determined by working and contractual conditions, particularly exposure to job risks. We postulate a model in which its impact is mediated by the choice of occupation, with a level of risk associated with it. We assume this choice is endogenous, and that it depends on preferences and opportunities in the labour market, both of which may differ between immigrants and natives. To test this hypothesis we apply a bivariate probit model, in which we control for personal and firm characteristics, to data for 2006 from the Continuous Sample of Working Lives provided by the Spanish Social Security system, containing records for over a million workers. We find that risk exposure increases the probability of permanent disability – arising from any cause – by almost 5%. Temporary employment and low-skilled jobs also have a positive impact. Increases in education reduce the likelihood of disability, even after controlling for the impact of education on the choice of (lower) risk. Females have a greater probability of becoming disabled. Migrant status – with differences among regions of origin – significantly affects both disability and the probability of being employed in a high-risk occupation. In spite of immigrants' working conditions being objectively worse, they exhibit a lower probability of becoming disabled than natives because the impact of such conditions on disability is much smaller in their case. Time elapsed since first enrolment in the Social Security system increases the probability of disability in a proportion similar to that of natives, which is consistent with the immigrant assimilation hypothesis. We finally conclude that our theoretical hypothesis that disability and risk are jointly determined is only valid for natives and not valid for immigrants, in the sense that, for them, working conditions are not a matter of choice in terms of health.

1.1 Introduction

Numerous investigations have demonstrated that working conditions, and in particular exposure to the risk of work-related injury and illness, have an impact on health (Llena-Nozal et al, 2004; Robone et al, 2010; Bartley et al, 2004; Benach et al, 2004; Monden, 2005, Berger and Leigh, 1989). Due to the increase of "flexible" employment and other forms of non-standard contractual conditions, a growing body of literature has emerged that shows that unstable employment is associated with bad health too (Gash et al, 2007; Rodriguez, 2002; Virtanen et al, 2005). Also, psychological factors related to lack of autonomy at work and job dissatisfaction have appeared in several studies as strong determinants of general health or specific diseases (Datta Gupta and Kristensen, 2007; Marmot, 2004; Plaisier et al, 2007).

As Kerkhofs and Lindeboom (1997) stress, working conditions and the working environment affect both gradual changes in health and the occurrence of events that have a sudden impact on an individual's health, like work-related accidents. These authors assume that health status and work history may be jointly determined (that is, they may be endogenous). The idea that individuals invest in their own health has had a prominent place in the health economics literature since the publication of Grossman's seminal work in 1972, and the treatment of occupational choice as an investment in health can be found, for example, in Cropper (1977).

Following this line of thought, our central notion is that the relationship between working conditions and health is mediated by occupational choice in terms of risk. It is plausible to assume that upon choosing a job – with its inherent level of risk – workers do not ignore the effects of working in a risky job on their health status. Nevertheless, the choice of work-related risk level is partially determined by preferences and partially determined by social and economic circumstances. Among such circumstances, migrant status is thought to strongly affect occupational choice.

According to the hedonic equilibrium wage model, which relates wages to job characteristics including the relative attractiveness of a particular job, jobs with higher workplace risk receive a compensating wage premium. Nevertheless, wage-risk tradeoffs need not be equal. For instance, inequalities in lifetime levels of wealth – supposedly lower for immigrants – may explain differences in willingness to bear risk, i.e., immigrants or ethnic minorities would be more likely to accept and to be employed in high-risk jobs (Robinson, 1984; Viscusi, 2003; Leeth and Ruser, 2006). Immigrants and non-immigrants might also differ in terms of market opportunities. In several studies, it has been observed that the wages paid to compensate fatality risk differ among countries of origin, and that these variations may arise from discrimination, from unmeasured productivity differences (Akhavan, 2006; Leeth and Ruser, 2006) or from lower safety-related productivity arising from language barriers (Hersch and Viscusi 2010).

The compensating wage premium represents, in fact, any type of compensation that labour markets offer that is different for immigrants and natives. In an economy with a large underground sector the compensation could be, for instance, a legal contract giving rise to legal resident status and Social Security benefits. Additionally, informational disadvantages or occupational crowding – high competition for the same job, exacerbated by high unemployment rates – probably force immigrants to choose higher levels of risk than those arising from their preferences. From a health investment perspective, we can thus assume that there will be differences in health investments owing to migrant status.

This research uses a dataset containing ample information about working lives and disability status to explore two sets of issues: Firstly, how do working and contractual conditions, and particularly exposure to health risks, contribute to the probability of acquiring a disability, taking into account the endogeneity of risk level choices? Secondly, are there socioeconomic inequalities between immigrants and natives in terms of risk choices and in terms of the effect of these choices on their health status? Moreover, are all immigrants the same?

The existence of socioeconomic health inequalities due to differences in working conditions constitutes, in itself, a point of interest for public policies and they have been highlighted by several authors, for example, Artazcoz et al, 2005; Warren et al, 2004, Borg and Kristensen, 2000; Power et al, 1998; Lundberg, 1991. Possible differences in market opportunities depending on migrants' country of origin, resulting in higher risk exposure or more precarious employment constitute an additional source of inequality and are at the core of the debate on the conditions in which a society integrates new arrivals.

Due to the recent dramatic growth in the immigrant population in Spain (in 2009, 13.8% of the population had been born abroad, whereas the percentage was only 3.13% in 1999), the above-mentioned issues stand out as a very important topic of public debate. However, evidence regarding health status and workplace conditions of immigrant populations in Spain and other developed countries is still scarce. Furthermore, the existing evidence is based on subjective perceptions of both working conditions and health status, or restricted to differences in workplace illness and injury rates (Ahonen and Benavides, 2006; Parra et al, 2006). We seek to contribute to the quality of the discussion by applying a behavioural model using objective measures of working conditions and disability status obtained from the Social Security census of working lives. Moreover, we focus on disability arising from any cause, not just injuries or occupational (professional) illnesses.

After this introduction, in the next section we discuss our conceptual and empirical frameworks. In section three we describe the institutional context and the data, and we present the variables and their descriptive statistics. Section four contains the results, and section five concludes with a discussion of the main results and some limitations.

1.2. Methodological framework

1.2.1. Conceptual framework

We aim to model the two hypothesis that form the basis of our analysis: health depends on working and contractual conditions, mainly through the exposure to work-related health risks; and the occupational choice that determines the level of risk depends on preferences and opportunities in the labour market that may differ between immigrants and natives.

Worker's i health stock (H_i) is governed by a health production function where the health stock depreciates at rate δ, and L represents a stochastic and permanent shock (an example of a health production function with a stochastic shock can be found in Vaness, 2003):

$$H_i = \overline{H}_i - \delta H_i - L_i \quad (1.1)$$

$$L_i = f(R_i, C, A_i, X_i) \quad (1.2)$$

L_i depends on R_i = the level of risk (injury and illness rate) associated with the job chosen, C = other working conditions, A_i = the individual's ability to work safely, and X_i = other individual variables shaping the acceptance of health risks. Permanent disability occurs when H_i falls below a critical level. Transitions to permanent disability are observed, by definition, once in an individual's lifetime.

According to the arguments presented in the introduction, immigrants and natives face different levels of risk and, likely, the determinants of risk level choices have a differential incidence between these two groups:

$$R_{1i} = \beta X_i + \varepsilon_i \quad (1.3)$$

$$R_{2i} = \alpha X_i + \mu_i \quad (1.4)$$

where 1=immigrant and 2=native and the vector X_i covers all personal characteristics affecting the choice of risk level. R_{1i} and R_{2i}, the risk level choices, are not only the result of individuals' acceptance of risk but are also related to supply conditions, that is, the compensation (wage premium or other, if existing) offered in exchange of risk. The formulation presented in equation (1.3) and (1.4) is appropriate to empirically account for the sorting of workers into levels of risk underlying personal characteristics.

1.2.2. Empirical framework

The model consists of a recursive system of equations for disability and risk exposure, where the random component of the disability equation is allowed to be freely correlated with the random component of the risk equation. This specification is able to take endogeneity into account, which may arise from simultaneity and unobservable heterogeneity influencing both disability and risk exposure. Simultaneity (joint determination) issues may emerge from the fact that individuals do not ignore the health consequences of their risk level choices. This consideration is consistent with our conceptual framework, where risk choice is inserted into a health production function.

To properly account for endogeneity, and considering that both disability and risk are dichotomous variables, we specify the following bivariate probit model (Greene, 1998):

$$\begin{aligned} D_i^* &= \beta_1 X_i + \lambda R_i + \varepsilon_i \\ D_i &= 1 \qquad if \qquad D_i^* > 0 \end{aligned} \tag{1.5}$$

$$\begin{aligned} R_i^* &= \beta_2 X_i + \gamma Z_i + \mu_i \\ R_i &= 1 \qquad if \qquad R_i^* > 0 \end{aligned} \tag{1.6}$$

For individual i, D_i^* and R_i^* are unobserved latent variables indicating the individual's probability of acquiring a disability and the individual's propensity for choosing a high-risk job respectively. We observe D_i, a binary variable that

takes the value 1 if the person moves to a permanent disability status and 0 otherwise. Similarly, the binary indicator R_i takes a value 1 if the individual is employed in a high-risk job and 0 otherwise. The vector X_i contains the explanatory variables of disability. Z_i is a vector of variables that influence current risk level choice but are uncorrelated with ε_i; the remaining terms in equations (1.5) and (3.2) are the unknown parameters of interest that we wish to estimate, β_1, β_2, λ and γ, and the random error terms, ε_i and μ_i. The correlation between ε_i and μ_i - ρ- will be estimated, too, assuming that it follows a bivariate normal distribution.

The unobserved propensities D_i^* and R_i^* will be estimated first for the whole sample, with immigrants' region of origin as a dummy variable and interactions of these variables with risk. We then go on to estimate the bivariate probit separately for native-born Spaniards and immigrants, again distinguishing among immigrants' regions of origin with a set of dummy variables.

1.3. Institutional context, data and descriptive statistics

1.3.1. Institutional context

The employment-based Social Security (SS) system is mandatory for workers in Spain. Contributions are scaled according to occupational category. The SS funds the largest welfare programme: public benefits, allowances and pensions. Regarding permanent disability benefits, the law identifies four levels of disability, in increasing order of severity (the first two are compatible with employment): 1) *partial-permanent disability for the usual profession*, which refers to disability cases where a worker's ability to perform his/her usual tasks is decreased by 33% or more; 2) *total permanent disability for the usual profession*; 3) *absolute permanent disability*, which applies to cases were the individual is unable to undertake work of any kind; and 4) *severe disability*, where the person requires continued assistance from others in order to carry out basic daily activities

(Jiménez-Martín et al, 2006). To be eligible, the beneficiary must have contributed to the Social Security system for a minimum of five years if the disability is caused by an ordinary illness. There is no such requirement when the disability is caused by a work-related accident or an occupational illness.

1.3.2. Data and Variables

We use the Continuous Sample of Working Lives, known as the MCVL in Spanish (from *Muestra Continua de Vidas Laborales*), 2006, an administrative dataset provided by the Social Security administration with information on individuals who had an active record at any time during 2006. The sample is a 4% non-stratified random draw from a reference population that includes employed workers (wage earners and self-employed) and those on unemployment and other benefits. It consists of nearly 1.1 million individuals. The MCVL contains information on the employment and SS contribution history of the selected individuals dating back to 1967, although for reliability reasons we have limited the period to 1980 onwards. Since we work with secondary data, provided to us conveniently anonymised, no ethical approval was needed.

Individual variables include sex, date and place of birth, family status, benefits, degree of disability and the year of its commencement. Corporate characteristics comprise the number of employees, foundation date and geographical location. Job characteristics cover type of contract, the firm's sector of activity and the beginning and end dates of each contract. For each contractual relationship into which the worker enters, the characteristics of the job and the company are registered.

The MCVL has two features that are particularly relevant to our analysis: it contains a large and representative subsample of immigrants, and information regarding disabilities and the levels thereof. An immigrant is defined as someone who was born abroad. We work with cross section data: for active non-disabled population, the relationship with the Social Security prevailing in 2006 and, in the case of disabled people, data refer to the relationship

applicable when the disability appeared. Since every contractual relation generates a new record, we can observe the actual working conditions prevailing when the disability occurred. From the original dataset, we have restricted our sample to working-age individuals (21 to 64 years old) who have contributed to the SS system for at least five years, making a total of 718,958 observations. A detailed description of the variables follows.

Disability

"Disability" takes the value 1 if the person moves to a permanent disability status (any of the four categories mentioned above) at any time of his/her active working life between 1980 and 2006 and 0 otherwise. For disabled individuals, we consider the working conditions applicable at the time of the transition to disability, and subsequent working relations are discarded.

Risk

We have constructed the risk measure using narrowly defined injury and illness rates by industry-occupation: i.e., the number of individuals receiving an allowance for non-fatal work-related injuries or occupational illness in a certain industry-occupation divided by the total number of individuals working in that industry-occupation. There are 44 industries and 10 occupations, which makes a total of 440 job-industry cells. The risk variable takes the value 1 if the individual's job-industry cell is in the top quartile in the illness/injury rate ranking, and 0 otherwise. We find our binary variable to be more suitable than the continuous one. The latter would imply that individuals have full information of the level of risk throughout its whole distribution by industry-occupation cells. Taking into account that we are modelling a choice, it seems more reasonable to think that individuals broadly know about the existence of "good" and "bad" jobs in terms of risk. Indeed, below the upper quartile of the ranking, illness/injury rates are low and quite similar across industry-occupation cells. The interested reader can check Table 1.4 in the supplementary material where we present the non-fatal injury and illness rates aggregating by major industry-occupation cells.

Explanatory variables

In the disability equation we include both individual characteristics – age, sex, education, number of family members, and marital status – and working conditions: risk exposure, days since first enrolment in the Social Security system, type of contract, and a dummy variable for low-skilled jobs. The "type of contract" variable takes the value 1 for temporary and fixed-term contracts, and 0 for the civil service and other kinds of open-ended employment. Following the classification of the Spanish Ministry of Labour, we consider "low-skilled" workers those employed in the subordinate and unskilled labourers occupations. This variable is used as a proxy for lack of autonomy on the job. Age is expected to have a positive effect on disability, while education is expected to have a negative one. It seems likely that the greater the number of family members the more reluctant the worker will be to apply for disability benefits if that means losing income.

A relevant variable in our analysis is education. One might expect the impact of education on the probability of disability to be reduced since some of its effect is mediated by the role of education in relation to risk: i.e. increases in education lessen the probability of accepting riskier jobs, which in turn, reduces the chance of disability (Warren et al, 2004).

The risk equation contains mostly the same variables plus a dummy that takes the value 1 for workers whose previous working status was "unemployed". Crowded occupations or lack of employee bargaining power are natural correlates of unemployment status and constrain the worker's range of opportunities in the job market. Therefore, it is reasonable to expect that shifts from unemployment to high-risk jobs are more likely than transitions from other jobs to high-risk occupations, everything else being equal.

Number of family members and marital status have been used in some studies as proxies for risk preferences (Leeth and Ruser, 2006; DeLeire and Levy, 2004). Size of the family and risk are expected to be negatively correlated. In the case of unmarried persons the expected sign is less clear but we tend to

think that it is also negative because these individuals don't need so much the (possible) wage compensation for risk and they cannot count so much on others to look after them in case of injury. Consistent with other literature which shows that women are more risk averse than men in their financial decisions (Jianakoplos and Bernasek, 1998) and gambling (Hershey and Schoemaker, 1980), we expect women to engage in less risky jobs.

Control variables for corporate characteristics are also considered in the risk equation: number of employees and number of years since foundation. Findings from industrial safety literature indicate that firm size and accident rates are strongly correlated (Oi, 1974). The number of employees appears positively related to safety practices in Thomason (2002).

1.3.3. Descriptive statistics

Table 1.1 shows that the proportion of immigrants that have made the transition to a permanent disability (1.6%) is lower than that of natives (4.86%). Figure 1 (see supplementary material) depicts the non adjusted odd-ratios of disability associated with each of the three working and contractual conditions by country/region of origin. The odds-ratios are always higher for natives than for immigrants when these are taken altogether, but it is evident that the nature of the association varies widely among immigrants themselves.

We also observe that on average, immigrants exhibit a higher educational attainment than natives. The percentages of immigrants with secondary (33.8%) or university (8.4%) studies are larger than those for natives (29.3% and 5.9%). The same result has also been found in Fernández and Ortega (2008) and Díaz-Serrano (2013).

The proportion of immigrants on temporary contracts or low-skilled jobs is much higher than that of natives. Immigrants are also more likely to be employed in high-risk jobs. The difference is not large (27.4% versus 26.8%), but it is statistically significant. However, disaggregation of immigrants by

Table 1.1. Descriptive Statistics

$ Only includes private sector
** Indicates that the means are significantly different

					IMMIGRANTS BY COUNTRY/REGION OF ORIGIN				
	TOTAL	NATIVE-BORN SPANIARDS	IMMIGRANTS (ALL)	TEST OF INDEPENDENCE	AFRICA	LATIN AMERICA	EUROPE NON-EU 15	EU-15[&], USA AND CANADA	ASIA
VARIABLE	%	%	%	c^2/t	%	%	%	%	%
N	718,958	681,078	37,880		8,632	12,830	3,281	10,744	2,393
%	100	94.73	5.27		1.20	1.78	0.46	1.49	0.33
DEPENDENT VARIABLES									
Disability	4.69	4.86	1.60	29.20**	1.90	1.02	1.00	2.34	1.10
Risk	26.87	26.84	27.36	4.61**	39.52	24.66	36.18	21.30	13.04
PERSONAL CHARACTERISTICS									
Age (mean)	41.68	41.78	39.83	6.29**	39.92	40.21	37.62	39.81	40.49
Gender: Female	41.50	41.58	39.95	33.65**	21.17	49.66	40.11	44.91	33.14
Education									
Without studies	26.79	26.76	27.57	10.65**	58.29	17.66	22.73	17.42	39.44
Primary	37.75	38.06	30.32		22.59	31.58	33.96	34.89	29.11
Secondary	29.51	29.33	33.75		15.59	40.21	35.35	37.64	25.52
University	5.95	5.85	8.37		3.53	10.55	7.96	10.06	5.93
Family members (mean)	3.16	3.14	3.59	58.45**	4.01	3.74	3.46	2.96	4.32
Unmarried	12.95	12.81	15.52	15.24**	16.93	12.52	14.17	18.17	16.21
WORKING CONDITIONS									
Temporary contract	37.88	37.31	47.73	33.36**	61.14	48.57	43.42	37.81	40.20
Self-employed	16.29	16.31	16.04	1.38	9.97	13.05	13.01	21.06	35.60
Low-skilled job	28.51	28.14	35.19	29.62**	53.71	35.14	33.98	22.65	26.79
Years since 1st enrolment in the SS system	16.88	20.65	12.31	157.56**	12.32	10.71	9.66	15.18	11.25
Previous working status: unemployed	17.04	17.15	14.89	11.44**	16.62	13.86	14.69	16.58	6.81
FIRM CHARACTERISTICS[$]									
Nr. Employees (mean)	314.56	320.9	236.86	1.36	196.08	310.07	193.10	228.77	94.11
Years since foundation (mean)	17.53	17.68	14.75	30.02**	14.02	15.09	13.92	15.76	11.73

& The EU-15 includes the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden and UK. Here and throughout the text, reference to EU15 means all previous countries except Spain.

region/country of origin shows this general assertion to be over-simplistic. Only foreigners born in Africa and European non-EU15 countries are found in risky occupations in proportions higher than natives. Individuals born in Asia, the US, Canada, the EU15 and Latin America are actually less likely to engage in high-risk occupations. All groups, though (except EU15, USA and Canada), have more unstable contracts than natives. When the three potentially "unhealthy" working conditions are jointly considered, the proportion of immigrants employed in temporary, low-skilled or high-risk positions is nearly twice that of native-born Spaniards. This finding contradicts the expected positive relation between high academic attainment and good working conditions.

As a summary, and as far as the comparison between immigrants and native-born Spaniards is concerned, three insights can be obtained from our preliminary analysis: immigrants are better educated, work in worse risk and contractual conditions which, in general, seem to be associated with higher disability rates, but are, in fact, less likely to become disabled. In the econometric analysis we will try to unscramble this apparent puzzle by controlling for all the determinants of occupational choice and disability and their differential effects.

1.4. Results

Table 1.2 summarises the estimation results using the full sample. The first four columns present the variables and estimated coefficients of the bivariate probit model. In order to assess the magnitude of the bias due to the endogeneity of risk choices, we also report the results of the univariate probit estimation of the probability of disability. These two models include several regional dummies and their interactions with the risk variable. These interactions allow us to test for the potential existence of a differential effect of the level of risk on the probability of disability by birthplace. Selected results of the model in which immigrant status is captured by a single dummy variable are also included in two separate rows (model 3).

In order to facilitate comparisons, we report the marginal effects instead of the estimated coefficients. For variables appearing in both the disability and the risk equations we report the total marginal effects. These are the sum of the direct effect of the variable (column 2) on the probability of disability plus the indirect effect. The indirect marginal effects capture the effect of the variable on the probability of disability coming through its impact on the probability of choosing a risky job. Marginal effects are computed based on Greene, 1998.

It is interesting to note that the correlation (rho) between the unobservable factors affecting the probability of choosing a risky job and the probability of being disabled is negative and significant (-0.21). This result suggests that such unobservable factors tend to reduce the choice of risk but to increase the probability of being disabled, and vice versa. To formally test the null hypothesis of exogenous risk choice, we performed the Hausman-Wu test (Hausman, 1978). The exogeneity of risk choice was rejected ($p < 0.05$) in all models. Therefore, our comments are based on the estimates of the bivariate probit model.

The impact of risk exposure on disability is strong and significant when the whole sample is considered. Workers employed in high-risk jobs increase their probability of becoming disabled by 4.7%. Moreover, all the marginal effects associated with working conditions are significant and large. Being employed in a temporary job, as opposed to an open-ended contract, increases that probability by 2.2%.

Education behaves as expected. The probability of disability decreases by 1.5% and 1.2% for college graduates and workers with secondary education respectively. Education is significant even after controlling for the effect of education on risk. . For instance, holding risk constant, having a university education reduces the chance of a disability by 1.32 percent; but education also reduces occupational risk so that the total impact of a university education on the chance of a disability allowing risk to vary is 1.50%. The 17.9% lower likelihood of accepting a high-risk job (see the risk equation in table 1.2)

Table 1.2.
Bivariate probit and univariate probit estimations for the whole sample.
Immigrants represented with dummies by region of origin or taken as a whole (model 3). Marginal effects.

		Model 1. Bivariate probit		**Model 2. Univariate probit**			
		Total mg. effects	Mg. effects (direct effect)	$\tilde{z}$		Mg. effects	
	Dependent variable: permanent disability						
	Age	0.0019	0.0019	*84.67*	**	0.0018	*81.9* **
	Female	0.0016	0.0039	*4.07*	**	-0.0027	*-8.03* **
	Primary education$	-0.0055	-0.0046	*-16.02*	**	-0.0062	*-18.84* **
	Secondary education$	-0.0122	-0.0097	*-28.24*	**	-0.0139	*-36.24* **
	University education$	-0.0150	-0.0132	*-22.38*	**	-0.0158	*-26.28* **
	Unmarried	0.0024	0.0023	*4.18*	**	0.0022	*3.78* **
	Family members	-0.0020	-0.0018	*-13.96*	**	-0.0020	*-14.77* **
	Years since 1st enrolment in SS	0.0019	0.0016	*19.85*	**	0.0018	*19.53* **
	Years since 1st enrolment in SS Sq	0.0000	0.0000	*-16.31*	**	0.0000	*-15.32* **
	Temporary contract	0.0219		*63.58*	**	0.0197	*59.29* **
	Low skilled job	0.0097		*24.98*	**	0.0104	*27.91* **
	Risk	0.0470		*39.27*	**	0.0209	*49.28* **
	Risk*African	-0.0044		*-1.32*		-0.0039	*-1.23*
	Risk*Latin American	-0.0056		*-1.45*		-0.0071	*-2.02* **
	Risk* Europe non-EU15	-0.0131		*-2.54*	**	-0.0129	*-2.58* **
	Risk* EU15, USA, Canada	0.0019		*0.56*		0.0013	*0.42*
	Risk*Asia	0.0167		*1.33*		0.0090	*0.83*
	Africa	-0.0097	-0.0092	*-5.03*	**	-0.0096	*-5.24* **
	Latin America	-0.0104	-0.0099	*-5.67*	**	-0.0102	*-5.8* **
	Europe non-EU15	-0.0036	-0.0050	*-0.86*		-0.0032	*-0.79*
	EU15, USA, Canada	-0.0042	-0.0039	*-2.47*	**	-0.0045	*-2.79* **
	Asia	-0.0134	-0.0121	*-3.97*	**	-0.0133	*-4.3* **
Model 3	Immigrant	-0.0088		*-8.74*	**	-0.0081	*-8.31* **
	Risk*Immigrant	-0.0021		*-1.12*		-0.0037	*-2.13* **

Table 1.2 Continued

	Dependent variable: risk					
	Age	-0.0150	*-27.71*	**		
	Age squared	0.0001	*22.11*	**		
	Female	-0.2251	*-208.56*	**		
	Primary education$	-0.0417	*-34.06*	**		
	Secondary education$	-0.1661	*-130.09*	**		
	University education$	-0.1794	*-101.26*	**		
	Unmarried	-0.0093	*-5.06*	**		
	Family members	-0.0013	*-3.14*	**		
	Years since 1st enrolment in SS	0.0104	*26.78*	**		
	Years since 1st enrolment in SS Sq	-0.0001	*-14.34*	**		
	Unemployed last relation	0.0370	*25.06*	**		
	Africa	0.0596	*11.91*	**		
	Latin America	0.0656	*13.54*	**		
	Europe non-EU15	0.1659	*18.83*	**		
	EU15, USA, Canada	0.0066	*1.51*			
	Asia	-0.0885	*-9.61*	**		
	Years since firm´s foundation	0.0000	*-206.79*	**		
	Nr. of employees	0.0000	*-42.76*	**		
Model 3	Immigrant	0.0388	*14.68*	**		
	Rho -0.21				No. Observations	648547
	Likelihood-ratio test of rho=0: chi2(1) =	352.90			Log pseudolikelihood =	-94180.80
	No. Observations	629700			Wald chi2(12) =	26657,85
	Log pseudolikelihood	-363972.67			Prob > chi2	0.0000
	Prob > chi2	0.0000			Pseudo R2	0.1835

** Significant at 5% level ; * Significant at 10% level

$ Excluded category: no studies

The marginal effects of the binary variables are calculated as the difference in the average predicted probability of a positive outcome for the variable when:(1) variable values are set to zero; and (2) variable values are set to one

z-statistics refer to the estimated coefficients

reduces the chance of becoming disabled by 0.18 percentage points, or 13.6 percent. We also estimated the bivariate probit model without education in the disability equation in order to observe changes in the risk coefficient. The results (not shown) indicate that the marginal effect of risk on disability would jump to 0.074, in contrast with the marginal effect of 0.047 that we obtain when education is included, as in table 1.2. That is, education would pick up part of the effect of risk.

The interactions of risk with the birthplace dummies are all negative, except for Asians and citizens from EU15, the US and Canada. Nevertheless, only the coefficient for non-EU15 Europeans is significant, implying no differences with natives for the rest of groups. By contrast, regional dummies are all significant and negative except precisely for those born in non-EU15 Europe. These results suggest that differences in disability between natives and immigrants are related to conditions associated with origin rather than being the result of a differential effect of risk by birthplace. Only for non-EU15 Europeans (Romanians, Poles, Ukrainians, etc.) differences in disability actually originate from a differential (lower) impact of risk on disability.

When we do not distinguish by region of origin and estimate the bivariate model including a single variable for immigrants, the results show that being an immigrant reduces the probability of disability by nearly 0.9% (model 3), but the effect of this variable when interacted with risk is not significant. This reinforces the idea that differences in disability are more associated with region of origin itself than with a differential impact of risk by birthplace. The case of females is interesting. Holding risk constant, the direct marginal effect is to increase disability by 0.39 per cent, but since being a female actually reduces the acceptance of risk by 22.5%, the total marginal effect is just 0.16%. That is, the total probability of a female becoming disabled appears to be only slightly higher than that of men, but that is mainly due to the indirect effect working through risk, which reduces that probability by 0.23 percentage points, or 59 percent.

Most of the estimates in the univariate probit do not differ much from those of the bivariate one, except for risk. Given its endogenous nature, the effect of risk in the univariate model turns out to have a strong downward bias (marginal effects: 0.021 vs. 0.047).

The estimates regarding the determinants of risk (lower part of table 1.2) show that immigrants, taken as a whole, are more likely to be found in risky jobs (marginal effect equals 0.0388 in model 3). However, there are differences by birthplace. Africans, Latin Americans and non-EU15 Europeans are the groups most prone to be engaged in risky jobs. People coming from China and other Asian countries are actually less likely to be exposed to work-related risks than natives, and those born in the EU15, the US and Canada are not significantly different from natives.

Table 1.3 allows for a more thorough analysis of disparities between natives and immigrants. First of all, we note that most of the estimated marginal effects in the disability equation are notably larger for natives than for immigrants, particularly so in the case of risk, age, university education and temporary contract. Moreover, female and primary education are not significant in the immigrants model. This suggests that in their case there are more unobserved factors that determine the probability of being disabled that we are not controlling for.

The results for the regional dummies in the sample of immigrants indicate that differences among immigrants in terms of disability are not marked. Only Europeans from non-EU15 countries have a greater probability of disability than the base category (Latin America) at 10% significance, which is consistent with their significantly greater tendency to work in risky jobs (see the risk equation) and with the results of the univariate probit. The interaction of risk with the regional dummies shows that risk exposure has a differential (positive) impact on disability only for people born in Asia. Finally, it is noteworthy to mention that again the univariate probit tends to underestimate the effect of risk on disability. This result holds for both natives and

Table 1.3.
Bivariate probit and univariate probit for native-born Spaniards and for immigrants (marginal effects)

	Native-born Spaniards						**Immigrants, with regional dummies and interactions**					
	Bivariate probit				Univariate probit		Bivariate probit				Univariate probit	
	Total mg. effects	Mg. effects (direct effect)	z		Total mg. effects	z	Total mg. effects	Mg. effects (direct effect)	z		Total mg. effects	z
Dependent variable: permanent disability												
Age	0.0021	0.0021	85.22	**	0.0019	82.72 **	0.0005	0.0004	9.43	**	0.0005	9.23 **
Female	0.0016	0.0040	3.86	**	-0.0031	-8.55 **	-0.0004	0.0010	-0.45		-0.0008	-0.99
Primary education§	-0.0058	-0.0049	-15.84	**	-0.0065	-18.77 **	-0.0011	-0.0009	-1.17		-0.0012	-1.26
Secondary education§	-0.0127	-0.0101	-27.74	**	-0.0147	-35.85 **	-0.0047	-0.0036	-4.48	**	-0.0045	-4.64 **
University education§	-0.0161	-0.0142	-22.37	**	-0.0169	-26.31 **	-0.0035	-0.0026	-2.46	**	-0.0034	-2.57 **
Unmarried	0.0031	0.0030	5.06	**	0.0028	4.78 *	-0.0033	-0.0029	-2.94	**	-0.0032	-3.01 **
Family members	-0.0019	-0.0018	-12.72	**	-0.0020	-13.39 **	-0.0014	-0.0013	-4.99	**	-0.0013	-4.92 **
Years since 1st enrolment in SS	0.0017	0.0014	16.87	**	0.0016	16.25 **	0.0017	0.0016	8.67	**	0.0016	8.39 **
Years since 1st enrolment in SS Sq.	0.0000	0.0000	-14.02	**	0.0000	-12.82 **	0.0000	0.0000	-5.25	**	0.0000	-4.88 **
Temporary contract	0.0233		63.58	**	0.0209	59.14 **	0.0050		5.89	**	0.0046	5.76 **
Low-skilled job	0.0101		24.65	**	0.0109	27.69 **	0.0049		4.76	**	0.0046	4.84 **
Risk	0.0502		39.64	**	0.0219	49.2 **	0.0080		2.41	**	0.0050	2.36 **
Risk*African							0.0015		0.59		0.0022	0.87
Risk* European							-0.0032		-1.11		-0.0028	-0.97
Risk* EU15, USA, Canada							0.0014		0.59		0.0021	0.85
Risk*Asia							0.0132		1.87	*	0.0113	1.74 *
Africa&							0.0003	0.0002	0.24		0.0004	0.28
Europe non-EU15&							0.0050	0.0036	1.93	*	0.0048	1.94 *
EU15, USA, Canada&							0.0020	0.0018	1.53		0.0020	1.64
Asia&							-0.0022	-0.0015	-1.05		-0.0018	-0.9

Table 1.3. Continued

Dependent Variable: risk

	Native-born Spaniards				Immigrants			
	Total mg. effects	**z**			**Total mg. effects**	**z**		
Age	-0.0204	-33.36	**		0.0102	5.4	**	
Age squared	0.0001	27.98	**		-0.0001	-5.87	**	
Female	-0.2223	-200.26	**		-0.2316	-52.41	**	
Primary education	-0.0424	-33.69	**		-0.0188	-3.63	**	
Secondary education	-0.1661	-125.28	**		-0.1071	-20.5	**	
University education	-0.1798	-96.92	**		-0.1363	-20.4	**	
Unmarried	-0.0108	33.38	**		-0.0066	-0.96		
Family members	-0.0025	-21.63	**		0.0053	4.4	**	
Years since 1st enrolment in SS	0.0148	-5.7	**		-0.0103	-8.58	**	
Years since 1st enrolment in SS Sq.	-0.0002	-5.58	**		0.0003	8.53	**	
Unemployed last relation	0.0363	23.98	**		0.0406	6.46	**	
Years since firm´s foundation	0.0000	-202.27	**		0.0000	-36.54	**	
Nr. of employees	0.0000	-42.07	**		0.0000	-7.23	**	
Africa					0.0116	1.94	*	
Europe non-EU15					0.0799	9.6	**	
EU15, USA, Canada					-0.0019	-0.34		
Asia					-0.1072	-12.98	**	
Rho	-0.21		No. observ.	614452	Rho	-0.05	No. observ.	33595
Likelihood-ratio test of rho=0: chi2(1)=	370.70		Log pseudolikel.	-91862	Likelihood-ratio test of rho=0: chi2(1) =	0.77	Log pseudolikel.	-2235
No. observations	598299		Wald chi2(12)	26657	No. observations	31401	Wald chi2(20)	626.27
Log pseudolikelihood	-348258		Prob > chi2	0.0000	Log pseudolikelihood	-15111.97	Prob > chi2	0.0000
Prob > chi2	0.0000		Pseudo R2	0.18	Prob > chi2	0.0000	Pseudo R2	0.16

** Significant at 5% level

* Significant at 10% level

$ Excluded category: no studies

&Excluded category: Latin America

Marginal effects calculated as in Table 1.2

immigrants, even though for immigrants rho is not statistically different from zero.

Generally, the variables included in the risk equation are highly significant and have the expected sign for both sociodemographic groups, with less difference between them in the size of the marginal effects than in the disability equation. Yet there are some peculiarities that deserve attention. The effect of age in the case of natives corresponds to a U-shape (negative and increasing), while the effect of years since first enrolment in the Social Security system follows an inverted U-shape (positive and decreasing), just the opposite to the pattern of immigrants. This implies that older immigrants are willing to accept more risk, although at a decreasing rate, whereas the longer immigrants stay in the legal labour market, the less risk they are willing to undertake. The negative effect of being unmarried is not significant for immigrants and the number of family members has a positive effect on risk in their case, while the reverse is true for natives. Finally, as anticipated, the transit from unemployment to high-risk work is more likely than the transit from a safer job to a high-risk one for both groups, the size of the effect being greater for immigrants.

1.5. Discussion

Our study constitutes an effort to assess disparities between immigrants and natives in the role played by working and contractual conditions, particularly risk exposure, in determining the occurrence of disability, an indication of poor health. Our paper differs from previous studies in several ways. First, we focus on disability arising from any cause, and not just from injuries and occupational illness. Secondly, our indicator of health is based on an objective measure, rather than the commonly used scales of self-perceived health. Thirdly, we analyse differences by region of origin in order to avoid inappropriate generalisations to all immigrants. Lastly, but most importantly, we account for possible endogeneity of risk exposure on the disability equation. We aim to capture the determinants of the occupational choice so as to better understand the factors behind discrepancies in health outcomes.

We explicitly determine that working conditions have an impact on health for natives and immigrants. Risk exposure is, as expected, a decisive factor in accounting for differences in disability. The considerable magnitude of its effect is one of our most important results. The findings regarding the strong impact of temporary employment on disability are also noteworthy and deserve further comment. The experience of job insecurity has already been associated with ill health in studies such as Robone et al, 2010 and Rodríguez, 2002. Nevertheless, previous evidence of this association for Spain is scarce and somewhat ambiguous (Amuedo-Dorantes, 2002). The present study shows that the negative effect of temporary employment on health is unambiguous when its impact is measured using an overall health status indicator, such as permanent disability, rather than considering only work related injuries and illness rates.

As to disparities between immigrants and natives, we find, first of all, that the probability of becoming disabled is higher for natives. We must also conclude that our theoretical hypothesis that disability and risk are jointly determined is only valid for natives and not valid for immigrants. Such is the interpretation of the non-significance of the rho parameter in the model for immigrants in table 1.3. This is consistent with earlier studies that confirm the weak role played by risk in occupational choices in the case of immigrants (Díaz-Serrano, 2013).

Our results are in agreement with previous studies of the immigrant assimilation hypothesis in Spain (Amuedo-Dorantes and de la Rica, 2007), as time elapsed since first enrolment in the Social Security system increases the probability of disability similarly to natives. The transit from unemployment increases the probability that risks will be accepted slightly more in the case of immigrants. These findings can be interpreted as a confirmation that immigrants (at least, some of them) are affected more than natives by lack of opportunities in the labour market. In addition, the significance of most of the regions of origin in the risk equation suggests a heterogeneous pattern of occupational choice among the various communities of immigrants.

One important limitation of our analysis is the lack of the individual's baseline health in our data. This variable is expected to have an influence on both the likelihood of accepting risks and the advent of disability. Its omission might bias the marginal effect of the other variables. For example, a better initial health status could explain the smaller impact of working conditions on disability in the case of immigrants, in spite of their working conditions being objectively worse than those of natives. This interpretation is consistent with other studies indicating that healthy people are the more likely ones to migrate; the so-called "healthy migrant effect" (Esteban-Vasallo, 2009; Akhavan, 2006; Swerdlow, 1991). Nevertheless, the fact that we account for some of the determinants of health (age, gender, education) may mitigate the size of the bias. We also do not know what were the economic circumstances in the home country, which could affect the willingness to accept risk.

Another limitation is that our data include only insured workers. This excludes irregular labour practices, which are more likely to occur among foreign workers. Also, institutional and bureaucratic requirements to obtain a disability pension may affect natives and immigrants differently. The latter may be less likely to apply for disability benefits due to lack of information or specific capabilities. Nevertheless, all individuals in our sample – including immigrants – had been working and living in Spain for at least five years, a factor that probably lessens the differences.

A principal corollary that can be drawn from this paper is that an effective and equitable health policy should incorporate a full understanding of the role of working conditions on determining health disparities. Furthermore, a better knowledge of the conditions in which vulnerable groups – like immigrants – access safe working conditions may help avoid future health inequalities. The strong effect on disability of risk exposure and other forms of precarious employment – such as temporary jobs – suggests that the actions involved in these policies probably need to go beyond traditional occupational health policies.

1.6. Supplementary material

Table 1.4. Non Fatal Injury and Illness Rates by Industry and Occupation (per 100,000 workers)

MAJOR OCCUPATION GROUP / INDUSTRY	Engineers, University Graduates & Senior Management Personnel	Engineering Technicians. Experts & Assistants with Univ. Degree	Administrative and workshop managers	Unqualified Assistants	Administrative Officials	Subordinates	Administrative Assistants	First and second degree skilled workers	Third degree skilled workers and Specialists	Unskilled labourers	**Industry Total**
Agriculture. Forestry and Fishing	335.57	0.00	687.55	471.70	800.00	0.00	874.64	1031.81	1308.14	424.27	**607.36**
Mining and Quarrying	0.00	0.00	6250.00	3508.77	2739.73	9090.91	0.00	8888.89	11009.17	5050.51	**7161.35**
Manufacturing	166.70	116.50	395.55	781.86	517.11	2263.20	406.50	1289.69	1296.58	1252.11	**1053.89**
Electricity, gas, steam and air cond. supply	0.00	259.07	423.73	936.77	1346.80	1470.59	444.44	1884.42	1685.39	1754.39	**1092.74**
Construction	195.77	47.19	462.25	1057.08	642.17	1264.04	512.58	1136.59	1054.27	965.36	**979.34**
Wholesale & retail trade, repair of motor vehicles	229.06	189.30	288.97	829.51	347.85	1040.83	339.13	3149.72	1373.18	2060.92	**1203.53**
Accommodation and food service activities	0.00	500.00	416.88	273.82	247.26	224.72	447.57	457.31	458.50	875.03	**496.34**
Transportation and storage	250.84	292.11	747.76	730.82	342.90	710.48	541.01	1309.48	2959.03	3332.47	**1330.05**
Financial and insurance activities	0.00	0.00	77.54	193.30	246.83	297.62	169.08	1702.13	1526.72	1436.78	**206.43**
Real estate activities	89.53	0.00	151.98	0.00	180.59	193.05	178.66	821.92	653.59	768.74	**361.57**
Information and communication	0.00	127.23	72.67	0.00	141.94	833.33	232.56	255.75	450.45	0.00	**124.44**
Professional, scientific technical activities	31.46	96.96	71.07	413.47	244.17	528.75	192.95	1216.74	1212.44	788.74	**543.54**

Table 1.6 Continued											
Public Administration and Defence	225.04	302.07	617.92	1324.81	682.77	1409.67	421.12	6672.03	6074.28	2317.00	**1744.55**
Education	136.61	175.70	387.35	217.39	328.95	732.22	361.16	1161.44	1219.51	1120.73	**373.00**
Human health and Social work activities	181.46	274.33	430.57	463.32	655.90	535.23	422.11	1587.82	1423.71	1412.11	**634.60**
Arts, Entertainment and Recreation	426.44	387.60	298.86	0.00	180.10	111.36	410.17	994.04	819.67	738.40	**479.51**
Other service activities	0.00	680.27	0.00	458.72	132.10	665.56	507.19	426.23	764.59	797.17	**568.44**
Activ. of households	0.00	0.00	0.00	0.00	0.00	626.96	0.00	4724.41	7894.74	3076.92	**1561.69**
Occupation total	**163.07**	**214.25**	**353.72**	**619.54**	**371.19**	**752.63**	**335.11**	**1476.15**	**1310.53**	**1229.62**	**884.93**

Figure 1. Non-adjusted odds-ratio of becoming disabled given being employed in a risky job, by country/region of origin

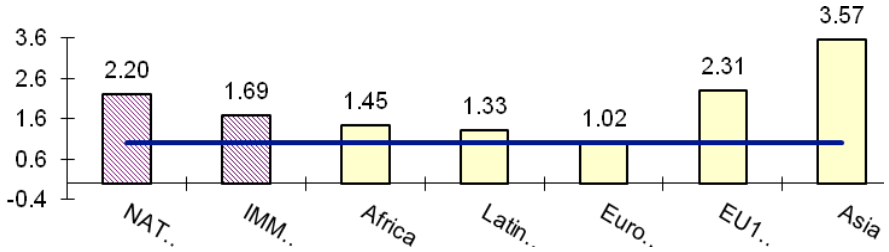


Figure 2. Non-adjusted odds-ratio of becoming disabled for those under temporary contracts, by country/region of origin

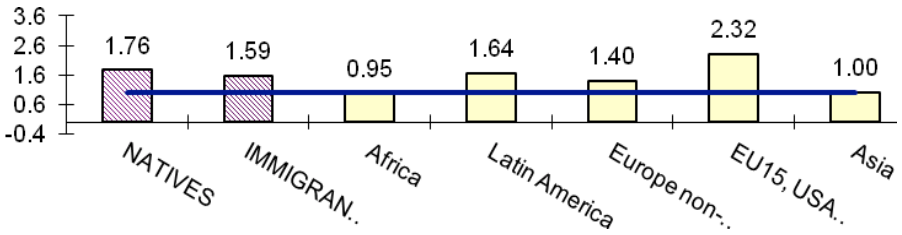
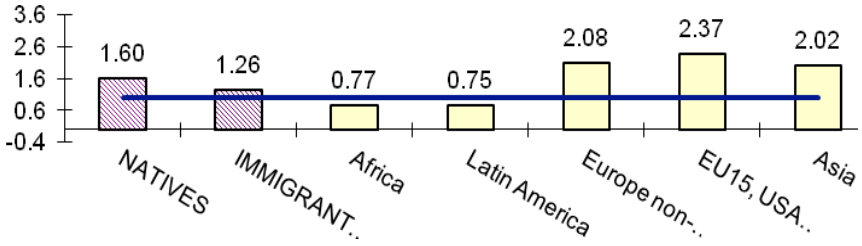


Figure 3. Non-adjusted odds-ratio of becoming disabled given being employed in a low skilled job, by country/region of origin



Chapter 2. Working, contractual conditions and disability among Spanish cohorts of young people.

Abstract

Our research analyzes the impact of working and contractual conditions on disability and how this relation has evolved during the period 1980-2010 in Spain. We focus on the impact of job insecurity and the exposure to physical hazards in successive cohorts of young people aged 25 to 34. Both those factors have undergone significant changes during the last two decades. The decline in manufacturing and manual jobs and the growth of service-oriented work imply the reduction of the importance of the traditional sources of adverse physical and environmental working conditions. On the other hand, the rise of atypical working arrangements, with the decline of "standard" full-time permanent contracts, has increased the scope for psychosocial job stressors and their consequent effects on health. Apart from controlling for other factors potentially related to working and contractual conditions (education, occupation and income) our analysis incorporates historical data of both experiences of unemployment and temporary contracts and exposure to physical hazards, through a measure of work-relate risk of accident and illness. Our strategy consists on estimating hazard rate models for selected cohorts. Specifically, we estimate a discrete time proportional hazard models with a gamma mixture distribution to incorporate unobserved individual heterogeneity. We find that job insecurity have a significant and huge impact on disability for all cohorts. By contrast, the effect of temporary employment "per se" is controversial without considering other factors -holding a temporary contract is one of the main components that explain probability of job loss, but not the only one. Attending to the time trend, we find that having a temporary contract has changed from being positive for health to significantly increase the probability of disability for those born more recently. This finding is coherent with the idea that not all temporary jobs necessarily provide inferior status and high insecurity.

2.2. Introduction

Both employment and working conditions are among the social determinants of health, and psychological well-being (Bartley et al, 2004; Benach et al., 2004; Berger & Leigh, 1989; Llena- Nozal, Lindeboom, & Portrait, 2004; Modden, 2005). And work trajectories with high exposure to unstable employment are associated to non-optimal health (Gash et al, 2007; Rodriguez, 2002; Virtanen et al, 2003). Three main hypotheses can be found in the literature to explain the link between health status and working and contractual conditions. A neo-material interpretation says that impact on health result from the accumulation of exposures and experiences that have their sources in the material world (Lynch et al, 2000). But empirical studies have suggested that psychosocial factors are also important mediators for these effects, and that the effects are mediated by psychobiological mechanisms related to stress physiology (Kristenson et al, 2004). By contrast, other studies assume that determinants of population health are completely specified as attributes of independent individuals and that health effects at the population level are merely sums of individual effects (Diez-Roux, 1998; Koopman and Lynch, 1999). While all pathways can be separated for analytic purposes, in the real world most of these processes are intertwined and ideally should be integrated in a comprehensive framework. This integrative approach can be found, for example, in the micro-theoretical framework of employment conditions and health inequalities proposed by the Employment Conditions Knowledge Network, "EMCONET" (WHO, 2007).

The increasing presence of non-standard arrangements and conditions has recently attracted attention as a determinant of physical ill health and poor psychological well-being (Robone et al, 2010). These factors have undergone significant changes during the last two decades. The decline of manufacturing and manual jobs and the growth of service-oriented work imply the reduction of the importance of the traditional sources of adverse physical and environmental working conditions. On the other hand, the rise of atypical

working arrangement, with the decline of "standard" full-time permanent contracts, has increased the scope for psychosocial job stressors and their consequent effects on health status (Cappelli et al., 1997). The number of "standard" full-time permanent jobs has decreased in Europe, and especially in Spain. Despite unemployment rates have been traditionally high in Spain, successive reforms occurred in the last two decades in the Spanish labour market that have led to more flexible and insecure employment, "EMCONET" (WHO, 2007).

In 1984, with the unemployment rate at 20.1%, the Spanish government implemented a reform in the Employment Protection Legislation (EPL) by liberalising temporary contracts in two main respects: first, their use was extended to hire employees performing regular activities; and, second, they entailed much lower dismissal costs than the regular permanent contracts. Soon after their introduction, coinciding with the economic expansion of the late 1980s, more than 90% of newly created contracts have been fixed-term, and this translated into a rapidly growing stock of temporary employment, from 11% in 1983 to approximately 35% in the early 1990s (Amuedo Dorantes, 2000; Güell and Petrolongo, 2007), which is more than three times the European average (see OECD, 1987, 1993).

During the 1990s, despite a series of countervailing labour market reforms in 1994, 1997 and, more recently, in 2001, which provided considerable restrictions for the use of fixed-term contracts, the share of temporary employees remained unchanged. Over this period, more than 90% of new hires were signed under temporary contracts, and the duration of employment spells has very much decreased. But these reforms had wider effects in terms of EPL. The most important reform of the Statute of Workers Rights ("Estatuto de los trabajadores") took place in 1994. That year, some aspects of labour relations, which to date were governed by laws, began to be the subject of collective bargaining, with the rejection of the reform by the union forces. The 1994 reform also developed flexible employment (with the creation of professional groups, functional and geographical mobility, flexibility schedules)

and individual and collective dismissal (by expanding the possibilities for objective dismissal). Thus, in just a decade, a fairly regulated labour market with high dismissal costs and strong unions' bargaining power at wage determination turned into a very divisive labour market.

In 2010, as a consequence of the above mentioned changes and reforms, temporary contracts represent the 25% of the total of contracts, and this proportion rises to 59 % among the young aged 15 to 24 and to 37.5% among the young adults aged 25 to 29 (Eurostat, 2010). In the third quarter of 2010, the highest rates of temporary employment are found in the agriculture (55.4%) and construction (42.3%) sectors, while the lower rates were registered in the financial and insurance sector (6.1%). Additionally to the undesirable instability associated to the temporary employment, fixed-term contracts imply shorter contract durations (only the 14% of temporary workers have employment relations longer than 1 year) and also lower wages. If we look at the wage distribution, 18.4% of temporary workers and only 7.3% of workers with a permanent contract can be found in the lowest decile. On the other hand, the percentage of workers with a temporary contract in the highest decile of the wage scale is only 2.3%, while this proportion raises to 12.5% for permanent workers.

This set of issues, and the availability of data for such a long period, prompts this investigation on how the impact of working and contractual conditions on health has evolved in the last two decades. We focus on the impact of job insecurity and the exposure to physical hazards in successive cohorts of people aged 25 to 34 to include young (the most affected by labour market changes and reforms) with (mostly) completed studies. Temporary employees may be more exposed to physical hazards at work due to their greater inexperience and lack of induction and safety training at the workplaces. These two factors are commonly confounded in the existing studies, which mostly use cross-section data (see Virtanen et al, 2005 for a completed overview of the previous findings). Our data also allows for controlling for the potentially confounding effect of unemployment in the impact of working and contractual conditions.

Temporary employees may have more intermittent employment histories with periods of unemployment, for example, than permanent workers. Therefore, their exposure to work may be overestimated and exposure to unemployment may be a confounding factor not estimated in previous studies (Virtanen, 2005). Our analysis incorporates historical data of both exposure to unemployment and physical hazards to deal with the above-mentioned problems.

Our analysis also tests the previously mentioned hypothesis that psychosocial factors have influence on heath. Contextual factors, like unemployment rates o busyness cycle indicators, have been found responsible for health differences in many studies (see literature review section). Additionally to its direct influence on health, contextual factors have been pointed as a modifying factor of the relationship between temporary employment and health (Virtanen et al, 2005). As previously said, the contextual changes occurred in Spain potentially affecting health and the impact of working conditions are numerous: changing regulations, business cycle fluctuations, and wider changes in social norms. These facts make the inclusion of such factors meaningful, in an investigation aimed not only at assessing the impact of working and contractual conditions on health but also at describing how its impact has evolved.

We use a panel data set that covers the period 1980-2010 and include variables describing working and contractual conditions at any point of the time- wage, occupation, exposure to physical hazards and job insecurity- as well as historical data. To test possible cumulative effects of physical and psychological stressors we introduce in the model measures of time of exposure to risky working conditions and job insecurity. Previous studies (Fletcher et al, 2011) have shown the importance of considering such effects, albeit the expected sign of these effects is not obvious a priori. With our estimates we will examine whether the net effect of specific job experience is to increase exposure to job characteristics and worsen health or whether longer working periods in a certain occupation are due to a better ability to cope with the conditions. To check possible changes in the impact of working

and contractual conditions over time and to what extend these changes are associated to macroeconomic variables and concrete labour market reforms, we will perform different tests for selected cohorts.

The empirical strategy consists on estimating hazard functions with non-parametric duration dependence to examine the impact of working and contractual conditions on disability. This approach is consistent with the nature of our data, and our interest in work trajectories and possible cumulative effects. This specification is useful to deal with unobserved heterogeneity problems, which may be an issue in our analysis. Individuals may differ in unobserved propensity to experience an adverse health event, because of different attitudes toward risk or inter-temporal preferences (some individuals more concerned about future consequences than others). The use of a model that introduces unobserved individual heterogeneity prevent from the possible omission of these relevant factors in the analysis. Relative to other models found in the literature, like the fixed effects model, such a specification has a more intuitive interpretation as a health model and permits greater flexibility both in examining the dynamic impact of working and contractual conditions on health and in examining whether the impact of these variables on disability differs according to current contextual factors. These advantages come at the cost of imposing some restrictions on the structure of individual heterogeneity.

Our measure of risk exposure is constructed using narrowly defined injury and illness rates by year and industry and occupation: i.e., the number of individuals receiving an allowance for non-fatal work-related injuries or occupational illness each year in a certain industry and occupation divided by the total number of individuals working in that industry and occupation. The availability of historic data allows for using the total time of exposure to work-related risks as variable. This, in turn, allows to examine whether the net effect of longer working careers is to increase exposure to adverse working conditions and worsen health or whether longer time worked lead to a better ability to cope with these conditions. Additionally, it is useful as control to

assure that the impact of temporary employment is not confounded by exposure to health risks.

With regards to job insecurity, we will test two different measures to assess the effects of this factor on disability: a simple indicator for temporary employment and the estimated probability of job loss. Previous studies have used subjective probabilities of job loss as *proxy* of job insecurity to predict health (Green, 2011) and have found that its effects are significant. Several measures of job insecurity based on the probability of job loss can be found in the labour market literature (Valletta, 1999; Gottschalk and Moffitt, 1999). We will construct an indicator based in the commonalities found in these studies: the inclusion of the traditional human capital and the presence of indicators of contextual factors (unemployment rate, temporary employment rate).

Our results indicate that being employed in a risky job strongly increases the probability of disability -by approximately 100%; and we find that this effect have pretty much remained unchanged in the last two decades. Job insecurity appears to be strongly related to disability: if we consider all the period (joint estimates including all cohorts), job insecurity multiplies by (almost) three the probability of disability. By contrast, temporary employment "per se" is controversial without considering other factors. That is coherent with the fact that holding a temporary contract is one of the main components that explain job insecurity, but not the only one. The results of our investigation also suggest that changes in the role of temporary employment may be important. Having a temporary contract has changed from being positive for health to significantly increase the probability of disability for those born more recently. This finding is coherent with the idea that not all temporary jobs necessarily provide inferior status and high insecurity and that institutional and contextual factors play an important role.

This paper has two main policy implications. Reduction of avoidable health inequalities associated to social factors is a concern for most of developed countries. Recent policies are mainly focused on affecting individual s behaviours related to health. This paper can help to distinguish which factors

transcend the individual scope but are related to labour market structures. Additionally, where detrimental to health, poor working arrangements and conditions are likely to contribute to a greater risk of employees leaving the labour market as soon as this becomes viable. The concern about the sustainably of the Social Security System and the pensions provision is in the agenda of many European countries, and particularly Spain. These countries are undertaking reforms in its Social Security Systems towards increasing the working life of individuals by postponing early retirement and increasing state retirement age. Maintaining the health of employees could contribute to the sustainability of the system and, contrary to other measures, without implying cutting in social rights. The investigation of its relative contribution to this goal, compared to other measures, leads for further researches.

The structure of the paper is as follows. Section 2 is a review of the literature. Section 3 describes our data and how our risk and job insecurity measures are constructed. Section 4 describes our model. Section 5 present the results and Section 6 concludes.

2.2. Literature review

We will classify the studies in three groups: those related to the impact of working conditions on health, those more specifically focused on the effects of job insecurity and temporary employment and those related to possible changes in the effects of these variables on health.

1.2.1. Working conditions and health

There are different pathways throw which exposure to working and employment conditions may affect individual's health. Certain aspects of work, like highly physically demanding jobs, may cause health to deteriorate

faster. Exposure to risky workplace working conditions increases the probability of accident. But employment and working conditions have been also linked to mental health and psychological wellbeing. In this respect, findings from different fields -economic, medical and epidemiological- confirm that the body reacts to physical, social, and psychological stresses in physiological and biological ways.

Bound et al (1995) examine the extent to which differences in the nature of job requirements explain differences in disability status, using data on the physical and mental demands of jobs. The authors argue that physical impairments have a larger impact on those men who have spent their lives working in physically demanding jobs, so that a given health problem is more likely to disable these men. Similarly, men in such jobs may have relatively lower job skills and may be consequently less able to adapt to health problems by changing jobs than men in different jobs. This consideration reinforces the idea, reflected in our conceptual framework, that the critical level of health below that a person is considered disabled might be conditioned to her work trajectory. The work by Case and Deaton (2003, 2005) provides evidence that low paid, manual work damages self-assessed health to a greater extent than highly paid, skilled work. The results are robust to including important controls such as education and income, variables also reflected in our model. A possible limitation of this study is the use of repeated cross sectional data rather than panel data. The results of this paper are confirmed by Choo and Denny (2006) with a Canadian cross sectional database. This work also shows that the results are robust to including lifestyle choices (smoking, obesity) and controls for chronic diseases (e.g. diabetes, heart disease, cancer, etc). Robone et al. (2010) use longitudinal data from the British Household Panel Survey to examine the health impact of different measures of job characteristics: rotations at work (day-evening turns), perceived pay and promotion opportunities, worker location (e.g. employer versus home), worker satisfaction, type of job contract (e.g. fulltime versus part-time). The authors find that a high level of employability has a positive impact on self-reported health and psychological health for those with temporary jobs. Also, they

provide evidence that for part-time workers, being unsatisfied with their number of hours worked has a deleterious impact on health.

A study for Sweden (Lundberg, 1991) points to the unequal distribution of the adverse working conditions -danger, hard physical work- as a major cause of socio-economic differences in health. Inequalities in health status between manual and white-collar workers in Sweden have also been verified in Heymann et al (2006) (14). Some working conditions, as temporary employment, have been related to differences in work related injury and illness rates in the case of Spain. Amuedo Dorantes (2008) find that although temporary workers exhibit higher work injury and illness rates than permanent workers, they exhibit a lower likelihood of work injury and illness than permanent workers once the analysis controls for a given set of working conditions.

The inclusion of risk exposure in the set of material working conditions is rare. Berger and Leigh (1989) specifically estimate the impact of risk exposure on different health indicators, using a measure of illness and injury rate in the individual's most recent job. They find that those who work in jobs with high injury and illness rates have significantly higher systolic blood pressures, but increases in the illness and injury rat are associated with lower probabilities of disability, perhaps reflecting selection of the more able into riskier jobs.

A recent group of medical and epidemiological studies also prove the importance of cumulative burden of job characteristics on health, pointing out the adequacy of including variables that capture time of exposure in an empirical model relating working conditions and health. If stress is suffered over a long period of time, the reaction may be adaptive or, contrarily, the body can respond in maladaptive ways. Fletcher et al (2011) provide solid evidence linking cumulative exposure to physical demands and harsh environmental conditions at work to health. The authors construct two indexes of environmental conditions and physical demands, and they add the scores over the five-year period in order to measure cumulative exposure to strength and environmental requirements. Their findings indicate that

individuals who work in jobs with the 'worst' conditions experience declines in their health, though this effect varies by demographic group. Their results also suggest that earned income, a job characteristic, partially cushions the health impact of physical demands and harsh environmental conditions for workers. This finding reinforces the adequacy of including employment earnings as a control in our specification.

The medical and epidemiological literature also provides the biological pathways through exposure to stressful working conditions may damage health. Continual physical, social, and psychological stressors increase hormonal levels and can damage the functioning of the brain as well as the immune system (McEwen, 1999, 2000; McEwen and Seeman, 1999). The term 'allostatic load' refers to the physiological costs of chronic exposure or cumulative strain and was coined by McEwen (2000). Allostastic load, quantified by biological and physiological measures, has been found to compromise physical health (see, for example, Seeman et al., 2001, 2002).

As mentioned previously, a group of studies point that some working conditions are more psychosocial or have equal physical and psychosocial implications for individual's health. Michie and Williams (2002) published a review of the impact of working conditions on mental health. Marmot (2005) found that lack of choice and autonomy at work of low-skilled jobs are the primary source of inequality rather than the physical working conditions. The same author considers the loss of social role, such as unemployment status, positively related to poor health. In line with the thesis by Marmot, Alfredson et al (1985) found that workers with jobs that combine a lot of activity and few opportunities to learn are more frequently hospitalized for heart attacks. Organizational aspects of the job have been associated to concert diseases. A bad organizational treatment or the presence of discrimination in the workplace affects the emergence of insomnia, asthma or high blood pressure (Smith et al, 1995). A study for Sweden (Akhaban, 2006) finds a significantly contribution of work hierarchical position to health inequalities, and particularly the low levels of health of immigrant women in this country. Llena-Nozal et al (2004) analyzes the effect of work on mental health and find

that occupation has large effects on mental health for females, but not for males. The authors find strong and large effects of accidents and disability shocks on mental and point out the interest for further research the influence of occupation and employment status on the occurrence of a disability shock.

2.2.2. Job insecurity, temporary employment and health

The consequences of job insecurity perceptions have received a great deal of attention in psychological studies. A robust finding from this literature is that job insecurity is a source of lower health and well being (for overviews see Nolan et al., 2000; Wichert, 2002; Cheng and Chan, 2008). This effect holds for a variety of indicators of job insecurity, including the form of employment contract and the inclusion of contextual factors like unemployment rates. The main rationalisation in psychological theory is the argument that job insecurity is a stressor, leading to work strain.

The studies relating job insecurity and health from an economic perspective (/in the field of health economics) are scarce compared to the presence of this topic in other disciplines. An example is the recent study of Green (2011) focused on testing the role of employability as moderator of the effect of unemployment and job insecurity on life satisfaction and mental health. The author finds that the risk of job loss is a direct source of loss of life satisfaction and mental health.

There is also important evidence on the relationship between temporary employment and health, mainly in the epidemiological literature. Temporary contracts may be linked to poor health through a component of insecurity and lack of control, acting as a psychological stressor. But type of contract may affect health through behavioural factors and temporary jobs may also involve worst working conditions in terms of physical demands (Kompier et al., 2009). In this respect, temporary employments may also entail higher risks of injuries, because the (plausible) employee's lack of training and practice. The study of Virtanen et al (2005), a review on temporary employment and health, confirms

these findings. The review suggests higher psychological morbidity and higher risk of occupational injuries among temporary workers. Morbidity may be higher in temporary jobs with high employment instability and in countries with a lower number of temporary workers and unemployed workers (we will comment the role of contextual factors in more detail in the next section). The authors also prevent for possible problems of selection (healthy worker effect) and point out the necessity of additional research to clarify the role of employment instability and hazard accumulation. The negative relationship between health and having a temporary contract is confirmed is several studies for men and woman with low level of education (Robnone et al, 2010; Benavides et al., 2000 and Gash et al. 1997) However, the effect of temporary employment on health for the most educated is less clear and some studies have found a positive effect of temporary employment on health for this group (Robone et al, 2000; Silla et al., 2005).

2.2.3. Contextual factors

Contextual factors, like unemployment rates or labour market fluctuations, have been found to have an impact on health and also to modify the effects that other variables may have on health. As previously said, additionally to business cycle fluctuations, the Spanish labour market has undergone important changes during the last two decades. In this period, temporary and insecure employment has become much more common. On the other hand, the decline of manufacturing and manual jobs and the growth of service-oriented work have reduced the importance of the traditional sources of adverse physical and environmental working conditions.

Previous studies have related labour market fluctuations and health (Charles and de Cicca, 2008). Conceptually, local labour market conditions may affect health for a variety of reasons that may be conflicting. Two general explanations have gained prominence in recent literature. The first can be classified as a "behavioural" explanation since it implies that health impacts propagate through changes in individual behaviour, while the second can be

considered a "structural" explanation as it implies that labour market conditions can affect health absent any explicit behavioural changes. Labour market fluctuations might impact health through changes in the opportunity cost of time. The reduction of employment associated to higher unemployment rates lowers the opportunity cost of non-market activities including household production and, particularly, activities intended to improve health (e.g., exercising, producing and consuming homemade or using preventive medical services). Therefore, this "behavioural" explanation predicts a countercyclical relationship between labour market conditions and health. Another channel through which fluctuating labour market conditions might affect health is sometimes referred to as the "economic stress" hypothesis (c.f., Catalano and Dooley, 1983; Catalano, 1991). The idea is that a weaker economy leads to increased stress due to greater uncertainty of present and future income receipt. In turn, this greater stress level leads to reductions in health. If this "structural" hypothesis is operative and if greater stress reduces health in the short-run, a pro-cyclical relationship between labour market conditions and health will obtain. The "structural" hypothesis allows business cycle indicators related to more insecurity, like unemployment rates, to have an impact not only on those directly affected by insecurity in the present -unemployed or temporary employed- but also on those potentially affected in the future -including also employed with secure employment. In this respect, the aggregate detrimental impact of a higher unemployment rate on subjective well being is found to be especially large, and is explained as deriving partly from the increased numbers of unemployed people, but to a much greater extent from the inferred greater job insecurity of employees (Di Tella et al., 2001, 2003; Luechinger et al., 2008). In this respect, Clark et al (2010) explicitly relate unemployment rates to well being, confirming their initial hypothesis that regional unemployment reduces the well-being of the secure employed but has a less negative, or even positive, effect on the insecure employed.

Additionally to its direct effect on health, contextual factors may alter the relationship between health and other factors. For example, there is evidence of some differentiation in the psychological impact of unemployment. The

effect of individual unemployment is found to be less pronounced in areas of high unemployment, which is interpreted as a social norm effect (Clark, 2003; Shields and Wheatley-Price, 2005; Stutzer and Lalive, 2004; Powdthavee, 2007; Clark et al., 2010). Unemployment is thought to act as less of a stigma, and less of a threat to one's identity, when others around are also out of work. By contrast, some studies find that well being increases with others' average income (Senik, 2004). This may be due to "tunnel effect". The tunnel effect occurs when individuals see income growth for other they believe that it is a signal of an imminent improvement of their own situation. The metaphor on "tunnel effects", coined by Hirshman (1973), comes from the idea of someone sitting in traffic in a tunnel and seeing movement in one of the other lanes, this movement may be a signal that they will also be able to move soon.

The review of Virtanen et al (2005) suggests that the differences in the relative size of the peripheral workforce (i.e. temporary workers and the unemployed) may be related to health in association with temporary work. The authors find that high national unemployment is associated with low morbidity among temporary workers. The authors argue that, when the unemployment rate is high, a larger 'health reserve' exists among the unemployed. In this situation, employers are more likely to find and recruit healthy workers (into temporary jobs) from the reserve of unemployed people than when there is a workforce shortage. Similarly, when competition for jobs is harsh among temporary workers, employees with health problems may be more likely to lose their jobs. Another explanation is that a large peripheral workforce may be more heterogeneous in its demographic characteristics than a small peripheral workforce. A small and more homogeneous peripheral workforce with mainly manual occupations may result in higher morbidity because these jobs may be more likely to include 'bad job' characteristics.

Dependency on one's job is also affected by institutional factors that may have change in these two decades: it has been found that employees in countries with high levels of employment protection legislation (EPL) express lower satisfaction with security (Clark and Postel-Vinay, 2009). The latter finding is interpreted as EPL reducing outflows from unemployment, thereby raising the

cost of job loss. Thus, the same risk of job loss has different well-being implications across differing institutional environments.

We have found no studies specifically focused on how the impact of working conditions has evolved over time. Nevertheless, there is an existing literature on changes in the effects of other SES determinants that we have used as a reference in two ways: first, the arguments why these changes may occur are (applicable) for the case of working conditions. Second, the methodology employed serves as a referent for our investigation. These studies have found lower variability in health among younger cohorts (Deaton and Paxson, 1998 for USA and Kippersluis et al, 2009 for Europe). Deaton and Paxson (1998) find that the income gradient in health is greater among younger cohorts, such that socioeconomic inequality in health has been rising while total health inequality has been falling. Kamrul Islam et al. (2007) find that socioeconomic inequalities in reported health have been increasing over time in Sweden, but Ferrie et al. (2002) and Burström et al. (2005) find little or no evidence of increasing socioeconomic inequality in morbidity in the UK and Sweden, respectively. The findings form Burström et al (2005) also suggest that the change in health over time may be affected by the business cycle and changes in the labour market. These authors point out that it is an open empirical question to what extent effects form the labour market contributed towards the increased socio-economic inequality in health.

2.3. Data and definitions

We use Spanish administrative data from the Continuous Sample of Working Lives known as the MCVL in Spanish (from Muestra Continua de Vidas Laborales). This data set is based on a random draw from the Social Security registers. The sample consists of4% of the reference population each year, (available from 2004) which includes employed workers (wage earners and self-employed) and those on unemployment and other benefits, like retirement pensions. It consists of nearly 1.1 million individuals. The MCVL contains

information on the employment and SS contribution history of the selected individuals dating back to 1967, although for reliability reasons we have limited the period to 1980 onwards. Individual variables include sex, date and place of birth, family status, benefits, degree of disability and the year of its commencement. Job characteristics cover type of contract, the firm's sector of activity and the beginning and end dates of each contract. For each contractual relationship into which the worker enters, the characteristics of the job and the company are registered. Since every contractual relation generates a new record, we can observe the actual working conditions prevailing when the disability occurred. From the original dataset, we have restricted our sample to individuals aged 25 to 34 and constructed a panel data set that covers the period 1980-2010 (recovering working histories of workers appearing in some of the successive waves from 2005 to 2010).

We focus on the impact of job insecurity and the exposure to physical hazards in successive cohorts of young adults because this group may be the most affected by job insecurity (at least in terms of temporary employment). The restriction of the sample to older than 25 is to assure that most of people included in the sample have finished their studies, and that the educational level observed is the maximum obtained. On the other hand, some studies have related disability benefit policies to retirement policies. As far as the main source of information about disability status comes from data on disability benefits, the exclusion of older adults (aged 35 or more) prevent a possible confounding effect of retirement policies in the observation of our variable1.

Most of the studies that link working conditions to health outcomes use subjective indicators of both job characteristics -typically job satisfaction or job security -and heath status. It is known that certain demographic groups are more prone to declare satisfaction with their working conditions (Díaz-Serrano, 2013) or systematically better health (Bago D´ Uva et al., 2008.)

[1] We also observe working people with disability that are not receiving disability benefits but their employers have declared their disability (there are fiscal incentives for contracting disabled workers). In any case, 94% of our sample of disabled people are receiving disability benefits.

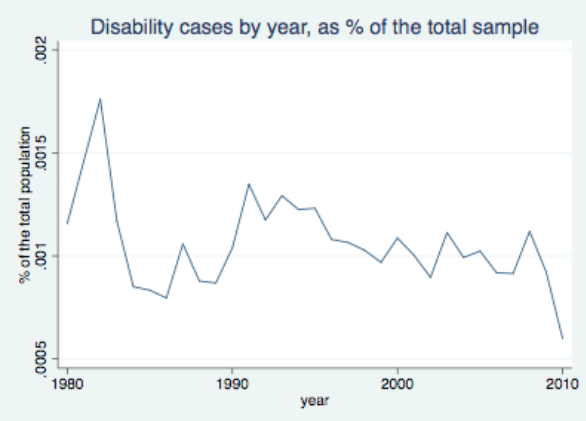
Objective measures of both working conditions and health, as those used in the current study, avoid the heterogeneity problems associated to the self-perceived measures. Nevertheless, not all the possible problems of heterogeneity are solved with the employment of objective indicators.

Working conditions and health may be linked through a third factor, instead of health outcomes being caused by job characteristics. Individual differences in time discount rates and disparities in risk preferences may explain part of the differences in both (and simultaneously) health status and occupational decisions. Certain aspects of work, like highly physically demanding jobs, may cause health to deteriorate faster. Nevertheless, it will be difficult to appropriately measure all relevant factors involved in the causal effect of work on health. Genetic factors, time preferences and the attitude toward risk are relevant to explain choices regarding work and health. These unobserved factors cannot be individually identified and measured, but they must be taken into account in the empirical model.

2.3.1 Disability

"Disability" takes the value 1 if the person moves to a permanent disability status at any time of his/her active working life between 1980 and 2010 and 0 otherwise. For disabled individuals, we consider the working conditions applicable up to the time of the transition to disability, and subsequent working relations are discarded.

Graph 1. Disability by year

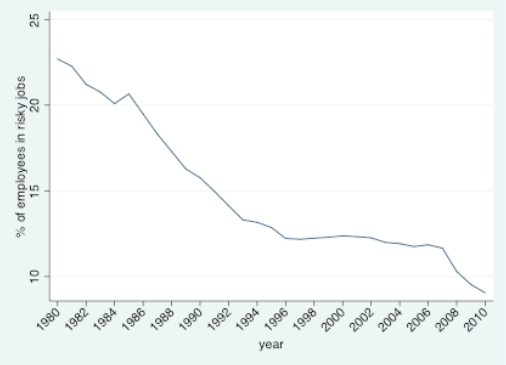


Graph 1 shows the number of transitions to permanent disability by year, as percentage of the total population in the sample. After an important decrease in the mid-eighties, the incidence of disability has remained quite stable during the period, except for the last year of our study period, 2010.

2.3.2 Risk exposure

We have constructed a risk measure using narrowly defined injury and illness rates by year and industry and occupation: i.e., the number of individuals receiving an allowance for non-fatal work-related injuries or occupational illness each year in a certain industry and occupation divided by the total number of individuals working in that industry and occupation. There are 44 industries and 10 occupations, which makes a total of 440 job industry cells. The risk variable takes the value 1 if the individual's job industry cell is in the top quartile in the illness/injury rate ranking, and 0 otherwise. We find our binary variable to be more suitable than the continuous one. The latter would imply that individuals have full information of the level of risk throughout its whole distribution by industry occupation cells. Indeed, below the upper quartile of the ranking, illness/injury rates are low and quite similar across industry occupation cells. Graph 2 clearly shows that the percentage of employees in risky occupations has dropped dramatically during the period. We observe an important decrease during the eighties; this is followed by a period of relative stability up to 2008. The slope falls again after 2008, probably associated with the economic recession, which has implied an important reduction of employment in the construction industry.

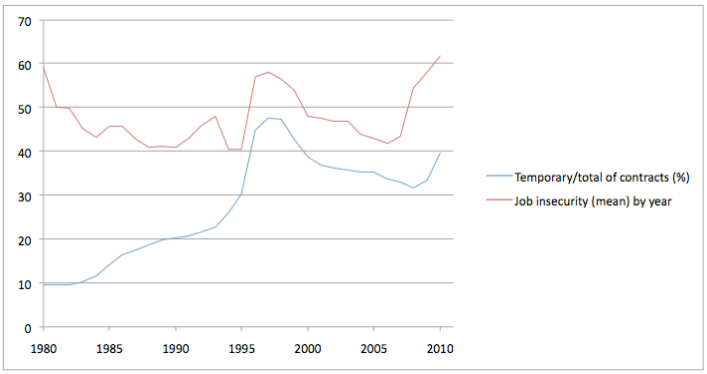
Graph 2. Percentage of employees in risky jobs (high rates of injury and illness) by year



2.3.3 Job insecurity

Our first measure of job insecurity consists on a simple indicator of temporary employment. This specification is probably too simple to capture the effects of job insecurity -it assumes that only temporary workers are affected by insecurity- but it is useful to compare results with other findings regarding temporary employment, the most common indicator found in the literature. Our second measure of job insecurity is constructed by estimating probabilities of job loss. As mentioned in Green (2011), there is a broader concept of employment insecurity that also encompasses uncertainty over future prospects in the labour market. Although employment insecurity is an objective concept, it also has an important affective dimension defined by how people perceive the uncertainty. Our data does not include subjective information but, by contrast, provides rich information about work histories (including involuntary transitions to unemployment). This allows constructing a simple measure of risk of involuntary job loss, which is the most relevant outcome associated to the general perception of job insecurity. The labour market literature offers numerous examples of this kind of objective ex post indicators of job insecurity (see Valletta, 1999; Gottscalk and Moffit, 1999 and Clark et al 2010). Quite recently, it has been established that perceptions of job insecurity are quite well correlated with subsequent job loss frequencies (Dickerson and Green, 2009 Campbell et al., 2007; Stephens, 2004;), bridging the two literatures and measures of job insecurity.

Graph 3. Temporary contracts and job insecurity by year.



The lower line in graph 3 represents the evolution of temporary contracts (as percentage of the total of contracts). There is an abrupt increase after 1984 and 1994, years in which took place the main reforms of the Spanish labour market. As previously said, despite the 1994 reform was oriented to restrict the applicability of temporary contracts, previous findings indicate that this objective was not reached, and the incidence of temporary employment continued increasing (IESE). A deeper analysis of our data reveals that the increase after 1994 is mainly caused by the increase of two types of contracts limited to specific projects ("Obra o servicio" and "Eventual")

Table 2.4 in the supplementary material presents the results of estimating the probability of job loss. As expected, the human capital variables -tenure, experience and education- contribute to decrease the probability of job loss. The effects of the unemployment and temporary rates are large, as well as the effect of holding a temporary contract. The upper line in graph 3 shows the evolution of this indicator during the period 1980-2010. It describes a moderate decrease during the eighties and two abrupt increases from 1994 and 2007, this one following a period of decline.

2.4. The model

The essence of the model builds on the seminal work of Grossmann (1972) and the literature described above that links working and contractual conditions to health status. As in Grossman, health status transitions over time can be modelled in a simple way:

$$H_t = H_{t-1} + E_t \qquad 2.1$$

where health status at time t is a linear function of the depreciated health status from the previous period plus any health investments / expenditures (E) made in the current period.

$$H_{it} = \overline{H_{it}} - \delta H_{it} + \sum_{k=1}^{t} \delta^{k-1} E_{ik} - X_{it} \qquad 2.2$$

$$X_{it} = r_{it}, l_{it}, w_{it}, z_i, c_t \qquad 2.3$$

We see disability depending on working and contractual conditions, mainly through the exposure to work-related health risks and job insecurity; Worker's i health stock (Hi) is governed by a health production function where the health stock depreciates at rate d, and X includes risk exposure (R), insecurity exposure (L), other working conditions (W), individual time invariant variables (Z) and contextual factors (C). Our model also aims at examining whether the net effect of more hours worked is to increase exposure to adverse working conditions and worsen health or whether increasing specific experience lead to a better ability to cope with these conditions. For that purpose we use in our empirical analysis variables indicating exposure to potentially adverse employment and working conditions. To that end, and similarly to Fletcher et al (2011), we unravel the function recursively and define health status at period t as a function of the health endowment (H) and the summation of the subsequent discounted investments and expenditures made up to t, that we simplify by E to capture the cumulative burden engendered by exposure to physical and psychosocial stressors. As in Green (2011), we assume that health is a linear function of job insecurity. But our model is simpler in the sense that we consider that job insecurity is captured by a unique indicator meaning probability of job loss. Other variables try to capture other aspects relevant for the creation of expectations regarding employment, like macroeconomic indicators, and, hence, complement our measure of job insecurity, trying to approximate a broader concept of employment insecurity. This one would also encompass uncertainty over future prospects in the labour market.

2.5. Estimation

With our empirical specification we try to assess two questions: how exposure to physical hazards and job insecurity affect the probability of disability and possible changes in the role of employment and working conditions on determining such different probabilities during the last two decades. In order to test these effects, we will use hazard rate models. Specifically, we will estimate a discrete time proportional hazard models with a gamma mixture distribution to incorporate unobserved individual heterogeneity (see Prentice and Gloeckler, 1978; Meyer, 1990; Jenkins, 1995 and 1997).

We model disability transitions (if observed) that are observed between annual intervals in our data and we do not know in all cases the actual date of exit. Denote these annual intervals [0 = (t0, t1), (t1, t2), . . ., (tk−1, tk)]. The probability of exit in the jth interval for person i is:

$$\begin{aligned} &prob\{T \in (t_{j-1}, t_j)\} = S(t_{j-1}; X_{it}, \overline{E}_{it}) - S(t_j; X_{it}, \overline{E}_{it}) \\ &and \\ &prob\{T \geq t_{j-1}\} = S(t_{j-1}; X_{it}, E_{it}) \end{aligned} \qquad 2.4$$

where S is the survivor function and other variables are defined as before. Given the proportional hazards assumption, the survivor function in the discrete case is written as:

$$S(t_j; X_{it}, \overline{E}_{it}) = \exp[-\exp\left(\theta\left(\sum_{k=1}^{t} \delta^{k-1} E_{ik}\right) - X_{it}'\beta + \delta_j\right)] where\ \delta_j = \log(H_{it})\ \ for\ \ j = 1,...,k \qquad 2.5$$

and where Ht is the integrated baseline hazard at t. The discrete time hazard, hj, in the jth interval is:

$$h_j(X_{it},\overline{E}_{it}) = 1-[-\exp(X_{it}+\overline{E}_{it}+\gamma_j)] \;\; with\, \gamma_j = \log\int_{t_{j-1}}^{t_j}\lambda_0(\tau)d\tau \qquad 2.6$$

where γj is the baseline hazard in the interval j−1 toy and λ is the instantaneous hazard rate. We also incorporate a Gamma distributed random variable εi with unit mean and variance σ2 = ν to describe unobserved individual heterogeneity. We can rewrite () including unobserved heterogeneity as:

$$h_j(X_{it},\overline{E}_{it}) = 1-\exp\{-\exp[X_{it},\overline{E}_{it}+\gamma_j+\log(\varepsilon_\iota)]\} \qquad 2.7$$

Our first step focuses on assessing the first of the questions mentioned above, consists on testing the effect of working and contractual conditions on disability with data for the whole period (1980-2010). As previously mentioned, this relation is not so established in the literature like it is for other SES indicators; so it is worth starting with a general picture of the impact of these factors. The set of variables related to working and contractual conditions include: wage, occupation, exposure to physical hazards (the indicator of high risk of work-related injury and illness "risk") and type of contract/indicator of job insecurity. The variables that capture possible cumulative effects are: "Total time in risky jobs", "Total time unemployed" and "No of involuntary transitions to unemployment".

The first columns in table 2.1 (model 1) show the results of including in the model an indicator of temporary contract. Model 2 (columns 6 to 9) considers the effects of our constructed measure of job insecurity. The size of the variance of the gamma mixture distribution relative to its standard error suggests that unobserved heterogeneity is significant in both models. A likelihood ratio test of a model with unobserved heterogeneity versus another that does not consider heterogeneity suggests the same conclusion in both cases. That is, individual differences in disability, even for people sharing the characteristics that are included in our model, may be important. The duration

Table 2.1. Hazard models of disability

	Model 1				Model 2			
	Hazard ratio	**S.E.**	**z**		**Hazard ratio**	**S.E.**	**z**	
Log_period	1.2976	0.0787	4.3**		1.1990	0.0914	2.38	**
Age	1.2756	0.0251	12.38**		0.1920	0.0623	-5.08	**
Age Sq.	-	-	-	-	1.0296	0.0057	5.28	**
Sex	0.5329	0.0647	-5.2**		0.5385	0.0701	-4.76	**
Primary Education*	0.8509	0.0770	-1.8**		0.9544	0.1036	-0.43	
Secondary Education	0.7123	0.0913	-2.7**		0.5268	0.0826	-4.09	**
University Education	0.2855	0.1055	-3.4**		0.2058	0.0810	-4.01	**
Wage	0.5598	0.0149	-21.9**		0.5377	0.0256	-13.06	**
Administrative tasks	0.4829	0.0703	-5.0**		0.6198	0.0894	-3.32	**
Qualified worker	0.8534	0.5844	-0.2		0.9675	0.6929	-0.05	
Risk	1.8613	0.1778	6.5**		2.0472	0.2214	6.62	**
Total time in risky jobs	0.9997	0.0000	-9.2**		0.9997	0.0000	-8.98	**
Total time unemployed (previously)	0.9993	0.0002	-3.1*		0.9986	0.0005	-2.8	**
Temporary contract	0.3708	0.3424	-1.1		-	-	-	-
No. of involuntary transitions to unemployment	1.0055	0.0025	1.9**		1.0055	0.0037	1.5	
Job insecurity	-	-	-	-	2.9517	0.8550	3.74	**
Constant, year dummies and year-contract interactions included					Constant and year dummies included			
* Base category: no studies Unobserved heterogeneity included using a gamma mixing distribution								
LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000012					LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000001			
N 135,620					N 135,608			
Log likelihood −2107.76					Log likelihood −7378.41			

dependence parameter exerts significant and large effects in both models.

We report 'hazard ratios' which (approximately) measure the proportional effect on the hazard of a one unit change in the variable in question. In both models, being employed in a risky job increases the probability of disability by approximately 100% whether time of exposure contributes to mitigate the effect of this variable. This result suggests that more experience lead to a better ability to cope with these conditions.

In model 1, type of contract appears not being significant It is coherent with previous research that has suggested that temporary work may benefit workers if it is used as a stepping-stone into permanent employment (Bielenski, 1999; Nätti, 1993). But number of involuntary transitions to unemployment (a proxy

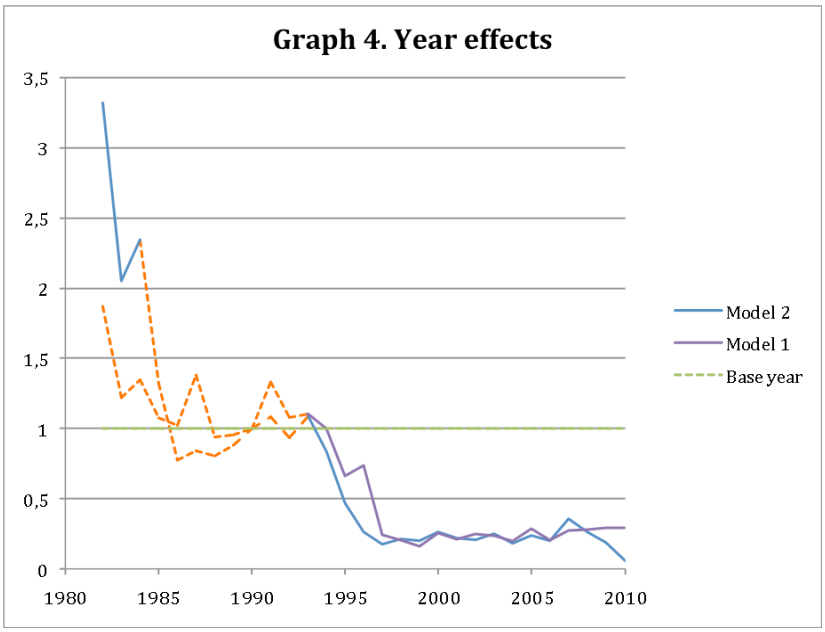
of exposure to insecurity) increases the probability of disability (being significant only at 10% level).

Similar results regarding risk and risk exposure are obtained when model 2 is estimated but the results regarding job insecurity show a quite different scenario. Job insecurity, measured as probability of job loss, multiplies by three the probability of disability, while transitions to unemployment are not significant. This finding reinforces the idea that the effect of temporary employment "per se" is controversial without considering other factors. As seen in Section 2, holding a temporary contract is one of the main components that explain probability of job loss, but not the only one. Other factors, including worker's characteristics related to human capital or macroeconomic indicators, may alter the probability of losing the job and, consequently -as far as are perceived by the worker-, affect worker's health and psychological well being. Other variables behave as expected. Education attainment and being employed in more skilled occupations significantly reduces the probability of disability, but the effect of occupation is stronger in model 1, probably because part of this effect is mediated by the job insecurity variable in model 2.

The following step in our analysis consists on testing whether the effect of job insecurity and exposure to physical hazards on health have changed in the last two decades. For that purpose, we test different specifications. First, as in Deaton and Paxson (1998, 2001), we enter year into the regressions not only in levels, but also interacted with our risk exposure and job insecurity variables.

Graph 4 shows the coefficient's values of year dummies (in levels) when model 1 (including temporary contract indicator) and model 2 (with job insecurity measure) are estimated. Results regarding year effects are quite similar in both models. This graph corresponds to a fitted model in which the age profile remains constant, but drifts down with time, so that all people alive at any given date benefit from that year's reduction in disability. It shows that period's effect decline was relatively rapid during the early 1980s and mid-

nineties. Since then it has remained quite stable, with a moderate increase (if model 1 is considered). Fluctuations shown in graph 2 may be reflecting changes in the health system, such as the extension of coverage, or advances in medical technology that are effective for the treatment of age-specific conditions.



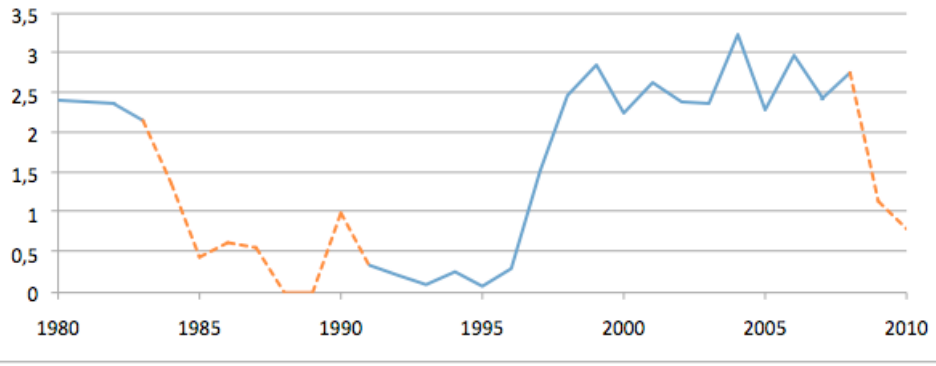
yellow dashed line indicates not significant

To test possible changes in the effect of risk exposure on disability, we have estimated two versions of model 2, entering the interaction of risk (time of exposure to risk) with the set of year dummies. Neither of both regressions shows significant changes in the effects of these variables (the coefficients of the interactions are not significant), suggesting that the effects of risk exposure have remained unchanged.

Graph 5 presents the coefficient values of the interactions of temporary contract with year. We observe significant period effects from 1983 to 2008, with a clear change in the trend in 1994, year in which having a temporary contract changes from being positive for health to being significantly negative.

The examination of the same model including year interactions with our constructed measure of job insecurity show the same pattern, although period effects appear not significant.

Graph 5. Changes in the effect of temporary contract (Coeff. of the interaction with year)



yellow dashed line indicates not significant

To explore possible explanations of this change in trend occurred in 1995 we have followed different strategies. First, we have tested the role of labour market reforms, estimating two models that include each one a dummy variable that takes value 1 if the contract was signed after the 1984 (1994) reform. As Graph 3 shows, the increase in the proportion of temporary contracts coincides with the introduction of these reforms.

In a model that considers possible effects of the 1984 reform, the coefficient associated to this dummy appears not being significant (results not shown) and the rest of variables have similar effects as those shown in previous models. The first column in table 2.2 shows the estimation results of including the 1994 reform dummy variable. The effect of having a contract signed from 1994 onwards significantly increases the probability of disability. Other variables behave as expected with the exception of being female, that have lost its significance compared to the model in which the 1994 reform dummy variable is not included (table 2.1).

But the observed period effects in the relationship between temporary employment and disability may be related to the increase in the proportion of temporary employment rather than being associated to changes in the Employment Protection Legislation. As seen in Graph 3, the abrupt increases of temporary arrangements almost coincide with the 1984 and, particularly, with the 1994 reform; so the effects of these factors may be confounding. Following previous studies (Valletta, 1999; Clarck et al, 2010) we have estimated a model that includes contextual variables such as unemployment rate and temporary employment rate (table 2.3).

Results shown in table 2.3 suggest a number of comments. Consistent with the results of table 1, the effects of our job insecurity measure are significant and large, and quite robust across different specifications. The effects of the inclusion of contextual variables are quite mixed. Almost half of the variables appear not being significant. Only the temporary employment rate significantly decreases the effect of holding a temporary contract (interacted with contract) and exerts significant effects on disability. These results seem to be coherent with the "social norm" hypothesis (Clark, 2003; Shields and Wheatley-Price, 2005; Stutzer and Lalive, 2004; Powdthavee, 2007; Clark et al., 2010), that would predict a modifying effect of the aggregate variables -temporary employment rate in this case-, diminishing the individual effect -of the job insecurity variable, in our case. The effect of higher unemployment rates is positive (increasing disability probabilities) but not significant when we control for unobserved heterogeneity. Interestingly, its effect is large and significant in a model in which heterogeneity is not taken into account -this change is not observed for the rest of the variables.

Finally, we have re-estimated Model 1 (with temporary contract dummies) separately by cohorts: those born between 1952 and 1962, who virtually entered the labour market before any of the reforms took place, and those born between 1972 and 1982, which (mostly) entered the labour market after the 1994 reform. As far as we only consider people aged 25 to 34, this implies considering two separate, not overlapping, periods: from 1980 to 1995 and from 1996 onwards

Table 2.2. Hazard models of disability with 1994 reform effects (Model 3) and by Cohorts (Cohort 1 and Cohort 2)

	Model 3				Cohort 1 (born between 1952 and 1962)				Cohort 2 (born between 1972 and 1982)			
	Hazard ratio	S.e.	z		Hazard ratio	S.E.	z		Hazard ratio	S.e.	z	
Log period	4.0632	0.6447	8.84	**	5.0420	0.8334	9.79	**	6.3395	1.3418	8.73	**
Age	0.2107	0.1706	-1.92	**	0.9897	0.0385	-0.27		0.0638	0.0350	-5.01	**
Age Sq.	1.0295	0.0137	2.19	**					1.0442	0.0092	4.91	**
Sex	0.6774	0.1645	-1.6		1.1227	0.1598	0.81		0.3891	0.0464	-7.92	**
Primary education	0.6858	0.1446	-1.79	**	0.9252	0.1283	-0.56		1.0346	0.1258	0.28	
Secondary education	0.4618	0.1330	-2.68	**	0.6924	0.1288	-1.98	**	0.4616	0.0741	-4.82	**
University education	0.0785	0.0679	-2.94	**	0.5498	0.1820	-1.81		0.1104	0.0383	-6.34	**
Wage	0.4477	0.0400	-9	**	0.4999	0.0307	-11.28	**	0.5624	0.0180	-17.95	**
Qualified worker	0.3302	0.0934	-3.92	**	0.4231	0.0699	-5.21	**	0.7362	0.0907	-2.49	**
Risk	2.0757	0.3897	3.89	**	2.1913	0.3207	5.36	**	1.7819	0.2543	4.05	**
Total time in risky jobs	0.9996	0.0001	-5.47	**	0.9999	0.0000	-4.67	**	0.9998	0.0001	-3.28	**
Total time unemployed (previously)	0.9987	0.0005	-2.74	**	0.9941	0.0044	-1.34		0.9941	0.0286	-0.21	
Temporary contract	0.2137	0.0954	-3.46	**	0.2105	0.0671	-4.89	**	1.2460	0.1403	2.95	**
No. of unvoluntary transitions to unemployment	0.9858	0.0088	-1.61		0.9887	0.0066	-1.7	*	1.0025	0.0019	1.3	
Contract signed after 1994	9.9174	4.9895	4.56	**								
Constant included					Constant and year dummies included				Constant and year dummies included			
* Base category: no studies					* Base category: no studies				* Base category: no studies			
Unobserved heterogeneity included using a gamma mixing distribution												
LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000012					LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000007				LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000001			
N 135,620					N 253,881				N 343,700			
Log likelihood −2107.76					Log likelihood −7378.41				Log likelihood −7378.41			

Results are shown in columns 2 and 3 in table 2.2. The effect of risk exposure has diminished, as well as the impact of wage and being a qualified worker. Having a temporary contract has changed from being positive for health to significantly increase the probability of disability for those born more recently. This finding is coherent with the idea that not all temporary jobs necessarily provide inferior status and high insecurity. Some research has suggested that temporary work benefits workers when it allows them to control their work

time, sample a variety of work experience, and use their temporary job as a stepping stone into permanent employment (Bielenski, 1999; Nätti, 1993).

Table 2.3. Summary results of the effects of contextual factors

	Model 1. Macro variables and type of contract	Model 2. Macro variables and job insecurity measure	Model 3. Macro variables with variable interactions and type of contract	Model 4. Macro variables with variable interactions and job insecurity measure
Regional unemployment rate	9.5871	6.9652		
Temporary employment rate	0.0572 **	0.0343 **		
Type of contract	0.8553	-	0.7464 **	
Job insecurity measure	-	3.4901 **		1.4945 **
Temporary contract * unemployment rate			1.7973	
Temporary contract * temporary employment rate			0.4262 **	
Job insec. measure* unemployment rate				0.4132
Job insec. measure* temporary employment rate				0.0226 **

Almost the same conclusions can be drawn when the same model is estimated including our measure of job insecurity instead of having a temporary contract. The only exception is the coefficient associated to job insecurity. Contrary to what obtained for holding a temporary contract, the job insecurity variable exerts significant and large effects for both cohorts of young people, albeit these effects are larger for cohorts born more recently (the coefficients are 2.3 and 3.1 respectively). The effect of risk exposure describes also a diminishing trend, but to a lesser extent than in previous model (the coefficients are 2.1 for the cohort born between 1952 and 1962 and 1.9 for the cohort born between 1972 and 1982.)

2.6. Conclusions

The impact of risk exposure and job insecurity is large and significant in most of the models estimated in this paper. These results are coherent with previous findings that have found similar effects using other health indicators (Bartley et al, 2004; Benach et al., 2004; Berger & Leigh, 1989; Llena- Nozal, Lindeboom, & Portrait, 2004; Monden, 2005). Our paper also allows to conclude that the relationship between job insecurity and disability have not remained unchanged during the last two decades in Spain, a result that is less found in previous studies. While job insecurity, measured as probability of job loss, appears to be a risk factor for all generations, holding a temporary contract has changed its effect from being positive for health to being significantly negative. This result seems to indicate that not all temporary jobs necessarily provide inferior status and high insecurity, and its effect may change according to wider changes in employment protection rules and social environment. Effectively, we find that changes in Employment Protection Legislation, motivated by labour market reforms -particularly the one initiated in 1994- seem to play certain role the evolution of such relationship.

On the other hand, increasing temporary rates seem to be related to lesser effects of job insecurity on health, in line with previous studies that have found that the effect of individual unemployment is less pronounced in areas of high unemployment, which is interpreted as a social norm effect (Clark, 2003; Shields and Wheatley-Price, 2005; Stutzer and Lalive, 2004; Powdthavee, 2007; Clark et al., 2010). Under this hypothesis, unemployment (or, similarly, temporary employment rates) are thought to act as less of a stigma, and less of a threat to one's identity, when others around are also out of work or (or holding high probabilities of job loss.)

This paper has two main policy implications. Reduction of avoidable health disparities is a concern for most of developed countries. Recent policies are mainly focused on affecting individual s behaviours related to health. This paper can help to distinguish which factors transcend the individual scope but

are related to labour market structures. In this respect, our results, in line with previous studies, indicate that aspects relative to precarious employment should not be missed when identifying most vulnerable groups to negative health impacts. Additionally, where detrimental to health, poor working arrangements and conditions are likely to contribute to a greater risk of employees leaving the labour market as soon as this becomes viable. The concern about the sustainably of the Social Security System and the pensions provision is in the agenda of many European countries, and particularly Spain. These countries are undertaking reforms in their Social Security Systems towards increasing the working life of individuals by postponing early retirement and increasing state retirement age. Maintaining the health of employees could contribute to the sustainability of the system and, contrary to other measures, without implying cutting in social rights. The investigation of its relative contribution to this goal, compared to other measures, leads for further researches.

2.7. Supplementary material

Table 2.4. Probability of job loss. Random effects probit

	Coeff.	*z*	
Age	0.0008	4.34	**
Sex	0.1961	28.9	**
Immigrant	-0.2063	-18.15	**
Primary education	-0.0266	-2.4	**
Secondary education	-0.1836	-16.11	**
University education	-0.2970	-22.93	**
Tenure	-0.0558	-27.23	**
Tenure Sq.	0.0130	50.78	**
Experience	-0.0257	-144.05	**
Experience Sq.	0.0001	59.46	**
Administrative tasks	-0.0617	-11.84	**
Qualified worker	0.0548	4.86	**
Temporary contract	1.3404	325.76	**
Unemployment rate (by activity and year)	5.2614	34.7	**
Temporary employment rate (by sector and year)	1.3036	29.27	**
Constant	-2.3095	-13.51	**
lnsig2u|	1.132782	-238.58	**
N	2,112,647		

Log likelihood = -911680.51
Wald chi2(56) = 195507.98
Prob > chi2 = 0.0000
Likelihood-ratio test of rho=0: chibar2(01) Prob >= chibar2 = 0.000

Chapter 3. Wage discrimination and other determinants of the labour force participation of the disabled

Abstract

We analyse the impact of permanent disability (PD) on labour market outcomes. Specifically, we examine the factors that account for the low labour force participation of the permanently disabled, with a particular focus on the possible disincentive effects of wage discrimination. Drawing on data from the Continuous Sample of Working Lives published by Spain's office of Social Security for the period 2005-2011, we apply decomposition techniques to pay differentials so as to observe what part of these wage differences is attributable to differences in productivity and what part can be attributed to discrimination. These results are then used to estimate the effect of discrimination on the participation of those with a PD in the labour market.

We find that disabled workers, on average, earn lower wages than those earned by other workers, while they are less likely to be in employment. These differentials cannot be explained solely by differences in productivity, but are also attributable to labour market discrimination. The impact of wage discrimination on the labour force participation of those with a PD is high, especially, for men. In this group, the estimated probability of employment without discrimination is almost five percentage points higher than the observed probabilities. These results should help in the design of policies that best combine the requisite level of protection with appropriate incentives for access to employment and, thus, avoid the exclusion of the disabled from the labour market.

3. 1. Introduction

A permanent disability (henceforth a PD) implies a reduction in a person's capacity to work for the remainder of their life, but not necessarily a complete incapacity to take on all forms of gainful work. Indeed, promoting employment opportunities for those with a PD is on the labour agenda of many countries and international organizations. By adopting such policies it is not only hoped to reduce the burden on central administrations but also to improve the welfare and social integration of those with a PD (see, for example, OECD, 2003). The importance of such measures is likewise stressed within the conceptual framework of the social determinants of health, which recognises the bidirectional relationship between both variables, i.e., health and illness have an impact on an individual's employment opportunities and socioeconomic status, which, in turn, are important determinants of health inequalities (WHO, 2008). However, despite these policies, the employment rates of those with a PD are relatively low in all OECD countries: an average of 42% (OECD, 2009). In Spain, this rate is particularly low (around 35%) both when compared to the rate in other countries and with respect to the employment rate of the able-bodied.

In most rich countries (i.e., those of the OECD and, above all, the EU-15), the average income of those with a PD is not comparable with the income of the rest of the population. In the late 90s, the income ratio between those with and without a PD was approximately 80% in the OECD countries, and a little higher in the countries of the EU (OECD, 2003). Spain presented one of the lowest ratios, with the income of those with a PD representing just 60% of the income of those without a PD.

An examination of the income composition of the disabled likewise reveals that the Spanish case can hardly be considered "typical". Taking the aforementioned OECD study as reference, pensions represented a higher proportion of total income than they did in all the other countries included in the study. Specifically, pensions accounted for around 40% of income in Spain, equalling in importance labour income, whereas in other EU countries the average weight of pensions was around 20%, much lower than the percentage represented by labour income. This state of affairs is of great relevance in the study of the factors that determine the labour force participation rate of those with a PD for two reasons: first, because it serves to define the context of opportunities in which those with a PD opt to seek employment or not and, second, because the supposed "generosity" of permanent disability pensions has traditionally been cited in the literature as a disincentive to employment.

The macroeconomic data described above suggest the need to study the causes, at the micro-scale, of the economic disadvantages and the labour force participation of those with a PD. The overall objective of this study is to analyse the employment of people with a permanent disability and the disincentive effects of discrimination, understood both as the disadvantages they face when seeking employment and as the wage discrimination due to their PD. In order to study the probability of employment and the wage levels of those with a PD in relation to those of the able-bodied in the same country and during the same period (Spain, 2005-2011), we take the following approach. First, using decomposition techniques based on the Oaxaca-Blinder methodology (1973) – as widely employed in the literature (Oaxaca and Ransom, 1994; Reimers, 1983; Neumark, 1988; Cotton, 1988; Bauer and Sinning, 2008), we analyse the extent to which differences in the probability of employment between the two groups may be attributed to productivity

differences or whether, on the contrary, they are attributable to discrimination. Second, and analogously, using decomposition techniques (Baldwin and Johnson, 1992; 1994) we measure the effects of discrimination on wages in order to be able to estimate the contribution of pay discrimination as a disincentive to employment for those with a PD.

The analysis of the work history of individuals after they suffer a disability, as proposed by this study, should allow us to identify, first, the extent to which a permanent disability is associated with a worsening in wage conditions, and second, which factors (including discrimination) hinder their return to the labour market in Spain. This should help in the design of policies that best combine the requisite level of protection with appropriate incentives for access to employment and, thus, avoid the exclusion of the disabled from the labour market. The period studied, 2005-2011, is of special interest as it covers a change in Spain's economic cycle, including a period of crisis which started in 2008 and which was still running its course in the final year of the study.

Following on from this introduction, we review the relevant literature and delimit the institutional framework governing permanent disabilities in Spain. We then present a detailed description of the data and of the econometric techniques used, we report our results, and terminate with a section dedicated to the conclusions that can be drawn.

3.2. Literature review

Many earlier studies have examined the work history of the disabled from a range of different perspectives, although focusing primarily on labour force participation rates, income levels and wage discrimination. Fewer studies have

concentrated on the specific issue addressed in this article: relating the participation rates of those with a PD with the possible existence of wage discrimination and measuring the effect this might have as a disincentive to employment. Baldwin and Johnson developed a methodology to measure this impact (1992) and subsequently applied it to the case of disability (Baldwin and Johnson, 1994) drawing on US data for 1984. They found that wage discrimination accounts for only a small part of the difference in participation rates between men with and without a PD (just 2 of the 29 percentage points). The wage differential between men with and without a disability was not very high, nor was the contribution of discrimination to this difference (associated primarily with returns to experience). Thus, the disincentives associated with this discrimination appeared to reduce the probability of employment by between no more than 0.3 and 1.4%, depending on the severity of disability. In a later study, the same authors (Baldwin and Johnson, 1995) analysed the impact of wage discrimination on the employment of women in the US and drew similar conclusions: discrimination accounted for a small part of the differences in the probability of employment between women with and without disabilities. However, in the case of Great Britain, Kidd *et al.* (2000), using data from 1996, found that wage discrimination was important (accounting for around 50% of the wage gap between men with and without a PD), but that its effect on employment was not as great because wage elasticities were also not as large. In this study, the analysis is also performed separately for men and for women.

Below we summarise the available evidence in three main groups: the effects of disability on wages, its effects on labour force participation and its impact on the possible existence of wage discrimination. A reduction in wages as a result of a PD has been observed in various studies using micro data. Early studies showed how this differential was as high as 35% in the United States

(Luft, 1975). In the case of Great Britain, the average earnings of the disabled are around 20 per cent lower than the income of the able-bodied of working age, and employment rates are half (Jenkins and Rigg, 2003; Burchardt , 2000b; Grundy *et al.*, 1999). In the case of Spain, García-Gómez and López-Nicolás (2006) show that the decline in wages following a health shock is significant. This might be attributed to a combination of three factors: a fall in participation in the workforce, a fall in the number of hours worked and a fall in hourly wages.

In the case of the labour force participation of those with a PD, Lindeboom *et al.* (2005) found that individuals with disabilities have significantly higher odds of being unemployed. Similar results were reported in the review undertaken by Jones (2008). In Spain, García-Gómez and López-Nicolás (2006) found that an adverse health *shock* has a causal effect on the probability of being employed. The probability of an individual that has experienced a health *shock* of being employed fell by 5%, while they were 3.5% more likely to become inactive.

Studies conducted in other countries have attempted to decompose the gap between the employment rate of the disabled and the able-bodied, finding that much of this gap cannot be explained by differences in the characteristics of the worker or the job itself, and that it is therefore attributable to the existence of labour market discrimination (see, for example, Blackaby *et al.*, 1999; Kidd *et al.*, 2000).

Prior evidence also stresses the need to address economic incentives as an explanation for labour market participation. Indeed, many studies have linked the low employment rates of those with a PD with the receipt of a pension. Bell and Smith (2004) show, using data for Great Britain from the 90s, that the

decline in the participation rate of the disabled occurs, almost exclusively, among low-skilled, male workers. They conclude that the generosity of the disability pension system relative to that of unemployment insurance acts as a disincentive for those with a PD to continue working. In the case of Spain, Malo *et al.* (2011) found, however, that higher pensions have no negative effect on the compatibility between employment and the receipt of a pension for PD. The probability of reconciling employment and a pension depends on the severity of the disability, the age on being awarded the pension and previous experience of disability. While this approach should be taken into account (the generosity of the pension awarded is one of the determinants of the probability of employment in our models), we believe that the economic incentives to find employment should be addressed from a broader perspective, recognizing for example the role of wage levels offered to those with a PD.

The possible effect of pensions acting as a disincentive, as reported in previous studies, also acquires a different nuance in the case of Spain, if we take into account previous data concerning the weight of pensions in relation to total income: in Spain, pensions are generous if (and only if) they are compared with the (potential) income obtained in the labour market, but they do not compensate the loss of revenue due to the PD, as the income gap between those with and without a PD is particularly great in Spain. This "failure" to compensate for the loss of income is greater in Spain than it is in other countries, so that the "direct" disincentives to look for work attributable to the pension should be lower than those in other countries.

As for possible wage differentials between disabled and able-bodied workers, numerous studies have explored the existence of discrimination in the labour market as an explanatory hypothesis of these inequalities. These studies show,

for different countries, that the disabled earn significantly less than their able-bodied counterparts, after controlling for the workers' human capital and the characteristics of the job (see, for example, Baldwin and Johnson, 1994, 1995, 2000; Haveman and Wolfe, 1990; Acemoglu and Angrist, 2001; Blackaby *et al.*, 1999; Kidd *et al.*, 2000). In this last study, the authors applied decomposition techniques to wage differentials between workers with and without disabilities (a technique that we also employ here) and found that about 50% of the wage gap between these two groups is not explained by differences in characteristics related to productivity; rather it is attributable in part to discrimination. However, the evidence regarding discrimination is somewhat ambiguous since various authors point out the impossibility of separating productivity differences from labour market discrimination (DeLeire, 2001).

Previous research has also indicated that the economic disadvantages of the disabled listed above could arise from sources other than from the effect of disability onset itself: a pre-existing disadvantage among those who become disabled (a 'selection' effect) and the effects associated with remaining disabled post-onset (Jenkins and Rigg, 2003). These authors address the problem of the possible selection effect by analyzing in detail the characteristics associated with selection into disability. Their analysis was based on a sample of all individuals that were at risk of becoming disabled and the comparison of base year incomes and employment status between two groups – those who subsequently became disabled versus those who did not. The base year used in their calculations was the year two years prior to potential onset of a disability. The effect of the duration of disability on employment or wages can be relatively easily captured by including in the analysis variables that indicate the time elapsed since the onset of disability. This is in fact the approach taken by Jenkins and Rigg. The authors find that post-onset trajectories for employment rates and incomes went in opposite directions. Employment rates

declined continuously as disability spell lengthened. For individuals disabled for at least two years, the employment rate fell from 55 per cent in the onset year to 52 per cent a year later. For individuals disabled for four years or more, only 30 per cent were in work in their fourth year of disability, compared to 42 per cent in the onset year. An obvious explanation for the decline is that the longer a worker is disabled, the fewer opportunities and capabilities they have to work.

3.3. Institutional framework

Participation in the employment-based Social Security system is mandatory for workers in Spain. Contributions (around 37% of monthly earnings) are scaled according to a worker's occupational category. Employers contribute approximately 85% of the total amount and employees the remaining 15%. The Social Security system funds the largest welfare programme in Spain: public benefits, allowances and pensions, including, disability pensions.

PD pensions are intended to compensate the loss of income that a disabled person is expected to suffer due to a permanent reduction in their capacity to work as a result of a pathological or traumatic process, arising from an illness or accident. In Spain, as in other countries, receiving a pension is perfectly compatible with having a job, provided that it is not specifically the one for which the person is recognized as being disabled.

The Spanish Social Security employs a classification that recognises four degrees of disability defined according to the working capacity that has been lost. They are, in increasing order of severity (although all are compatible with employment): 1) partial-permanent disability for the usual profession, referring

to cases where a worker's ability to perform his/her usual tasks is decreased by 33% or more; 2) total permanent disability for the usual profession *where a worker's ability is decreased by 55% or more*; 3) total permanent disability for the usual profession where a worker's ability is decreased by 75% or more; 4) absolute permanent disability, referring to cases were an individual is unable to undertake work of any kind; and 5) severe disability, where the person requires constant help from others in order to carry out basic activities of daily living (Jiménez-Martín *et al.*, 2006). In terms of eligibility for a disability allowance, the beneficiary must have contributed to the Social Security system for a minimum of five years to be eligible if the disability is caused by an ordinary illness. There is no such requirement when the disability is caused by a work-related accident or professional illness. In general, to be granted a permanent disability benefit, the individual must first have taken sick leave (temporary disability/incapacity), and following the prescribed medical treatment, the individual must still present anatomical or functional disabilities that reduce or impede their capacity to work.

In this study, in order to assess the impact of disability on employment-related variables and to measure possible discrimination, we only consider the three intermediate degrees of disability: a 55%, 75% and total disability for the usual occupation. Those with a partial disability are unlikely to face discrimination and are unlikely to be significantly distinguished from able-bodied workers. On the other hand, absolute and severe disability is, in practice, incompatible with employment (however, the sample does not contain more than two people with this degree of disability for employment).

In 2010, the total number of individuals recognized by the Spanish Social Security as having a permanent disability of one degree or another was 935,514. They represented about 11.6% of contributory pensions (most being

retirement pensions) and a cost of about 799 million euros. In terms of GDP, the pensions program represented an average of 1.5% of GDP in the period 1995-2000, a few points below the EU average of 2.2%.

3.4. Data base and study variables

We use a data panel created from the *Muestra Continua de Vidas Laborales* (MCVL – the Continuous Sample of Working Lives). This sample combines information from three sources: the Census, the Social Security register and the tax records. The MCVL contains a representative sample of 4% of the population for each year, that is, approximately 1,200,000 individuals. Here, we use the 2011 wave, supplemented by the employment histories of workers present only in some of the previous six waves (2005-2010). The MCVL contains complete information about the working life of individuals, including data on wages and benefits received.

Both in our analysis of labour force participation and in that of wages, we work with a subsample of the population: individuals of working age (between the ages of 16 and 64). The data include information about both their current employment as well as their previous employment history. It is important to note that our sample includes only people who have been employed at least once (during the current period or before). This helps avoid a possible sample selection effect on the labour participation of those with a DP. As mentioned above, it is plausible that these individuals have pre-existing disadvantages that hinder their incorporation into the labour market. These might include, for example, poor health or socioeconomic disadvantages associated in turn with a greater likelihood of disability and of

lower rates of employment (a low education level, for example). The possible impact of the time elapsed since the onset of disability, as distinguished from the impact of the "shock" of the PD itself, is captured using a specific variable (time elapsed since the onset of the PD), whose expected effect is controversial. Its effect on employability has been estimated to be negative in previous studies (Jenkins and Rigg, 2003), although we would expect some effect of adaptation to disability status. As for the effect of time elapsed on income, both international studies (Jenkins and Rigg 2003) as well as a recent study for Spain (Cervini-Plá *et al.*, 2012) found that while the income gap between people with and without a PD holds, it tends to decrease with time.

The employability analysis is based on a variable that considers as employees those actively employed at the time of sample collection (from 2005-2011), as opposed to those who are unemployed, be it claiming supplementary benefit or unemployment allowance. The set of explanatory variables used in the employment equation includes individual characteristics (age, sex), other characteristics that may affect productivity and preferences with respect to work and leisure time (level of education, number of children), and experience. The degree of disability is used in the estimates for people with a PD in the hope, obviously, that higher degrees of PD are associated with lower probabilities of being employed. We also estimate, for the case of people with disabilities, a model that includes the time elapsed since the onset of the PD.

Wages are obtained from the tax information on labour income. The set of variables that captures productivity in the wage equation includes standard variables such as education, experience (total years worked), both general and firm-specific (i.e. tenure), a set of variables relating to working conditions and

employment (occupational level, temporary employment) and variables describing a firm's characteristics, such as size and age.

3.5. Descriptive results

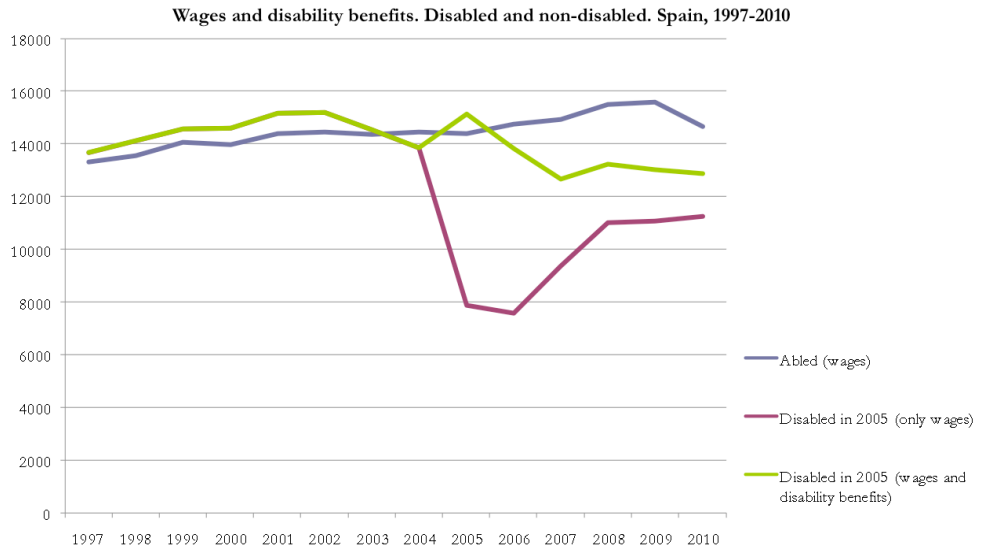
Table 3.1 shows that the hourly wages of people without a disability are markedly higher than those earned by the disabled. This is equally true for men (a difference of 2.43 points) as it is for women (a difference of 2.13 points). The employment rates of the disabled (17.39 for men and 11.07 for women) are also much lower than those of the able-bodied, as shown in the same table. It can also be observed that people with a PD have lower educational levels, are older and have more years of general but fewer years of specific-firm experience ("tenure"), in the case of men. Their participation in jobs with a low-skill level is also higher.

In order to observe the evolution in the income of those with a PD in relation to that of the rest of the population, we selected a subsample of individuals who became disabled in 2005 (Figure 1 and table 3.2). This shows the income evolution over a period of time comprising the years before and after the onset of the PD. Figure 1 shows a fall in income in the period just prior to the PD, most likely caused by the wage losses associated with a long illness. It can also be observed that the fall in wages is abrupt at the time of the onset of disability and during the following year, when wages fall even more markedly (by 45%). This trend is gradually corrected over the years and, after six years of PD, wages are "only" 18% lower than at the beginning of the period studied (1997). If we consider income, the fall following the onset of the PD is not as abrupt (24%) and the loss with respect to the initial period is only 6%. There is a slight increase in income in the year the PD occurs,

probably linked to the increase in Social Security transfers (see Gómez and López, 2006). If we compare this situation with that of wages at the end of the period studied, the wages of those who have been disabled for between five and six years are 24% lower than those of the able-bodied. This percentage is lower if we consider income, including PD pensions, which stands at around 12%.

Table 3.1. Descriptive statistics (2011)

	Men		Women	
	Disable	Abled	Disabled	Abled
N	31,909	508,649	15,959	417,759
Personal characteristics				
Age (mean)	55.84	42.45	56.04	41.05
Number of descendents	0.17	0.36	0.1	0.34
Number of descendents <3 or disabled	0.01	0.05	0.002	0.04
Immigrants (%)	5.63	16.32	4.46	15.79
Years of education	6.51	8.86	6.8	9.65
Disability degree				
Absolute permanent disability	40.43		39.94	
Partial-permanent disability for the usual profession (75%)	23.35		27.96	
Partial-permanent disability for the usual profession (55%)	36.22		32.10	
Tenure	5.89	6.47	5.42	4.84
Experience	24.40	17.93	20.07	14.96
Job characterisitcs				
Participation	17.39	88.26	11.07	89.56
Hourly Wage (mean)	11.75	14.18	9.51	11.64
Temporary contract (%)	32.45	31.46	32.54	33.51
Occupation				
Low-skilled	74.39	63.55	61.24	43.49
Medium	24.34	29.28	37.4	49.41
Engineers and University Graduates, Senior management	1.27	7.17	1.36	6.7
Part-time job (%)**	9.18	6.12	19.26	19.28
		2.13		
Monthly Disability benefit (mean)	832.23		668.65	
Time disabled	7.95		6.87	
Firm Characterisitics				
Small firm (<50), %	16.89	59.63	7.49	52.24
Years since foundation (mean)	19.14	18.11	19.36	16.97
Economic Sectos				
Agriculture	3.80	3.71	1.92	3.13
Manyfacturing	18.89	16.89	8.76	9.49
Construction	18.05	14.13	2.10	7.71
Services	59.26	65.27	87.21	85.67



Similarly, poverty, defined as the condition suffered by those whose incomes are 50% lower than those of the median population, also evolves very differently in those with and without a PD (see table 3.2). If in 2005 almost 24% of those in the PD group were poor, in 2008 this had increased to 27.45%. However, for the whole sample, the percentage of individuals considered poor fell from 20.3% in 2005 to 17.9% in 2008. In short, both groups start from different positions and their evolution is distinct, so that the income differential widens significantly from the beginning of the period to the end.

It is interesting to note also that the percentage of individuals considered poor rises greatly among those with a PD when we raise the poverty threshold, that is, when their income is 60% lower than the median income of the population. When calculated for the entire sample, the percentage also increases, but not as much as it does in the PD group. This would seem to indicate that the dispersion of income is smaller in the case of those with a PD.

Table 3.2. Income and poverty among disabled and non-disabled people

	DISABLED (16-64 years old)			NON DISABLED (16-64 years old)		
	2005 (conditions when disability occurs)	2005/2006 (conditions one year after disability transition)	2008	2005 (conditions when disability occurs)	2005/2006 (conditions one year after disability transition)	2008
Median income (€)	10,061	10,103.00	11,575	13,344	14,678	16,842
As % relative to non-disabled	75.40	68.83	68.73	-	-	-
Income mean (€)	15,445.45	14,452.57	14,547	17,126.62	18,775.43	20,786
As % relative to non-disabled	90.18	76.98	69.99	-	-	-
% of poor people*	23.86	27.41	27.45	20.29	18.09	17.86
% of poor people**	35.09	37.83	38.01	24.00	21.99	22.03
% of poor people***	47.20	10.00	7.70	89.36	88.22	83.29

* Income lower than the 50% of the median income

** Income lower than the 60% of the median income

***People already retired in 2005 have been excluded from the sample. People receiving disability benefits are consiered as non-employed.

3.6. Econometric approach and results

Since the general objective of this paper is to analyse the working lives of the disabled relative to those of the rest of the population, focusing on the possible existence of discrimination, we address the issue by examining three issues consecutively: first, we study the probability of employment of the disabled relative to that of the able-bodied and the possible presence of discrimination; second, we analyse the possible wage discrimination of those

with a PD; and, third, should discrimination exist, we estimate its effects on rates of employment. All the estimates are made separately for men and women, given the labour differences that usually exist between the sexes. This also allows us to undertake a comparison with previous studies that only estimate the effects of wage discrimination in the case of men (Baldwin and Johnson, 1994, and Kidd et al., 2000)

- ***Differences in employment probabilities between those with and without a PD and a decomposition of the difference***

In this section we estimate the effect of the degree of disability on the probability of being employed using a simple model that describes the decision to participate in the labour market. Labour market participation (and, thus, the fact that we observe workers' wages) is assumed to be determined by the fit between what the market or the employer offers (which we assume to be influenced by productivity and unexplained factors such as discrimination) and what the worker is willing to accept (which we assume to be influenced by personal circumstances and by the level of income the individual receives from sources other than work).

We can express the employers' wage offer using a simple equation:

$$W_{ig}^{o} = \alpha_g Z_{ig} + \nu_{ig} \qquad (g = A, D) \qquad 3.1$$

where W_{ig}^{o} is the wage offered by the employer, Z_{ig} is a vector of characteristics associated with individual productivity (education, experience, etc.), α_g are the expected rates of return, which we assume differ between the workers with a disability (D) and those without a disability (A).

Finally, the error term includes those factors such as discrimination that are not associated with differences in productivity and that are not directly measurable.

Similarly, the minimum wage that the worker is willing to accept (his "reservation" wage) can be expressed as:

$$W_{ig}^{R} = \beta_g X_{ig} + \varepsilon_{ig}$$
$$(g = A, D)$$

3.2

where X_{ig} incorporates factors associated with "human capital" (education, experience) as well as factors that affect the value of time, or the importance that the person attaches to the future (family life, possessing sources of income other than wages, such as a pension, etc.). Note that we assume that these factors differ between the two groups of workers. While this reservation wage is not directly observable, what we can say is that the probability of observing the individual in work will depend on whether W_{ig}^{o} is greater than W_{ij}^{R}. Thus, we can define a dichotomous variable that represents whether the individual is employed or not:

$$I = 1 \ if \ W_{ig}^{0} > W_{ig}^{R} \ and \qquad 3.3$$
$$I = 0 \ otherwise$$

The probability that the individual is employed can then be defined as:

$$\Pr ob(i \ works) = \Pr[(W_{ig}^{o} - W_{ig}^{R}) > 0] = \Pr[(\alpha_g Z_{ig} - \beta_g X_{ig}) > \varepsilon_{ig} - \nu_{ig}] \qquad 3.4$$

In order to measure the effect of the degree of disability on the likelihood of

being employed, as defined in Equation 4, we estimate successive "probit" type models. First, we estimate the "pure" effect of the degree of PD on employment captured using "dummy" variables (column 1 of tables 3.3.1 and 3.3.2). Next, groups of variables are gradually added to the analysis to see what part of the initial differences is absorbed by these variables. These groups are the variables of personal characteristics and family situation (age, years of education, immigrant status, number of descendants, number of descendants under the age of 3 or disabled), other productivity-related variables (experience and level of occupation of last job) and geographical effects (using indicators of the province in which the person works). Experience is measured as number of years worked, while we define three levels of occupation: low-skilled manual jobs, non-manual jobs and qualified jobs (graduates and engineers). In the case of the disabled we also estimate the effect of the number of years since the onset of disability and the amount of benefit received. Following the traditional correction by Heckman selection (1976), the probit model estimates are also used to obtain the "Inverse Mills ratio", 2 which is introduced as a variable in the wages equations to correct for potential selection bias.

The first columns of tables 3.3.1 and 3.3.2 show that the effect of the degree of PD on the average probability of employment is high and significant for both men and women. This fall in probability ranges between 48% and 81%, depending on the degree of PD in the case of men. For women, the fall is even greater for the less severe degree of PD: ranging between 67% and 83%. The model that includes the personal variables (columns 2 of the same tables) reduces the effect of PD on the probability of employment by just one point (between 1 and 2.)

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[2] $\lambda_i = \frac{f(\phi_i)}{1 - F(\phi_i)}$ where $f(\phi_i)$ and $F(\phi_i)$ are the density function and the distribution function of a normal standard distribution, respectively .

Table 3.3.1. Employment probabilities (probit model). Abled and disabled men (2005-2011)

	Effect of being disabled	+ Personal characterististics	+ Education and experience	+ Geographical effects
Permanent disability for the usual profession (55%)	-0.4817	-0.4622	-0.3273	-0.3244
	(95.89)**	(89.26)**	(55.86)**	(55.30)**
Permanent disability for the usual profession (75%)	-0.8053	-0.7979	-0.7271	-0.7263
	(291.37)**	(249.26)**	(119.50)**	(117.19)**
Absulute disability	-0.8118	-0.8003	-0.7014	-0.7009
	(372.18)**	(305.46)**	(124.59)**	(122.49)**
Age		-0.0106	-0.0089	-0.0086
		(32.83)**	(21.99)**	(21.31)**
Age sq.		0.0001	0.0001	0.0001
		(28.61)**	(22.65)**	(21.69)**
Immigrant		-0.0243	-0.0441	-0.0562
		(16.60)**	(20.66)**	(24.99)**
Number of descendants		0.0572	0.0525	0.0547
		(64.50)**	(62.71)**	(65.82)**
Number of descendants < 3 years old		0.0251	0.0192	0.0186
		(7.38)**	(5.99)**	(5.91)**
Years of education			0.0077	0.007
			(63.53)**	(57.13)**
Experience			-0.0027	-0.0024
			(6.69)**	(6.01)**
Experience sq.			0	0
			(4.40)**	(3.59)**
Amount of disability benefit				-0.0033
				(5.97)**
Years disabled				0.0111
				(17.58)**
Years disabled Sq.				-0.0002
				(8.39)**
Employed prior to disability&				0.0409
				(3.71)**
N	540,558	501,183	487,617	487,617
LR chi2(11)/(14)	100001.00	110020.23	58261.00	61749.37
Prob>chi2	0.000	0.000	0.0000	0.000
Log likelihood	-186320.66	-170637.77	-168605.8	-166862
Pseudo R2	0.2136	0.2358	0.1473	0.1561

* Base category: no studies

Table 3.3.2. Employment probabilities (probit model). Abled and disabled women (2005-2011)

	Effect of being disabled	+ Personal characterististics	+ Education and experience	+ Geographical effects	
Permanent disability for the usual profession (55%)	-0.6681	-0.6576	-0.531	-0.533	
	(105.61)**	(99.91)**	(57.71)**	(57.82)**	
Permanent disability for the usual profession (75%)	-0.8199	-0.826	-0.7635	-0.7672	
	(214.77)**	(219.83)**	(108.69)**	(109.45)**	
Absulute disability	-0.8318	-0.829	-0.7448	-0.7456	
	(270.74)**	(249.47)**	(104.25)**	(103.39)**	
Age		-0.0114	-0.0077	-0.008	
		(34.88)**	(19.99)**	(20.90)**	
Age sq.		0.0001	0.0001	0.0001	
		(34.16)**	(24.09)**	(24.58)**	
		0.0048			
		(3.43)**			
Immigrant		0.0443	-0.0205	-0.022	
		(47.79)**	(11.05)**	(11.55)**	
Number of descendants		-0.0143	0.0452	0.0468	
		(4.80)**	(49.47)**	(51.37)**	
Number of descendants < 3 years old			-0.0162	-0.016	
			(5.52)**	(5.50)**	
Years of education			0.0037	0.0035	
			(29.35)**	(27.49)**	
Experience			-0.0026	-0.0023	
			(7.54)**	(6.70)**	
Experience sq.			0	0	
			-1.79	-1.55	
Amount of disability benefit					-0.0044
				(5.03)**	
Years disabled				-0.0008	
				-0.79	
Years disabled Sq.				-	
				-	
Employed prior to disability&				0.0209	
				(2.78)**	
N	433,718	397,359	389,690	389,612	
LR chi2(11)/(14)	67035.05	66969.87	38338.13	40147.38	
Prob>chi2	0.000	0.000	0.0000	0.000	
Log likelihood	-136717.45	-127265.2	-126009.16	-125094.31	
Pseudo R2	0.1969	0.2083	0.132	0.1383	

* Base category: no studies

In contrast, the incorporation of the productivity-related variables, including experience and education, reduces markedly the effect of disability on employment probability, indicating that the differences between the groups in relation to these variables account for a good part of the differences in participation. These differences, however, remain very high, even with the full model that incorporates regional effects (these do not introduce major changes in the effect of the degree of PD, but are significant for most regions)3. The fall in probability of employment associated with a PD, even when controlling for all the variables in the full model, remains around 32% for the least severe degree of PD in the case of men. For women, the effect of disability in the full model remains at 53%.

Next we perform a decomposition into three components as proposed by Oaxaca and Ransom (1994), and further developed by Bauer and Sinning (2008) for nonlinear models, to decompose the difference in the employment probabilities of the two groups. This allows us to see what part of these differences are attributable to differences in productivity-related characteristics, and what part cannot be explained in this way and is related to the disadvantages associated with being disabled (discrimination).

In general, the decomposition of the differences in means of a variable between two groups can be expressed as:

$$\overline{Y_A} - \overline{Y_D} = (\overline{X_A} - \overline{X_D})\beta^* + \overline{X_A}(\beta_A - \beta^*) + \overline{X_D}(\beta^* - \beta_D) \qquad 3.5$$

As proposed by Oaxaca and Ransom (1994) the first term on the right-hand side of (5) can be interpreted as an estimate of the productivity differential between the two groups, the second term is an estimate of the able-bodied

[3] Results are available from the authors upon request.

advantage and the third term is seen as an estimate of the disabled disadvantage. In (5), Ω is defined as a weighted average of the coefficient vectors, and D:

$$\beta^* = \Omega\beta_A + (I - \Omega)\beta_D \qquad 3.6$$

where Ω is a weighted matrix and I is an identity matrix. Different assumptions about the form of Ω can be found in the literature. Reimers (1983) treats Ω as a weighting matrix Ω = (0.5) I, Reimers (1983) and Cotton (1988) consider Ω as a scalar matrix, while Cotton (1988) proposes the weighting matrix Ω= sI, where s denotes the relative sample size of the majority group. Neumark (1988) and Oaxaca and Ransom (1994) propose fitting a pooled model to derive the counterfactual coefficient vector. Here, we take into account different specifications of Ω as a way of testing the robustness of the results. Nevertheless, the previous literature suggests that major differences can be expected between the results (Oaxaca and Ransom, 1994).

The results (not shown), as was expected (see Oaxaca and Ransom, 1994), show that the decomposition of this difference is very sensitive to the specification of the Ω matrix. The differences in productivity explain between 10.6% and 20.1% of the differences in employment rates between the two groups.

- Wage differentials between workers with and without a PD and decomposition of the difference

As mentioned above, there are reasons to suppose that the wages of people with and without a PD may differ: owing to differences in personal

characteristics (to their age, most plausibly), in productivity-related factors (education, experience, etc.) and also to the existence of discrimination. On the other hand, we have seen that there may be some selection effect whereby those that continue to be employed are the ones that receive higher wages, so that our sample would be biased.

The traditional methodology proposed by Heckman (1976) allows us to correct the wage equation so as to take into account this possible selection effect. The results are shown in tables 3.4.1 and 3.4.2. First, the tests to indicate the model fit that best controls for selection show that it is necessary to control for this effect in all the estimated models (see the foot of tables 3.4.1 and 3.4.2). The selection effect, measured by the significance of the lambda variable in the estimation of wages is significantly negative in all models. Baldwin and Johnson (1994) found lambda to be significant for the group of people without disabilities, but not for the disabled. Kidd et al. (2000), on the other hand, found lambda not to be significant for either of the two groups. The econometric explanation of this result is that unobservable factors in the model exert opposite effects for the probability of employment and wage determination. From a theoretical standpoint, the results show that those not in employment at the existing average wage offers have more valuable opportunities outside the work force.

For men, their personal characteristics unrelated to productivity contribute to increase the effect of disability on wages. This does not hold true for women, probably because those with a PD are, on average, older and age is positively associated with wages. By contrast, differences in education and experience help to reduce the effect of a PD in wages by approximately half for both men and women. This would explain why people with a disability present a disadvantage in these factors in relation to the rest of the population: they

Table 3.4.1. Wage estimates. Men (2005-2011)

	Effect of being disabled	+ Personal charact.	+ Education and experience	+ Job charact.	+ Firm charact.	+ Geographical effects
Disabled	-0.1119	-0.1422	-0.0792	-0.0971	-0.0806	-0.0795
	(12.72)**	(16.16)**	(9.31)**	(10.88)**	(8.87)**	(8.84)**
Age		0.0156	0.0034	0.0185	0.0229	0.0247
		(22.79)**	(3.92)**	(19.63)**	(23.29)**	(25.30)**
Age sq.		-0.0001	0.0001	-0.0002	-0.0002	-0.0003
		(16.19)**	(1.97)*	(20.27)**	(22.19)**	(23.86)**
Immigrant		-0.0001	0.0188	0.1225	0.1383	0.1259
		(-0.61)	(4.95)**	(29.87)**	(32.44)**	(29.43)**
Years of education			0.0383	0.0191	0.0136	0.0119
			(152.19)**	(61.97)**	(41.72)**	(36.41)**
Experience			-0.0357	-0.0336	-0.0336	-0.0338
			(41.54)**	(35.96)**	(34.72)**	(35.17)**
Experience sq.			0.0007	0.0006	0.0005	0.0005
			(45.38)**	(36.45)**	(29.86)**	(29.55)**
Tenure			0.0256	0.0335	0.0244	0.0242
			(69.40)**	(72.29)**	(46.90)**	(46.85)**
Tenure sq.			0	0	0	0
			(74.11)**	(72.62)**	(35.86)**	(35.41)**
Part time job				0.0703	0.1103	0.0994
				(17.97)**	(26.71)**	(24.27)**
Temporary contract				-0.0006	-0.0009	-0.0009
				(68.46)**	(87.02)**	(86.02)**
White collar workers*				0.2471	0.2185	0.2176
				(99.59)**	(84.01)**	(84.22)**
Engineers and University Graduates, Senior management personnel				0.4916	0.4677	0.4694
				(114.86)**	(106.80)**	(107.97)**
Firm age					0.0013	0.001
					(18.15)**	(14.66)**
Small firm (<20 employees)					-0.1582	-0.1521
					(69.47)**	(67.11)**
Manufacturing					0.2347	0.2167
					(31.29)**	(29.09)**
Construction					0.2656	0.2603
					(34.62)**	(34.18)**
Services					0.136	0.1321
					(18.76)**	(18.32)**
Constant	2.2025	1.7436	2.0891	2.0468	1.9771	1.9577
	(207.46)**	(105.90)**	(121.24)**	(106.36)**	(90.04)**	(89.54)**
Lambda	-0.3165	-0.3264	-0.1864	-0.0884	-0.0530	-0.0584
(SE)	(0.0025)**	(0.0025)**	(0.0034)**	(0.0039)**	(0.0043)**	(0.0041)**
Years disabled						-0.0034
						(-3.14)**
Years disabled Sq.						-
N	492,378	492,378	492,378	391,306	352,691	352,691

Table 3.4.1 Continued

Wald chi2	2,093	4,726	4,776	5,653	5,666	6,667
Prob>chi2	0.000	0.000		0.000	0.000	0.000
Uncensored obs	410,397	410,397		309,325	270,710	270,710
Log likelihood	-600,393	-599,088		-438,705	-383,858	-380,948

* Base category: blue collar workers

MODEL 1	LR test of indep. eqns. (rho = 0): chi2(1) = 8776.40 Prob > chi2 = 0.0000
MODEL 2	LR test of indep. eqns. (rho = 0): chi2(1) = 9382.23 Prob > chi2 = 0.0000
MODEL 3	LR test of indep. eqns. (rho = 0): chi2(1) = 388.40 Prob > chi2 = 0.0000
MODEL 4	LR test of indep. eqns. (rho = 0): chi2(1) = 121.43 Prob > chi2 = 0.0000
MODEL 5	LR test of indep. eqns. (rho = 0): chi2(1) = 156.87 Prob > chi2 = 0.0000

Table 3.4.2. Wage estimates. Women (2005-2011)

	Effect of being disabled	**+ Personal charact.**	**+ Education and experience**	**+ Job charat.**	**+ Firm charact.**	**+ Geographical effects**
Disabled	-0.12	-0.1007	-0.0595	-0.0279	-0.0451	-0.0458
	(6.71)**	(5.63)**	(3.46)**	-1.46	(2.24)*	(2.29)*
Age		0.0226	-0.0193	0.0071	0.0126	0.0143
		(26.36)**	(19.58)**	(6.50)**	(10.52)**	(11.94)**
Age sq.		-0.0003	0.0002	-0.0001	-0.0001	-0.0002
		(29.19)**	(13.56)**	(7.95)**	(10.14)**	(11.38)**
Immigrant		-0.0856	0.027	0.2012	0.1686	0.1633
		(21.50)**	(6.40)**	(42.69)**	(33.34)**	(31.95)**
Years of education			0.0466	0.0257	0.0193	0.0185
			(153.19)**	(68.47)**	(46.89)**	(44.44)**
Experience			-0.0001	-0.0151	-0.0228	-0.0232
			-0.08	(14.65)**	(20.01)**	(20.40)**
Experience sq.			0.0002	0.0004	0.0004	0.0004
			(9.98)**	(17.90)**	(16.93)**	(16.76)**
Tenure			0.0177	0.0408	0.041	0.041
			(33.73)**	(60.74)**	(56.95)**	(57.25)**
Tenure sq.			0	0	0	0
			(35.63)**	(53.82)**	(44.00)**	(44.02)**
Part time job				0.4017	0.4247	0.4187
				(118.97)**	(120.70)**	(119.34)**
Temporary contract				-0.0004	-0.0007	-0.0007
				(34.47)**	(60.31)**	(59.24)**
White collar workers*				0.3434	0.2465	0.2446
				(111.60)**	(74.10)**	(73.69)**
Engineers and University Graduates, Senior management personnel				0.6668	0.5547	0.5536
				(116.04)**	(93.11)**	(93.25)**
Firm age					0.0012	0.0011
					(12.34)**	(11.84)**

Table 3.4.2 Continued

Small firm (<20 employees)					-0.2279	-0.2256
					(75.21)**	(74.44)**
Manufacturing					0.1643	0.1502
					(8.77)**	(8.05)**
Construction					0.1823	0.1763
					(8.62)**	(8.38)**
Services					0.1311	0.1237
					(7.20)**	(6.82)**
Constant	1.9056	1.6319	2.0123	1.5875	1.7028	1.6775
	(117.61)**	(72.71)**	(88.73)**	(58.37)**	(47.55)**	(46.94)**
Lambda	-0.326	-0.303	-0.158	-0.109	-0.054	-0.055
SE	(0.0032)**	(0.0034)**	(0.0045)**	(0.0055)**	(0.007)**	(0.0069)**
Years disabled						-0.0048
						(-1.56)
Years disabled Sq.						-
						-
N	382,988	382,988	382,988	318,009	280,473	280,473
Wald chi2	4,348	5,921	5,981	5,980	6,220	6,223
Prob>chi2	0.000	0.000	0.001	0.000	0.000	0.000
Uncensored obs	327,449	327,449	327,449	262,470	224,934	224,934
Log likelihood	-510,502	-509,745	-500,749	-401,216	-348,302	-346,824

* Base category: no studies

MODEL 1
LR test of indep. eqns. (rho = 0): chi2(1) = 5626.85 Prob > chi2 = 0.0000
MODEL 2
LR test of indep. eqns. (rho = 0): chi2(1) = 4194.87 Prob > chi2 = 0.0000
MODEL 3
LR test of indep. eqns. (rho = 0): chi2(1) = 727.57 Prob > chi2 = 0.0000
MODEL 4
LR test of indep. eqns. (rho = 0): chi2(1) = 271.53 Prob > chi2 = 0.0000
MODEL 5
LR test of indep. eqns. (rho = 0): chi2(1) = 46.73 Prob > chi2 = 0.0000

have lower average educational levels and fewer years, on average, of specific work experience ("tenure"). Work characteristics significantly reduce the impact of the degree of PD for women, but not for men. The overrepresentation of people with a PD among low-skilled occupations is markedly higher for women than for men (being around 20 points for the former and 11 for the latter). The fact that women have a relatively greater disadvantage in this aspect may explain the disparity in results between men and women. The characteristics of the firm reduce the impact of PD on wages for both sexes. This is reasonable if we consider the fact that people with a PD are less likely to be employed in small firms (wage penalisation factor). The current legislation in Spain requires companies with over 49 employees to

have a minimum of 2% of people with disabilities on their staff. This probably explains the lower proportion of persons with a PD in small businesses.

Having confirmed the wage differential between workers with and without disabilities, we are now interested in determining what causes these differences. Therefore, once again we apply the decomposition techniques based on Blinder-Oaxaca (Blinder, 1973; Oaxaca, 1973). As suspected initially and as the results in the previous section confirm, there may be a selection bias in the observation of wages, which must be accounted for in the decomposition. To do this, as is usual in similar studies, we use the technique of Reimers (1983) consisting basically in deducting the selection effects from the overall differential and then applying the standard decomposition formulas to this adjusted differential, with the following wage equation corrected for this bias:

$$E(W_{ig}^{0} \mid I = 1) = \beta_g X_{ig} + \frac{\sigma_{vug}}{\sigma_{ug}} \lambda_{ig} \qquad 3.7$$
$$g = A, D$$

where W_{ig}^{0} is the log of the hourly wage of worker i and X_i is a vector of variables that affect productivity. The decomposition of the wage differential can be expressed as:

$$\overline{W}_A - \overline{W}_D - (\gamma_A \overline{\lambda}_A - \gamma_D \overline{\lambda}_D) = D = Q + U \qquad 3.8$$

where the difference is decomposed into an explained (Q) and an unexplained (U) component. This technique is widely used in studies of discrimination because it is based on the assumption that there is a vector of "non-discriminatory" coefficients, which should be used to determine the

contribution of the differences in the model's explanatory variables. Thus, the unexplained component is defined as:

$$Q = \left[E(X_A) - E(X_D)\right]\beta^* \qquad 3.9$$

and the explained component as:

$$U = E(X_A)'(\beta_A - \beta^*) + E(X_D)'(\beta^* - \beta_D) \qquad 3.10$$

The determination of the components of decomposition (10) is quite complex because it requires an estimate for the unknown non-discriminatory coefficients vector β^*. Following Neumark (1988) and Oaxaca and Ransom (1994), we use the coefficients from a pooled model over both groups as the reference coefficients.

The unexplained component, U, of the decomposition is often associated in the literature with the existence of discrimination as, in our case, it captures the part of the wage difference not attributable to differences in productivity. The differences in productivity could be due equally to differences by sector of activity as to the characteristics of the individual, and thus be reflected in the variables included in our model. It is important to note, however, that the unexplained component of the decomposition captures all the effects of the unobservable variables, which we have not specified in our model, and not just discrimination. While we believe, in line with the existing literature, that the model presented is reasonably complete given that it includes the set of variables that have traditionally been associated with productivity, the results on possible discrimination need to be read with some caution.

Table 3.5 shows the decomposition of the wage differentials by groups of variables, according to Equation 7. The part of the wage differential explained is slightly higher for women than it is for men (69.6 versus 65.5). Kidd et al. (2000) find that the unexplained component is also high, around 50%. Personal characteristics, which include age, sex and family status, tend to increase the wage differential by a small amount for men (their impact is less than 1%). For women it is around 5%. It is the productivity-related characteristics that are responsible for most of the explained differences in wages for both men and women. They are responsible for 35% of the variance explained for men and 37% for women. These results are consistent with the wage equation estimates, indicating that the introduction of these variables in the model significantly reduces the impact of a PD on wages. Work characteristics (if the job is unskilled, temporary, part-time, etc.) are a factor to add to the wage differential for men and women. This result seems to contradict the findings for wage estimates for men, for which the introduction of job variables tended to reduce the impact of a PD.

It should be borne in mind, however, that this reduction was very low (close to 2 percentage points). Finally, the characteristics of a firm (size and age) are factors that reduce wage differentials for women and that have hardly any impact in the case of men. As mentioned above, the disabled present a certain advantage with respect to these variables, particularly because of their lower presence in small businesses (associated with lower wages). The introduction of the variable "province of residence" in the estimates does not alter the impact of disability on wages appreciably. While individually the provinces have significant impacts on wages and, in general, on the expected sign (positive for the richest provinces and vice versa), it does not seem that the geographical distribution of people with a PD is a differentiating factor (with respect to the able-bodied) that contributes to an increase in the wage gap

between these groups.

Table 3.5. Decomposition of wage differenctials between abled and disabled

	Men	Women
Log_Hourly wage Abled	2.6518	2.4543
	(1,951.73)**	(1,452.98)**
Log_Hourly wage Disabled	2.4639	2.2520
	(231.65)**	(98.10)**
LN wage differential		
Observed LN wage differential	0.2299	0.1808
	(24.67)**	(8.58)**
Offer LN wage differential	0.2268	0.1941
	(24.17)**	(8.98)**
Personal Characteristics	0.0008	0.011
Education and Experience	0.0802	0.0727
Job Characterisitcs	0.0552	0.0578
Firm Characteristics	0.0097	-0.0181
Other (period, region)	0.0026	0.0117
Total	0.1485	0.1351
% Explained	65.4762	69.6033
	(33.26)**	(14.16)**
N	270,710	224,934

• *The effects of wage discrimination on employment*

In line with previous studies (Baldwin and Johnson, 1992 and 1994), we estimate the effects of wage discrimination against the disabled in the work force:

$$\Pi_j^* = \Phi\left[\left(\frac{\hat{\beta}}{\sigma_g}\right)\overline{X}_g + \frac{\overline{W}_g^{o*} - \overline{W}_g^{o}}{\sigma_g}\right]$$
$$g = A, D \qquad 3.11$$

where the first term on the right-hand side refers to the predicted probability of employment for the representative average able-bodied and disabled individual, respectively; $\overline{X}_j$ incorporates endowments that determine productivity, personal characteristics and factors influencing the value of time; $\overline{W}_g^{o}$ is the mean offer wage and the non-discriminatory offer wage can be estimated from:

$$(\overline{W}_g^{o})^* = 0.5(\hat{\beta}_0^A + \hat{\beta}_0^D) + 0.5((\hat{\beta}_1^A + \hat{\beta}_1^D)\overline{Z}_g \qquad 3.12$$

where the asterisk denotes "non-discriminatory" and, as before, contains human capital variables.

In line with Baldwin and Johnson (1992) we use the 0.5 interval to weight the non-discriminatory wages. As these authors point out, this is an arbitrary but conventional choice (see, also, Cotton, 1988 and Neumark, 1988). The identification of σ_g is more involved and problematic. Again, in line with the literature (Baldwin and Johnson, 1992, 1994 and Kidd et al., 2000), we use the Heckman model of labour supply to obtain σ_g. This implies that we are assuming that hours worked are proportional to the gap between the offer and the reservation wage.

Finally, the effect of wage discrimination on employment depends on the elasticity of labour supply for disabled and able-bodied workers:

$$\eta = \frac{\%\Delta L_g}{\%\Delta W_g} \qquad 3.13$$

where $\%\Delta L_g = (L_g^* - L_g)/(L_g^* + L_g)$, L_g is the weighted total of workers in the group g and $\%\Delta W_g = (W_g^* - \overline{W}_g)/(W_g^* + \overline{W}_g)$

Table 3.6 shows the effects of discrimination (wage differential not explained by differences in productivity) on the probability of employment of the disabled according to the above equations. The calculation of non-discriminatory wages in accordance with equation 11 shows that the disabled would earn higher wages in the absence of discrimination (12.61 for men and 12.28 for women) and that the differences with respect to those without a PD would be reduced significantly: falling from 3.5 points to 1 point in the case of men and from 2.5 to 1 for women. It should be noted that the characteristics associated with productivity, on average, perform worse for those with a PD in both sexes, which suggests certain wage differences would be maintained.

The non-discriminatory employment probabilities are significantly different from those observed in the case of the disabled, especially men. In this group, this difference reaches 5 points, and 3 in the case of women. These differences are greater than those found in previous studies, being hardly noticeable in Kidd et al. (2000) and fluctuating between 0.3 and 1.4 in Johnson and Baldwin (1994).

In general, the elasticities found for men - 0.0012 for able-bodied and 0.3656 for the disabled - are substantially greater than those found by Kidd et al. (2000), but they are similar to those reported by Baldwin and Johnson (1992).

Table 3.6. Employment effects of discrimination

	Male	Female
Non-discriminatory hourly wage	12.61	12.28
Employment probabilities		
Abled	0.8004	0.8030
Abled non-discriminatory	0.8002	0.7955
Disabled	0.6329	0.4348
Disabled non-discriminatory	0.6838	0.4640
Wage elasticities		
Abled	0.0012	0.1059
Disabled	0.3646	0.4366
Loss of jobs to disabled		
N= total of disabled	2415	695
%	5.09	2.92

While the latter study did not address discrimination against the disabled by gender, the employment elasticities are high for both men and women: between 0.1 and 0.33 for the former and between 0.44 and 1.16 for the latter. Note that we are calculating the elasticities with respect to the participation decision and not with respect to the choice of hours worked (the measure typically used in the literature, see for example Killingsworth and Heckman, 1986, or Pencavel, 1986), so that the results are not directly comparable to other studies examining "labour supply". Similarly, the relative magnitude of these elasticities, if we compare the different groups, are as expected according to the theory. As Baldwin and Johnson point out in their article, women can be expected to have higher elasticities than men, given that their average wage is lower. The same authors argue that the same reasoning is valid if we compare those with and without disabilities. We found that, for both sexes, the elasticities of the disabled were higher and that, in general, women have higher elasticities than those of men.

3.7. Discussion and conclusions

Our results confirm the low rates of participation of those with a PD in the labour force, and the marked differences in their employment rates with those of the able-bodied. However, the disincentive effects of employment are less clear and somewhat more controversial. While it is true that higher PD pensions are associated with lower probabilities of employment, it can also be said that, in general, disability leads to impoverishment. Even when PD pensions are taken into account in the computation of income, those who suffer a disability have lower levels of income and their presence among the poor increases, so it is not clear that the decision to forego a salary is fully attributable to the circumstances (being in receipt of a pension) and worker preferences. By contrast, it seems plausible that supposed disincentives to employment tend to emerge, and more especially, on the labour market side. It has been shown in this study that the wage differential between workers with and without a PD is high and significant, and that this gap cannot be explained by differences in productivity.

In this sense, the findings reported here regarding the wage differentials between disabled and able-bodied workers are consistent with previous studies that have explored the existence of discrimination in the labour market as their explanatory hypothesis. In line with Kidd et al's (2000) study of men in Great Britain, based on decomposition techniques, less than 50% of the wage gap between these two groups can be explained by differences in productivity-related characteristics, which means that more than half the gap can, in part, be attributed to discrimination. Although this interpretation is common in the literature on discrimination and, if we adhere to existing studies, the model presented here is reasonably complete given that it includes the set of variables that have traditionally been associated with productivity, the results presented

here indicating possible discrimination need to be read with some caution. This is because the unexplained component of the decomposition may also be capturing the effects of the unobservable variables, which have not been specified in our model.

As in the study conducted by Malo et al., (2011), we found that reconciling work and the receipt of a PD pension depends greatly on the degree of disability recognized. However, unlike the findings reported here, these authors concluded that the amount of the pension does not have a negative effect on the compatibility of being in employment and receiving a PD pension. Indeed, they found significant effects with regard to the amount of the pension only in certain groups (the groups being established on the basis of the size of the pension).

The effects of wage discrimination on the employment rates of those with a PD have been estimated as being important, given the high wage elasticities of the disabled. For men, the difference between the discriminatory and non-discriminatory probabilities of employment is great, so that the estimated effects of discrimination are high. This result suggests that policies aimed at reducing the wage gap between people with and without PD would have significant impacts on employment.

References

Acemoglu, D. and Angrist, J.D. 2001.Consequence of employment protection? The case of the Americans with Disabilities Act. Journal of Political Economy; 19 (5): 915-50.

Agudelo-Suárez A et al. 2009. Proceso migratorio, condiciones laborales y salud en trabajadores inmigrantes en España. Gac Sanitaria; 23 (1):115-21.

Ahonen EQ, Benavides FG. 2006. Risk of fatal and non-fatal occupational injury in foreign workers in Spain. Journal of Epidemiology & Community Health,; 60, 424-426.

Ahonen EQ, Porthé V, Vázquez ML, García AM, López-Jacob MJ, Ruiz-Frutos C, Ronda Pérez E, Benach J, Benavides FG. 2009. A qualitative study about immigrant worker's perceptions of their working conditions in Spain. J Epidemiol Community Health;63:936-942.

Ahonen, EQ., & Benavides, FG. 2006. Risk of fatal and non-fatal occupational injury in foreign workers in Spain. Journal of Epidemiology & Community Health; 33(2): 96-104.

Akhavan S. 2006. The health and working conditions of female immigrants in Sweden. Stockholm, Karolinska Institutet, 93 pp. Available at http://publications.ki.se/jspui/bitstream/10616/37871/1/thesis.pdf
[Accessed January 2011]

Alfredsson, L., Spetz, C., y Theorell, 2003. T. Type of occupation and near-future hospitalization for myocardial infarction and some other diagnoses.

International Journal of Epidemiology; 14(3): 378-388.

Amuedo-Dorantes C, De la Rica S. 2007. Labour market assimilation of recent immigrants in Spain. British Journal of Industrial Relations 45 (2); 257-284.

Amuedo-Dorantes C. 2002. Work safety in the context of temporary employment. The Spanish experience. Industrial and Labour Relations Review; 55 (2), 262-285.

Amuedo-Dorantes, 2000. C. Work transitions into and out of involuntary employment in a segmented market: evidence from Spain. Industrial and Labor Relations Review; 53 (2): 309-325.

Artazcoz L, Benach J, Borrell C, Cortes I. 2005. Social inequalities in the impact of flexible employment on different domains of psychological health. Journal of Epidemiology and Community Health 56: 761-767.

Bago d'Uva, T., Van Doorslaer, E., Lindeboom, M., & O'Donnell, O. 2008. Does reporting heterogeneity bias the measurement of health disparities? Health economics; 17(3), 351-375.

Baldwin y Johnson. 1995. Industrial Relations: A Journal of Economy and Society; 34 (4):555-577.

Baldwin, M. and Johnson, W.G. 1994, Labor market discrimination against men with disabilities. Journal of Human Resources 1994; XXIX (1): 1-19.

Baldwin, M. and Johnson, W.G. 1995. Labor market discrimination against women with disabilities. Industrial Relations; 34 (4): 555-71.

Baldwin, M. and Johnson, W.G. 2000. Labor market discrimination against men with disabilities in the year of the ADA. Southern Economic Journal; 66 (3): 548-66.

Bartley M, Sacker A, Clarke P. 2004. Employment status, employment conditions, and limiting illness: prospective evidence from the British household panel survey 1991–2001

Bauer, T. K., and M. Sinning. 2008. An extension of the Blinder–Oaxaca decomposition to nonlinear models. Advances in Statistical Analysis 92: 197–206

Bell, B. and Smith, J. M., Health, Disability Insurance and Labour Force Participation (May 2004). Bank of England Working Paper No. 218. Available at SSRN:

Benach et al. 2004. Types of employment and health in the European Union. Changes from 1995 to 2000. The European Journal of Public Health, 2004; 14, 314-321.

Benach J, Muntaner C, Santana V, Chairs F. Employment conditions and health inequalities. Final report to the WHO Commission on Social Determinants of Health (CSDH) Employment Conditions Knowledge Network (EMCONET). Geneva: WHO; 2007.

Benavides, FG; Benach, J; Diez-Roug, AV; Roman, C. 2000. How do types of employment relate to health indicators? Findings from the second European Survey on Working Conditions. Journal of Epidemiology and Community

Health; 54: 494-501.

Berger M, Leigh J. Schooling, self-selection, and health. 1989. The Journal of Human Resources; 24 (3), 433-455.

Bielenski H. New patterns of employment in Europe. In: Ferrie JE, Marmot MG, Griffiths J, Ziglio E (eds). Labour Market Changes and Job Insecurity. A Challenge for Social Welfare and Health Promotion. Copenhagen: WHO Regional Publications, European Series No.81, 1999, pp. 11–30.

Blackaby, D., Clark, K., Drinkwater, S., Leslie, D., Murphy, P. and O'Leary, N. Earnings and Employment Opportunities of Disabled People, Research Report 1999; 133, Department for Education and Employment, Nottingham.

Blanck, P.D., Sandler, L.A., Schmeling, J.L. and Schwartz, H.A. 2000. The emerging workforce of entrepreneurs with disabilities: preliminary study of entrepreneurship in Iowa. Iowa Law Review, 85: 1583-668.

Blinder, A. S. 1973. Wage Discrimination: Reduced Form and Structural Estimates. The Journal of Human Resources; 8: 436–455.

Borg V, Kristensen TS. 2000. Social class and self-rated health: can the gradient be explained by differences in life style or work environment? Social Science & Medicine; 51, 1010-1030.

Bound, J., Schoenbaum, M. and Waidmann, T. 1995. Race and education differences in disability status and labour force attachment in the Health and Retirement Survey. Journal of Human Resources; 30: 227-67.

Burström, K., Johannesson, M., Diderichsen, F. Increasing socio-economic inequalities in life expectancy and QALYs in Sweden 1980–1997. Health Economics, 2005; 14: 831–850.

Cappelli, P., Bassi, L., Katz, H., Knoke, D., Osterman, P., Useem, M.: Change at Work. Oxford University Press, New York (1997)

Case A, Deaton A. 2003. Broken down by work and sex: how our health declines. NBER Working Paper.

Case A, Deaton A. 2005. Broken down by work and sex: how our health declines. In Analyses in the Economics of Aging, Wise D (eds). University of Chicago Press: Chicago.

Catalano, R., 1991. The health effects of economic insecurity. American Journal of Public Health 81 (9), 1148–1152.

Catalano, R., Dooley, D. 1983. Health effects of economic instability: a test of the economic stress hypothesis. Journal of Health and Social Behavior; 24, 46–60.

Charles, K K, DeCicca, P. 2008. Local labor market fluctuations and health: Is there a connection and for whom? Journal of Health Economics 27; 1532–1550.

Cheng, G. H. L., & Chan, D. K. S. 2008. Who Suffers More from Job Insecurity? A Meta-Analytic Review. Applied Psychology, 57(2), 272-303.

Choo E, Denny M. 2006. Wearing out – the decline of health. Working Paper,

University of Toronto.

Clark, A., Knabe, A., Rätzel, S., 2010. Boon or bane? Others' unemployment, wellbeing and job insecurity. Labour Economics 17 (1), 52–61.

Clark, A., Postel-Vinay, F., 2009. Job security and job protection. Oxford Economic Papers-New Series 61 (2), 207–239.

Clark, A.E., 2003. Unemployment as a social norm: psychological evidence from panel data. Journal of Labor Economics 21 (2), 323–351.

Cropper M. 1977. Health, investment in health, and occupational choice. The Journal of Political Economy 85 (6), 1273-1294.

Cueto et al. El empleo después de la incapacidad permanente: trayectorias laborales y patrones de salida del mercado de trabajo. Premio FIPROS 2008. Ministerio de Trabajo e Inmigración. Secretaría de Estado de Seguridad Social.

Datta Gupta N, Kristensen N. 2008. Work environment satisfaction and employee health: panel evidence from Denmark, France and Spain, 1994–2001. European Journal of Health Economics 9, 51-61.

Deaton,A.S., Paxson, C.H., 1998.Aging and inequality in income and health. American Economic Review Papers and Proceedings 88 (2), 248–253.

DeLeire T, Levy H. 2004. Worker sorting and the risk of death on the job. Journal of Labor Economics 22 (4), 925-953.

DeLeire, T. 2001. Changes in wage discrimination against people with

disabilities: 1948-93. Journal of Human Resources; 36 (1): 144-58.

Di Tella, R., MacCulloch, R.J., Oswald, A.J., 2001. Preferences over inflation and unemployment: evidence from surveys of happiness. American Economic Review 91 (1), 335–341.

Di Tella, R., MacCulloch, R.J., Oswald, A.J., 2003. The macroeconomics of happiness. Review of Economics and Statistics 85 (4), 809–827.

Diaz-Serrano L. 2013. Immigrants, natives and job quality: Evidence from Spain. International Journal of Manpower, forthcoming.

Diez-Roux AV. 1998. Bringing context back into epidemiology: variables and fallacies in multilevel analysis. Am J Public Health;88:216

Dolado, J, Florentino Felgueroso, F, Jimeno, J. 2000. Youth labour markets in Spain: Education, training, and crowding-out. European Economic Review; 44 :943-956

Esteban-Vasallo, María D.; Domínguez-Berjón, M. Felicitas; Astray-Mochales, Jenaro; Gènova-Maleras, Ricard; Pérez-Sania, Aurelio; Sánchez-Perruca, Luis et al. 2009. Prevalencia de enfermedades crónicas diagnosticadas en población inmigrante y autóctona. Gaceta Sanitaria 23 (6), 548-52.

Fairlie, R. W. 1999. The Absence of the African-American Owned Business: An Analysis of the Dynamics of Self-Employment. Journal of Labor Economics,17, 80–108.

Fairlie, R. W. 2003. An Extension of the Blinder-Oaxaca Decomposition

Technique to Logit and Probit Models, Yale University Economic Growth Center Discussion Paper No. 873, pp. 1–11.

Fernández C, Ortega C. 2008. Labor market assimilation of immigrants in Spain: employment at the expense of bad job-matches? Spanish Economic Review 10 (2), 83-107.

Ferrie, J.E., Shipley, M.J., Smith, G.D., Stansfeld, S.A., Marmot, M.G., 2002. Change in health inequalities among British civil servants: the Whitehall II study. Journal of Epidemiology and Community Health 56, 922–926.

Fletcher, JM; Sindelara, JL;Shintaro, Y. 2011. Cumulative effects of job characterisitics on health. Health Economics 20: 553–570

García-Gómez, P; López-Nicolás, A. 2006. Health shocks, employment and income in the Spanish labour market. Health Economics; 15: 997-1009.

Gash V, Mertens A, Romeu Gordo L. 2007. Are fixed-term jobs bad for your health? A comparison of West-Germany and Spain. European Societies 9 (3), 429-458.

Gómez, S., Contreras, I., Gracia, M. D. 2008: Las reformas laborales en España y su impacto real en el mercado de trabajo en el período 1985-2008, Cátedra SEAT, IESE Business School.

Gottschalk, P; Moffitt, R. 1999. Changes in Job Instability and Insecurity Using Monthly Survey Data. Journal of Labor Economics, Vol. 17, No. S4:91-126

Green F. 2011. Unpacking the misery multiplier: How employability modifies

the impacts of unemployment and job insecurity on life satisfaction and mental health. Journal of Health Economics 30 265–276

Greene W. 1998. Gender economics courses in liberal arts colleges: Further results. Journal of Economic Education 29 (4), 291-300.

Greene, W. H. 2000. Econometric Analysis, 4th edn. New Jersey: Prentice Hall.

Grossman M. 1972. On the concept of health capital and the demand for health. Journal of Political Economy 80 (2), 223-255.

Guell M, Petrongolo B. 2007. How binding are legal limits? Transitions from temporary to permanent work in Spain. Labour Econ 14(2):153–183

Hausman JA. 1978. Specification tests in econometrics. Econometrica 46, 1251-1271.

Haveman, R. and Wolfe, B. 1990. "The economic well-being of the disabled 1962-84", Journal of Human Resources 1990; 25 (1): 32-54.

Heckman, J.J. 1976. The common structure of statistical models of truncation, sample selection and limited dependant variables and a simple estimator for such models. Annals of Economic and Social Measurement 5, 475–492.

Hernberg S. 1999. Towards a new millenium. Scan J Work Environ Health; 25:465-9

Hersch J, Viscusi WK. 2010. Immigrant status and the value of statistical life.

Journal of Human Resources, 45(3), 749-771.

Hershey J, Schoemaker PJH. 1980. Risk taking and problem context in the domain of losses: An expected utility analysis. Journal of Risk and Insurance 47(1), 111-32.

Heymann J, Herzman C, Barer ML, Evans RG. Healthier Societies. From Analysis to Action. Oxford: Oxford University Press, 2006.

Hirschman, A.O., 1973. The changing tolerance for income inequality in the course of economic development, with a mathematical appendix by Michael Rothschild. Quarterly Journal of Economics, 87: 544–566.

Hotchkiss, J.L. Growing Part-Time Employment among Workers with Disabilities: Marginalization or Opportunity?, Economic Review Federal Reserve Bank of Atlanta, 2004; Atlanta, GA, third quarter.
http://ssrn.com/abstract=641161

Jann, B. 2008. A Stata implementation of the Blinder-Oaxaca decomposition for linear regression models. The Stata Journal 8(4): 453-479.

Jenkins, S. and Rigg, J. 2003. Disability and Disadvantage: selection, onset and duration effects. Institute for Social and Economic Research working paper no. 2003-18, Colchester, University of Essex.

Jianakoplos NA, Bernasek A. 1998. Are women more risk averse? Economic Inquiry 36(4): pp. 620-630.

Jiménez-Martín S, Labeaga J, Prieto C. 2006. Award errors and permanent

disability benefits in Spain. FEDEA Working Papers, 2006-18. Available at

Jiménez-Martín S, Labeaga J, Prieto C. 2006. Award errors and permanent disability benefits in Spain. Economics Working Papers: 966.

Jones, MK. 2008. Disability and the labour market: a review of the empirical evidence. Journal of Economic Studies; 35 (5): 405-424. Journal of Epidemiology and Community Health 58, 501-506.

Kamrul Islam, M., Gerdtham, U.G., Clarke, P., Burström, K., 2007. Does socioeconomic health inequality change as the population ages? Evidence from Swedish panel data. Lund University Health Economics ProgramWorking Paper Series No. 12.

Karasek RA. 1979. Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. Administrative Science Quarterly; 24 (2): 285-308.

Kerkhofs M, Lindeboom M. 1997. Age related health dynamics and changes in labour market status. Health Economics 6, 407-423.

Kerkhofs, M, Lindeboom, M. 1997. Age related health dynamics and changes in labour market status. Health Economics; 6: 407-423.

Kidd, M.P., Sloane, P.J. and Ferko, I. 2000. Disability and the labour market: an analysis of British males. Journal of Health Economics; 19: 961-81.

Killingsworth, Mark R., and James J. Heckman, "Female Labor Supply: A Survey," in Orley Ashenfelter and Richard Layard (eds.), Handbook of Labor

Economics volume I (Amsterdam: North-Holland, 1986), 103-204.

Kompier, M., Ybema, J.F., Janssen, J., Taris, T. 2009. Employment contracts: crosssectional and longitudinal relations with quality of working life, health and wellbeing. Journal of Occupational Health 51 (3), 193–203.

Koopman JS, Lynch JW. 1999. Individual causal models and population systems models in epidemiology. Am J Public Health;89:1170

Kristenson H.R. Eriksenb, J.K. Sluiterc, D. Starked, H. Ursin. 2004. Psychobiological mechanisms of socioeconomic differences in health. Social Science & Medicine; 58: 1511–1522

Leeth J, Ruser J. 2006. Safety segregation: The importance of gender, race, and ethnicity on workplace risk. Journal of Economic Inequality 4 (2), 123-152.

Leeth JD, Ruser J. 2006 Safety Segregation: The importance of gender, race and ethnicity on workplace risk. Journal of Economic Inequality; 4: 123-152.

Lindeboom M, Llena-Nozal A, van der Klaauw B. 2005. The interrelation between disability and work and the role of health shocks. Paper presented at the IZA Conference on Income Distribution, Health and Social Insurance of an Ageing Population, Bonn, Germany, September 2005.

Llena-Nozal A, Lindeboom M, Portrait F. 2004. The effect of work on mental health: does occupation matter? Health Economics 13, 1045-1062.

Luechinger, S., Meier, S., Stutzer, A. 2008. Why Does Unemployment Hurt the Employed? Evidence from the Life Satisfaction Gap between the Public

and the Private Sector, WWZ Working Paper 03/08, University of Basel.

Luft, H.S., 1975. The impact of poor health on earnings. Review of Economics and Statistics 57, 43–57.

Lundberg O. 1991. Causal explanations for class inequality in health: an empirical analysis. Social Science & Medicine 32 (4), 385-393.

Lynch, J W; Davey Smith, G; Kaplan, G A; House, JS. 2000. Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. BMJ 320: 1200-1204

Malo MA, Cueto B, Rodríguez V. 2001. Compatibilidad entre pensiones contributivas por incapacidad y empleo: el caso español. Cuadernos de relaciones laborales; 29 (1): 125-153.

Marmot, M. 2004. The Status Syndrome: How Social Standing Affects Our Health and Longevity. New York: Owl Books.

McEwen BS, Seeman T. 1999. Protective and damaging effects of mediators of stress. elaborating and testing the concepts of allostasis and allostatic load. Annals of the New York Academy of Sciences 896: 30–47.

McEwen BS. 1999. Stress and Hippocampal Plasticity. Annual Review of Neuroscience 22: 105–122.

McEwen BS. 2000. Allostasis and allostatic load: implications for neuropsychopharmacology. Neuropsychopharmacology 22(2): 108–124. meta-analytic review. Applied Psychology-an International Review-Psychologie

Appliquee-Revue Internationale 57 (2), 272–303.

Michie S, Williams S. 2002. Reducing work related psychological ill health and sickness absence: a systematic literature review. Occupational Environmental Medicine, 3–8, www.occenvmed.com.

Monden C. 2005. Current and lifetime exposure to working conditions. Do they explain educational differences in subjective health? Social Science & Medicine 60 (11), 2465-2476.

Nätti J. 1993. Temporary employment in the Nordic countries: A 'trap' or a 'bridge'? Work Employ Soc;7:451–64.

Neumark, D. 1988. Employers' Discriminatory Behavior and the Estimation of Wage Discrimination. The Journal of Human Resources 23: 279–295.

Nolan, J.P., Wichert, I.C., Burchell, B.J., 2000. Job insecurity, psychological well-being and family life. In: Heery, E., Salmon, J. (Eds.), The Insecure Workforce. Routledge, London.

Oaxaca RL, Ransom M R. 1994. On discrimination and the decomposition of wage differentials. Journal of Econometrics 61(1):5-21.

Oaxaca, R. 1973. Male-Female Wage Differentials in Urban Labor Markets. International Economic Review 14: 693–709.

Oaxaca, R. L., and M. R. Ransom. 1994. On discrimination and the decomposition of wage differentials. Journal of Econometrics 61: 5–21.

OECD Employment Outlook. Paris, 2003 and 2009

Oi WY. 1974. On the economics of industrial safety. Law and contemporary problems. Occupational Safety and Health 38 (4), 669-699.

ORGANIZACIÓN PARA LA COOPERACIÓN Y DESARROLLO ECONÓMICO (OCDE): Transforming disability into ability: Policies to promote work and income security. París, 2003.

Parra A, Fernández Baraibar J, García López V, Ayestarán JR, Extramiana E. 2006. Mercado de trabajo, salud laboral e inmigración. [Labour market, occupational health and immigration]. An. Sist. Sanit. Navar. 29, Suplemento 1:77-95.

Pencavel, John, "Labor Supply of Men: A Survey," in Orley Ashenfelter and Richard Layard (eds.), Handbook of Labor Economics volume I (Amsterdam: North-Hol- land, 1986), 3-102.

Plaisier I, de Bruijn J, de Graaf R, Have M, Beekman A, Penninx B. 2007. The contribution of working conditions and social support to the onset of depressive and anxiety disorders among male and female employees. Social Science & Medicine 64 (2), 401-410.

Powdthavee, N., 2007. Are there geographical variations in the psychological cost of unemployment in South Africa? Social Indicators Research 80 (3), 629–652.

Power C, Matthews S, Manor O. 1998. Inequalities in self-rated health: explanations from different stages of life. Lancet 351 (9108), 1009-1014.

Robinson JC. 1984. Racial inequality and the probability of occupation-related

injury or illness. The Milbank Memorial Fund Quarterly. Health and Society 62 (4), 567-590.

Robone S, Jones AM, Rice N. 2010. Contractual conditions, working conditions and their impact on health and well-being. The European Journal of Health Economics 12 (5), 429-444.

Rodriguez E. 2002. Marginal employment and health in Britain and Germany: does unstable employment predict health? Social Science & Medicine 55, 963-979.

Schur, L. and Kruse, D. 2002. Non-standard work arrangements and disability income. Report to the Disability Research Institute. University of Illinois Urbana-Champaign, Champaign,IL, August

Schur, L. 2003. Barriers or opportunities? The causes of contingent and part-time work among people with disabilities. Industrial Relations; 42 (4): 589-622.

Senik, C. 2004. When information dominates comparison: a panel data analysis using Russian subjective data. Journal of Public Economics 88, 2099–2123.

Shields, M.A., Wheatley-Price, S. 2005. Exploring the economic and social determinants of psychological well-being and perceived social support in England. Journal of the Royal Statistical Society A 168 (3), 513–537.

Siegrist J. 1996. Adverse effects of high effort / low reward conditions. Journal of Occupational Health Psychology; 1(1):27-41

Smith, K., Kaminstein, D., & Makadok, R. 1995. The health of the corporate body: Illness and organizational dynamics. The Journal of Applied Behavioral Science; 31: 328-351.

Solé, M., Rodríguez, M. 2010. Disparidades entre inmigrantes y nativos en el impacto de las condiciones laborales en la salud. Gaceta Sanitaria; vol.24, n.2.

Stutzer, A., Lalive, R., 2004. The role of social work norms in job searching and subjective well-being. Journal of the European Economic Association 2, 696–719.

Swerdlow AJ. 1991. Mortality and cancer incidence in Vietnamese refugees in England and Wales: a follow-up study. International Journal of Epidemiology, 20, 13-19.

Thomason T, Pozzebon S. 2002. Determinants of firm workplace health and safety and claims management practices. Industrial and Labor Relations Review 55 (2), 286-307 (21).

Vahtera J, Viurtanen P, Kivimäki M, Penti J. 1999. Workplace as an origin of health inequalities. J Epidem Community Health ; 53:399-407.

Valletta R G. 1999. Declining job security. Journal of Labor Economics, Vol. 17, No. S4 :170-197

Van Kippersluis, H., Van Ourti, T., O'Donnell, O., & van Doorslaer, E. 2009. Health and income across the life cycle and generations in Europe. Journal of health economics, 28(4), 818-830.

Vaness DJ. 2003. A structural econometric model of family valuation and choice of employer-sponsored health insurance in the United States. Health Economics 12 (9), 771-790.

Virtanen et al. 2005. Temporary employment and health: a review. International Journal of Epidemiology. doi:10.1093/ije/dyi

Virtanen M, Kivimaki M, Elovainio M, Vahtera J, Ferrie JE. 2003. From insecure to secure employment: changes in work, health, health related behaviours, and sickness absence. Occupation and Environmental Medicine 60, 948-953.

Virtanen, P, Vahtera, J, Kivimäki, M, Liukkonen, V, Virtanene, M, Ferrie, J. 2005. Labor Market Trajectories and Health: A Four-Year Follow-up Study of Initially Fixed-Term Employees. American Journal of Epidemiology; 161: 840-846.

Viscusi WK. 2003. Racial differences in labor market values of a statistical life. Journal of Risk and Uncertainty 27(3), 239-256.

Warren JR, Hoonakker P, Carayon P, Brand J. 2004. Job characteristics as mediators in SES-health relationships. Social Science & Medicine 59 (7), 1367-1378.

Wichert, I., 2002. Job insecurity and work intensification: the effects on health andwell-being. In: Burchell, B., Ladipo, D., Wilkinson, F. (Eds.), Job Insecurity and Work Intensification. Routledge, London, New York, pp. 92–111.

Winkelmann, L., Winkelmann, R., 1998. Why are the unemployed so unhappy? Evidence from panel data. Economica 65 (257), 1–15.