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

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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.

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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 or 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 rate 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). Allostatic 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 in 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 Lalove, 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 from 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 of 4% 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.)

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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:

\[
H_t = H_{t-1} + E_t
\]  

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.
We see disability depending on working and contractual conditions, mainly through the exposure to work-related health risks and job insecurity; Worker’s health stock \((H_i)\) is governed by a health production function where the health stock depreciates at rate \(d\), and \(X\) includes risk exposure \((R)\), insecurity exposure \((I)\), 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 \([0 = (t_0, t_1), (t_1, t_2), \ldots, (t_{k-1}, t_k)]\). The probability of exit in the jth interval for person i is:

\[
\text{prob}\{T \in (t_{j-1}, t_j)\} = S(t_{j-1}; X_{ij}, E_{ij}) - S(t_j; X_{ij}, E_{ij})
\]

and

\[
\text{prob}\{T \geq t_{j-1}\} = S(t_{j-1}; X_{ij}, E_{ij})
\]

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:

\[
S(t_j; X_{ij}, E_{ij}) = \exp[-\exp\left(\sum_{k=1}^{j-1} \delta_{ik} - \delta_{jk} \beta + \delta_{ik}\right)\text{where } \delta_j = \log(H_t) \text{ for } j = 1, \ldots, k]
\]

and where \(H_t\) is the integrated baseline hazard at \(t\). The discrete time hazard, \(h_j\), in the jth interval is:
where $\gamma_j$ is the baseline hazard in the interval $j-1$ to $j$ and $\lambda$ is the instantaneous hazard rate. We also incorporate a Gamma distributed random variable $\epsilon_i$ with unit mean and variance $\sigma^2 = \nu$ to describe unobserved individual heterogeneity. We can rewrite (6) including unobserved heterogeneity as:

$$h_j(X_i, E_u) = 1 - \exp(-\exp(X_i + E_u + \gamma_j))$$  \hspace{1cm} 2.6$$

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.
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

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hazard ratio</td>
<td>S.E.</td>
</tr>
<tr>
<td>Log_period</td>
<td>1.2976</td>
<td>0.0787</td>
</tr>
<tr>
<td>Age</td>
<td>1.2756</td>
<td>0.0251</td>
</tr>
<tr>
<td>Age Sq.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sex</td>
<td>0.5329</td>
<td>0.0647</td>
</tr>
<tr>
<td>Primary Education*</td>
<td>0.8509</td>
<td>0.0770</td>
</tr>
<tr>
<td>Secondary Education</td>
<td>0.7123</td>
<td>0.0913</td>
</tr>
<tr>
<td>University Education</td>
<td>0.2855</td>
<td>0.1055</td>
</tr>
<tr>
<td>Wage</td>
<td>0.5598</td>
<td>0.0149</td>
</tr>
<tr>
<td>Administrative tasks</td>
<td>0.4829</td>
<td>0.0703</td>
</tr>
<tr>
<td>Qualified worker</td>
<td>0.8534</td>
<td>0.5844</td>
</tr>
<tr>
<td>Risk</td>
<td>1.8613</td>
<td>0.1778</td>
</tr>
<tr>
<td>Total time in risky jobs</td>
<td>0.9997</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total time unemployed (previously)</td>
<td>0.9993</td>
<td>0.0002</td>
</tr>
<tr>
<td>Temporary contract</td>
<td>0.3708</td>
<td>0.3424</td>
</tr>
</tbody>
</table>

No. of involuntary transitions to unemployment

|                           | 1.0055        | 0.0025        | 1.9**    | 1.00550.0037  | 1.5        |
| Job insecurity            | -             | -             | -        | 2.95170.8550  | 3.74**     |

Constant, year dummies and year-contract interactions 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
N 135,620
Log likelihood = -2107.76

LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000001
N 135,608
Log likelihood = -7378.41
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.

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.

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; Clark 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)

<table>
<thead>
<tr>
<th>Model 3</th>
<th>Cohort 1 (born between 1952 and 1962)</th>
<th>Cohort 2 (born between 1972 and 1982)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Log period</strong></td>
<td>4.0632 0.6447 8.84 **5.0420 0.8334 9.79 **</td>
<td>6.3395 1.3418 8.73 **</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>0.2107 0.1706 -1.92 **0.9897 0.0385 -0.27 **</td>
<td>0.0638 0.0350 -5.01 **</td>
</tr>
<tr>
<td><strong>Age Sq.</strong></td>
<td>1.0295 0.0137 2.19 **</td>
<td>1.0442 0.0092 4.91 **</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>0.6774 0.1645 -1.6 1.1277 0.1598 0.81</td>
<td>0.3891 0.0464 -7.92 **</td>
</tr>
<tr>
<td><strong>Primary education</strong></td>
<td>0.6858 0.1446 -1.79 **0.9252 0.1283 -0.56</td>
<td>1.0346 0.1258 0.28 **</td>
</tr>
<tr>
<td><strong>Secondary education</strong></td>
<td>0.4618 0.1330 -2.68 <strong>0.6924 0.1288 -1.98</strong></td>
<td>0.4616 0.0741 -4.82 **</td>
</tr>
<tr>
<td><strong>University education</strong></td>
<td>0.0785 0.0679 -2.94 **0.5498 0.1820 -0.28</td>
<td>0.1104 0.0383 -6.34 **</td>
</tr>
<tr>
<td><strong>Wage</strong></td>
<td>0.4477 0.0400 -9 **0.4999 0.0307 8 **</td>
<td>0.5624 0.0180 17.95 **</td>
</tr>
<tr>
<td><strong>Qualified worker</strong></td>
<td>0.3302 0.0934 -3.92 <strong>0.4231 0.0699 -5.21</strong></td>
<td>0.7362 0.0907 -2.49 **</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td>2.0757 0.3897 3.89 **2.1913 0.3207 5.36 **</td>
<td>1.7819 0.2543 4.05 **</td>
</tr>
<tr>
<td><strong>Total time in risky jobs</strong></td>
<td>0.9996 0.0001 -5.47 <strong>0.9999 0.0000 -4.67</strong></td>
<td>0.9998 0.0001 -3.28 **</td>
</tr>
<tr>
<td><strong>Total time unemployed (previously)</strong></td>
<td>0.9987 0.0005 -2.74 **0.9941 0.0044 -1.34</td>
<td>0.9941 0.0286 -0.21 **</td>
</tr>
<tr>
<td><strong>Temporary contract</strong></td>
<td>0.2137 0.0954 -3.46 <strong>0.2105 0.0671 -4.89</strong></td>
<td>1.2460 0.1403 2.95 **</td>
</tr>
<tr>
<td><strong>No. of involuntary transitions to unemployment</strong></td>
<td>0.9858 0.0088 -1.61</td>
<td>0.9887 0.0066 -1.7 **</td>
</tr>
<tr>
<td><strong>Contract signed after 1994</strong></td>
<td>9.9174 4.9895 4.56 **</td>
<td>Constant and year dummies included</td>
</tr>
<tr>
<td><strong>Constant included</strong></td>
<td>Unobserved heterogeneity included using a gamma mixing distribution</td>
<td></td>
</tr>
<tr>
<td><strong>LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000012</strong></td>
<td>N 135,620</td>
<td>Log likelihood –2107.76</td>
</tr>
<tr>
<td><strong>LR test of significance of unobserved heterogeneity fails to reject, p-stat = 0.000007</strong></td>
<td>N 253,881</td>
<td>Log likelihood –7378.41</td>
</tr>
</tbody>
</table>

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 (Bielenksi, 1999; Nätti, 1993).

Table 2.3. Summary results of the effects of contextual factors

<table>
<thead>
<tr>
<th></th>
<th>Model 1. Macro variables and type of contract</th>
<th>Model 2. Macro variables and job insecurity measure</th>
<th>Model 3. Macro variables with variable interactions and type of contract</th>
<th>Model 4. Macro variables with job insecurity measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional unemployment rate</td>
<td>9.5871</td>
<td>6.9652</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary employment rate</td>
<td>0.0572 **</td>
<td>0.0343 **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of contract</td>
<td>0.8553</td>
<td>-</td>
<td>0.7464 **</td>
<td></td>
</tr>
<tr>
<td>Job insecurity measure</td>
<td>-</td>
<td>3.4901 **</td>
<td>1.4945 **</td>
<td></td>
</tr>
<tr>
<td>Temporary contract *</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* unemployment rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary contract *</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* temporary employment rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job insecurity measure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Coeff.</th>
<th>z</th>
<th>**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.0008</td>
<td>4.34</td>
<td>**</td>
</tr>
<tr>
<td>Sex</td>
<td>0.1961</td>
<td>28.9</td>
<td>**</td>
</tr>
<tr>
<td>Immigrant</td>
<td>-0.2063</td>
<td>-18.15</td>
<td>**</td>
</tr>
<tr>
<td>Primary education</td>
<td>-0.0266</td>
<td>-2.4</td>
<td>**</td>
</tr>
<tr>
<td>Secondary education</td>
<td>-0.1836</td>
<td>-16.11</td>
<td>**</td>
</tr>
<tr>
<td>University education</td>
<td>-0.2970</td>
<td>-22.93</td>
<td>**</td>
</tr>
<tr>
<td>Tenure</td>
<td>-0.0558</td>
<td>-27.23</td>
<td>**</td>
</tr>
<tr>
<td>Tenure Sq.</td>
<td>0.0130</td>
<td>50.78</td>
<td>**</td>
</tr>
<tr>
<td>Experience</td>
<td>-0.0257</td>
<td>144.05</td>
<td>**</td>
</tr>
<tr>
<td>Experience Sq.</td>
<td>0.0001</td>
<td>59.46</td>
<td>**</td>
</tr>
<tr>
<td>Administrative tasks</td>
<td>-0.0617</td>
<td>-11.84</td>
<td>**</td>
</tr>
<tr>
<td>Qualified worker</td>
<td>0.0548</td>
<td>4.86</td>
<td>**</td>
</tr>
<tr>
<td>Temporary contract</td>
<td>1.3404</td>
<td>325.76</td>
<td>**</td>
</tr>
<tr>
<td>Unemployment rate (by activity and year)</td>
<td>5.2614</td>
<td>34.7</td>
<td>**</td>
</tr>
<tr>
<td>Temporary employment rate (by sector and year)</td>
<td>1.3036</td>
<td>29.27</td>
<td>**</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.3095</td>
<td>-13.51</td>
<td>**</td>
</tr>
<tr>
<td>ln(sig2u)</td>
<td>1.132782</td>
<td>238.58</td>
<td>**</td>
</tr>
<tr>
<td>N</td>
<td>2,112,647</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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
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