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# The influence of disability on absenteeism: An empirical analysis using Spanish data

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**Non-technical summary**

The study of the influence of disability (and health) on absences reported by workers has been largely neglected in the economic literature on absenteeism. The contribution of this paper lies in that it sheds some light on such relationship. It investigates whether people with disabilities exhibit more absenteeism than other workers and whether other health-related variables (such as a subjective or global self-reported measure of health, visits to doctors and nights spent in hospitals) have a simultaneous influence on absence. We take advantage of the availability of panel information on disability status, health indicators and absence days contained in the European Community Household Panel (although we only use the Spanish data).

Our findings suggest that disability increases absenteeism directly and in interaction with (subjective) poor health, visits to the doctor and nights spent in hospital. However, with the exception of those with poor health, these interactions have proved to exert a relatively small influence on the number of absence days. The total marginal effect of disability on absenteeism ranges from 6 to 10 additional absence days per year. The relevant point here is that firms will incur these costs during the whole life of the work contract and not only as a fixed cost at the beginning of the contract.

The interest of these results is that they shed some light on the sources of statistical discrimination suffered by people with disabilities and provide some empirical evidence that could prove to be useful when discussing the hypothetical amount of the financial incentives that firms should receive in order to be compensated (at least partially) for the impact of disabilities on absenteeism and, thus, productivity. Since disability increases absenteeism, when firms anticipate this effect in the hiring process, the discrimination suffered by people with disabilities due to this reason is statistical and not based on discriminatory tastes. Therefore, informational measures and financial incentives appear to be the most appropriate interventions in the labour market to mitigate this source of discrimination, which results in lower hiring probability and lower wages for people with disabilities.

# THE INFLUENCE OF DISABILITY ON ABSENTEEISM: AN EMPIRICAL ANALYSIS USING SPANISH DATA

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**Abstract**

Using data from the European Community Household Panel for Spain covering the period 1995-2001, this paper investigates the influence of disability on absenteeism reported by workers. Results show that workers with disabilities are absent more days than workers without disabilities. This finding holds even when individual's self-reported health, visits to doctors and nights spent in hospitals are included in the estimations. The total effect of disability on absenteeism amounts to a marginal increase of 6-10 days per year. Implications for labour policy are discussed.

**JEL Classification:** J22, J51, J53
**Keywords:** disability, absenteeism, statistical discrimination

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## 1. Introduction

When workers cannot freely choose the working hours and must accept a more or less 'rigid' organization of working time, absenteeism may be considered a means to adapt effective working hours to the individuals' optimum. Since disabilities heavily affect the distribution and the magnitude of the time budget (Livermore et al., 2000), people with disabilities might be more prone to absenteeism than the rest of the population, even after considering that they presumably face additional health problems that lead them, for instance, to incur in more visits to doctors (Oi, 1991, refers to disability as a facet that 'steals time'). Is this presumption endorsed by the theoretical and the empirical literature? Although there has been a growing interest of economists on absenteeism during the last twenty years, no previous study has attempted to examine the potential impact of disability on work absence. This piece of research attempts to fill this gap in the economic literature.

Traditionally, the theoretical economic literature has focused on workers' choices about working time (using the conventional work-leisure model) and the empirical research has been mainly based on cross-sectional household or worker surveys, therefore examining absence-inducing factors across individuals. In this vein, several studies (Leigh, 1981, 1983; Allen, 1984; Drago and Wooden, 1992; and Winkelman, 1999, among others) have focused their attention on personal characteristics (such as gender or age) and firm characteristics (unionization, size, overtime, or scheduled working hours). Surprisingly enough, the literature (especially the theoretical one) has ignored so far the influence of the individual's health status on absence. The same is true for the potential impact of disability.

The contribution of this paper is that it sheds some light on the up-to-date neglected interest in the study of the impact of health and disability on absenteeism. It investigates whether people with disabilities exhibit more absenteeism than the rest of workers and whether other health-related variables (such as a subjective or global self-reported measure of health, visits to doctors and nights spent in hospitals) have a simultaneous influence on absence. We take advantage of the availability of panel information on disability status, health indicators and absence days contained in the European Community Household Panel (ECHP). From an empirical point of view, using panel data allows us to control for individual effects concerning specific variables potentially correlated with absenteeism. As our absenteeism variable is a

count of absence days per month, we estimate random-effects Poisson regression models.

The remainder of the paper is organized as follows. In section two, we provide a background to understand the potential relationship between absenteeism and disability. Section three presents the data and describes the main variables, in particular the measures of disability and health status. Section four carries out a descriptive analysis, providing a summarized picture of the relationships between the main variables. Section five is devoted to the econometric analysis aimed at estimating the isolated influence of disability on absenteeism. Finally, section six offers a summary and some policy implications.

## 2. Background

Disadvantaged groups usually find it more difficult to participate in the labour market and to compete for jobs. People with disabilities may be particularly affected by discrimination based on either prejudices or a lack of accurate information about impairments and their consequences, as the psychological literature has widely explained (Yuker, 1988).

It is known that people with disabilities receive lower wages and exhibit lower participation rates and higher unemployment rates than the general population (see Baldwin and Johnson, 1994, and Haveman and Wolfe, 2000, for the US, and Zwinkels, 2001, for the European Union). However, the availability of information about what happens at work with disabled people is actually scarce. Only casual information on the potential link between absenteeism and disability seems to circulate among employers. This association might prove to be particularly relevant for its effects on the hiring process: the employers would prefer not to hire people with disabilities, if they expect that this group will fail to turn up to work more frequently than able-bodied people.

The potential impact of disability on absenteeism has not been previously investigated in the economic literature. As Brown and Sessions (1996) argue, ignoring the individual's health status remains a serious weakness of the theoretical economic literature on absenteeism. The empirical research has always recognized that health influences individual absence behaviour though. In this vein, some authors

(Allen, 1981; Leigh, 1991) show that poor health and absence days are positively correlated[1].

One exception to this ignorance is the theoretical paper by Barmby et al. (1994). They use the static neo-classical labour supply model, including an index of health/sickness ($\sigma$, which is assumed to be a random variable with probability density function $f(\sigma)$) in the utility function. Higher levels of this index represent higher levels of sickness. In this context, utility depends on consumption, leisure and sickness levels. By specifying Cobb-Douglas preferences, the relative weight placed on leisure versus consumption is interpreted as the index of sickness: as the individual becomes sicker, he places relatively more weight on leisure than on consumption. Leisure is interpreted as recuperation time. Different realisations of $\sigma$ alter the slope of the indifference curve (the marginal rate of substitution between consumption and leisure), which explains why the individual will attend work or not.

Obviously, the previous model does not refer to disability but to sickness. However, if we interpret $\sigma$ as an index of disability, the main message remains that workers with higher values of $\sigma$ will be absent more frequently. One relevant point here is whether employers are able to screen potential employees prior to recruitment in order to gauge future absence spells. In the case of people without disabilities, this can only be done by having access to records of previous absence. But for people with disabilities, employers may adopt a view of "statistical discrimination": if they expect this group as a whole to be more absent prone, they will assign the highest probability to the next worker with disability to be hired.

Is it sensible to expect that workers with disabilities would fail to turn up to work more frequently than workers without disabilities? On the one hand, both groups of workers are heterogeneous, so we may think that absenteeism may be determined more by personal and job related characteristics than by the disability status of workers. On the other hand, disabled people differ not only in the degree or severity of the disability but also in its type. This means that one would expect certain groups of workers with disability to behave in a similar fashion to able-bodied

[1] Other works on absenteeism are Leigh (1981, 1983), Allen (1984), Dunn and Youngblood (1986), Kenyon and Dawkins (1989), Chaudhury and Ng (1992), Drago and Wooden (1992), Winkelman (1999), Barmby (2002), and Lusinyan and Bonato (2007).

workers; however, other groups may fail to turn up to work more frequently due precisely to the type (and severity) of the disability.

In turn, this may have consequences not only for workers' absence decisions but also for the actions taken by employers, since firms might adopt preventative measures to limit and allow for such anticipated absences. Providing workplace accommodations can reduce the absence rates of disabled workers[2]. And employers can replace a worker with disability by making temporary recruitments or rescheduling existing employees, something that will create hardship for the employer since it implies an adjusting of their workforce.

## 3. Data and main variables

The data we use to investigate the relationship between disability status and absenteeism come from the European Community Household Panel. The ECHP is a large-scale international panel survey carried out by the European Statistical Office (Eurostat) and collected yearly from 1994 to 2001. It was designed to provide fully comparable information on economic and life conditions of the European population. The survey is targeted at private households, collecting information on socio-demographic issues.

In this paper, we do not use the 1994 wave since the questions on disability changed slightly from the first to the second and subsequent waves. Moreover, information on the type of contract held by wage and salary workers is not available for the 1994 wave. Thus, for the sake of homogeneity, the data refer to the period 1995-2001.

A measure of disability can be constructed from the ECHP on the basis of individual responses to the following questions:

- *Q158: Do you have any chronic physical or mental health problem, illness or disability? If Yes ➔ Q159*

[2] The empirical literature that has evaluated the effects of accommodations on employment behaviour in the US has found that providing accommodations can reduce the probability of disabled workers leaving the labour market and, consequently, prolonging their employment (Burkhauser et al., 1995, 1999).

- *Q159: Are you hampered in your daily activities by this chronic or mental health problem, illness or disability? Yes, severely / Yes, to some extent / No*[3]

We assume that those individuals who answer 'yes' (severely or to some extent) to the last question can be defined as disabled persons. Of course, this is a 'subjective' self-reported measure of disability, not an 'objective' measure which does not rely on individual self-reports. It is obvious that the classification generated by self-reporting should not agree with that brought about by the application of objective requisites. On the one hand, one may expect that the use of subjective measures generates an overestimation of the prevalence of disability, since individuals might be justifying their behaviour of low or no labour supply and their receipt of sickness or disability benefits. Since some respondents face economic and/or psychological incentives that may affect their reply to the questions, the self-reported measures will be endogenous. On the other hand, self-reporting may generate an underestimation of prevalence, if disability is considered a stigma. Moreover, the self-reported nature of this information may not be comparable across individuals, which suggests that it may contain measurement error. Finally, the existence of biases is more likely when individuals have to provide information to the health authority in order to receive benefits or to gain access to given rights than in the case of a survey that guarantees the anonymity of respondents[4].

It is worth mentioning that the disability definition included in the ECHP does not correspond with either the international definition provided by the World Health Organization (WHO) nor administrative definitions (which are mainly work-based). Although the first feature reduces the comparability with other international surveys on disability, the second one can be regarded a highly positive characteristic since makes the ECHP definition closer to the WHO one, which defines disability with respect to daily activities. Accordingly, figures obtained from the ECHP give an approximation to the phenomenon of disability not strictly comparable to other

[3] The filtering question was added in the second wave (1995). This is an additional reason to use data from 1995 onwards, since it avoids any problem related to this change in the questionnaire in the following analysis.

[4] Several studies have tried to explain and document the numerous biases generated by subjective and objective measures of disability. See *inter alia* Chirikos and Nestel (1984), Kreider (1999), Campolieti (2002), and Benítez-Silva et al. (2004).

datasets whose questionnaires follow the international definitions more closely than administrative datasets[5].

Furthermore, the ECHP also allows one to have a measure of the individual's subjective health status, since one of the questions asks the individuals to self-report their perceived health in general. Their answers are coded in a range from 1 (very good) to 5 (very bad). This self-reported measure of health status is potentially relevant for the empirical analysis, since it can be used to qualify the information provided by the disability measure. Neither all workers with disabilities have health problems than limit their productivity, nor are all workers without disabilities sickness-free. Since health problems may potentially affect all individuals, we will include controls for health status (and in interaction with the disability measure) in the econometric procedure.

Regarding the variable on absenteeism (the left hand side variable), it has been constructed from a question in the ECHP questionnaire which is read as follows: "Please, think of the last four working weeks, not counting holiday weeks. How many days were you absent from work because of illness or other reasons?" In the empirical analysis, the answers to this question have been used as a non-negative count variable (ranging from 0 to 28) but also to build a dichotomous variable, taking the value 1 for those reporting a positive absence rate and the value 0 otherwise.

From the initial sample on Spanish individuals, we have excluded those individuals who do not report valid information on all the variables to be used in the forthcoming analysis. Therefore, after the application of this restriction, we have been left with 16,101 observations for the empirical analysis.

## 4. Descriptive statistics

Table 1 provides summary statistics on the sample of workers used in the empirical section. In order to uncover possible relationships between absenteeism and other economic variables, the table displays the distribution of the sample of workers broken down into two groups: disabled workers and non-disabled workers. It offers the means and the standard deviations of the variables for both groups.

[5] See Zwinkels (2001), who provides comparisons between panel data and administrative data for

Table 1. Descriptive statistics. ECHP 1995-2001 (Spain)

| Variable | People without disabilities | | People with disabilities | |
|---|---|---|---|---|
| | Mean | St. Dev. | Mean | St. Dev. |
| Absence days per month | 0.70 | 3.41 | 5.34 | 9.71 |
| Subjective health state (1=Bad) | 0.01 | 0.11 | 0.32 | 0.47 |
| Number of visits to a general practitioner (past 12 months) | 1.94 | 3.53 | 7.20 | 9.78 |
| Number of visits to a medical specialist (past 12 months) | 1.05 | 2.92 | 4.37 | 7.03 |
| Number of vistis to any doctor (past 12 months) | 3.00 | 5.31 | 11.58 | 13.58 |
| Number of nights spent in hospital (past 12 months) | 0.34 | 2.70 | 1.81 | 6.55 |
| Age: 16-24 | 0.07 | 0.26 | 0.03 | 0.17 |
| Age: 25-34 | 0.30 | 0.46 | 0.16 | 0.37 |
| Age: 35-44 | 0.31 | 0.46 | 0.26 | 0.44 |
| Age: 45-54 | 0.23 | 0.42 | 0.32 | 0.47 |
| Age: 55-64 | 0.09 | 0.28 | 0.23 | 0.42 |
| Age at which the person started his/her working life | 18.66 | 5.30 | 17.56 | 7.72 |
| Gender (1=Female) | 0.36 | 0.48 | 0.36 | 0.48 |
| Civil Status (1=Married) | 0.67 | 0.47 | 0.74 | 0.44 |
| Educational level: Primary or no studies | 0.33 | 0.47 | 0.14 | 0.34 |
| Educational level: Secondary | 0.20 | 0.40 | 0.15 | 0.36 |
| Educational level: University | 0.47 | 0.50 | 0.71 | 0.45 |
| Occupation: Legislators, senior officials and managers | 0.03 | 0.17 | 0.01 | 0.12 |
| Occupation: Professionals | 0.15 | 0.35 | 0.08 | 0.27 |
| Occupation: Technicians and associate professionals | 0.12 | 0.32 | 0.05 | 0.22 |
| Occupation: Clerks | 0.11 | 0.32 | 0.06 | 0.25 |
| Occupation: Service workers and shop and market sales workers | 0.13 | 0.34 | 0.15 | 0.35 |
| Occupation: Skilled agricultural and fishery workers | 0.02 | 0.13 | 0.04 | 0.18 |
| Occupation: Craft and related trades workers | 0.19 | 0.39 | 0.25 | 0.43 |
| Occupation: Plant and machine operators and assemblers | 0.11 | 0.31 | 0.09 | 0.28 |
| Occupation: Elementary occupations | 0.15 | 0.35 | 0.27 | 0.45 |
| Working hours (per week) | 40.41 | 8.92 | 39.99 | 9.90 |
| Full time (1=Yes) | 0.94 | 0.24 | 0.90 | 0.30 |
| Open-ended contract (1=Yes) | 0.69 | 0.46 | 0.61 | 0.49 |
| Job status (1=Supervisory or intermediate) | 0.27 | 0.44 | 0.22 | 0.41 |
| Sector: Agriculture | 0.04 | 0.19 | 0.10 | 0.31 |
| Sector: Industry | 0.34 | 0.47 | 0.36 | 0.48 |
| Sector: Services | 0.62 | 0.49 | 0.53 | 0.50 |
| Institutional Sector (1=Private firm) | 0.74 | 0.44 | 0.80 | 0.40 |
| Satisfaction level with working conditions (a) | 4.22 | 1.32 | 3.99 | 1.34 |
| Sickness/invalidity benefits (1=Yes) | 0.01 | 0.09 | 0.10 | 0.29 |
| N | 15,450 | | 651 | |

Notes: (a) This variable ranges from 1 (not satisfied) to 6 (fully satisfied).

different European countries.

The figures presented in the table show that the mean of absent days is clearly higher for people with disabilities (5 days) as compared with people without disabilities (0.7 days). One salient feature of absence data is its highly skewed distribution due to the concentration of responses in zero days. To look at this issue and to examine how it differs among groups of workers classified according to their disability status, we have constructed Table 2, which provides the distribution of absenteeism by disability status. This information further corroborates the previous remark: the majority of workers report no absenteeism, although there is a significant difference between people without disabilities (90 percent) and people with disabilities (65 percent).

Table 2. Distribution of absenteeism by disability status. ECHP 1995-2001 (Spain).

| **Absenteeism (days)** | **Without disabilities** | **With disabilities** |
|---|---|---|
| 0 | 90.3 | 65.1 |
| 1 | 3.1 | 5.1 |
| 2 | 1.4 | 2.0 |
| 3 | 0.9 | 1.8 |
| 4 | 0.4 | 1.4 |
| 5 | 0.5 | 1.8 |
| 6 | 0.1 | 0.5 |
| 7 | 0.4 | 0.8 |
| 8 or more | 2.8 | 21.5 |
| N | 15,450 | 651 |

Therefore, the raw information provided so far suggests that the existence of a clear positive correlation between absenteeism and disability. This association might be related to the fact that people with disabilities spend more time in visits to doctors and/or exhibit a poor health state than the rest of people. It is true that on average people without disabilities report fewer visits to any doctor (general or specialist) in the past 12 months than people with disabilities do: 3 versus 12 (see Table 1). To investigate further this relationship, we have estimated the Pearson correlations of the visits to a general practitioner (0.313), a specialist (0.259), and both (0.348) with absent days. Although they are positive and statistically significant, the Pearson coefficients do not show a very strong association.

However, the (subjective) health state is clearly worse for people with disabilities: 32 percent of them report a bad health state, while this proportion is only 1 percent for able-bodied people. Moreover, we have considered nights spent in hospitals in the last 12 months as an "objective" indicator of bad health periods. Since we expect that the number of visits to the doctor do not depend solely on individual decisions (for instance, women might go to the doctor more frequently due to problems related to the rest of the family, mainly children), nights spent in hospitals would be a more objective measure of bad health periods because they would be related to medical decisions external to the individual. The figures in Table 1 show that people with disabilities spend more nights in hospitals than the rest of people (1.8 versus 0.3).

Therefore, people with disabilities exhibit higher absenteeism, visit a doctor (either general or specialist) four times more often and suffer a poorer health state than those without disabilities. Of course, higher absenteeism might be the result of disabilities, of the time spent to go to the doctor, of a bad health state, or of the joint effects of all these variables. The econometric procedure carried out in the next section will help us disentangle these effects.

Before doing that, we turn to Table 1 to present the remainder of the (independent) variables to be used later and to look at how they distribute across the two categories of workers considered. These variables have been grouped into four categories: personal characteristics (age, age at the beginning of the working life, gender, marital status, and educational level attained); firm characteristics (institutional sector (public/private) and industry affiliation); job characteristics (occupation, job category (supervisor, intermediate worker, or employee), working hours, full-time/part-time status, and type of contract); and two additional variables on (subjective) job satisfaction with working conditions and on whether the individual received sickness/invalidity benefits (the latter refers to the previous year of the survey, so it may be considered a proxy of the recent history of sickness or disability recognized by the Social Security)[6].

[6] The questionnaire does not allow to disaggregate sickness benefits (a short-term income transfer) from invalidity or disability pensions (a long-term income transfer). Therefore, although this variable provides a useful control in the estimation procedure, it would be difficult to properly interpret its coefficient.

The sample data suggest that, when compared with the rest of workers, people with disabilities are on average older, have a higher educational attainment, and are more likely to be in low-skilled manual occupations, in jobs with fixed-term contracts, in private firms or in the agriculture sector.

## 5. Empirical specification and results

The dependent variable used in the analysis is a non-negative count variable, since each observation refers to the number of days the individual has failed to turn up to work. Therefore, we assume that it has been generated by a Poisson-like process[7]. As the dataset is a panel, we have estimated Poisson and Negative Binomial regressions with random effects[8]. The tests for the estimated Negative Binomial regressions show that the parameters related to the heterogeneity generated by the random effects were not significant[9]. Thus, we only report the results obtained with the random-effects Poisson models[10], which typically correspond to the estimation of the following equation:

$$ln\ \lambda_{it} = \beta' X_{it} + \varepsilon_i$$

where $\varepsilon_i$ is a random effect for the *i*th group (constant across time) and $exp(\varepsilon_i)$ exhibit a gamma distribution with parameters $(\theta, \theta)$. Thus, $E[exp(\varepsilon_i)]=1$ and $Var[exp(\varepsilon_i)]=1/\theta=\alpha$. Therefore, a test on $\alpha=0$ is, in fact, a test on the statistical significance of the random effects. We have obtained significant estimates for the parameter $\alpha$ in all the estimations we have carried out.

Table 3 provides a summary of the estimate results for different specifications (models 1 to 5). It reports the coefficients corresponding to the disability variable and to the interactions of disability with the subjective health measure, with visits to a doctor and with nights spent at a hospital. All the specifications also include controls for individual, job and firm characteristics that can be constructed from the information provided in the ECHP and described in the previous section.

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[7] Count data models have been employed previously to estimate the determinants of absenteeism (for instance, Delgado and Kniesner, 1997, and Winkelmann, 1999). For a description of count data models, see Winklemann and Zimmerman (1995) and Cameron and Trivedi (1998).

[8] The estimation of (conditional) fixed-effects models reduces the sample in around 10,000 observations.

[9] In these estimations, random- and fixed-effects refer to the distribution of the dispersion parameter and not to the usual $X\beta$ term in the model.

[10] In general, for a discrete random variable $Y$ with observed frequencies $y_i=1,\ldots,n$, where $y_i$ is non-negative integer count and regressors $X_i$, the Poisson model assumes that $Prob(Y=y_i)=exp(\lambda_i)(\lambda_i)^{y}{}_i(y_i!)^{-1}$, and $log\ \lambda_i=\beta' X_i$ (or, alternatively, $\lambda_i=exp(\beta' X_i)$). In the Poisson model, $\lambda_i$ corresponds to the mean and the variance of the dependent variable: $E[Y]=\lambda_i$.

Table 3. Marginal effects of disability variables on absence days estimated from the random-effects Poisson models. ECHP 1995-2001 (Spain).

| | **Disability** | **Bad Health * Disability** | **Visits to a general pract. * Disability** | **Visits to a specialist * Disability** | **Visits to any doctor * Disability** | **Nights in hospital * Disability** |
|---|---|---|---|---|---|---|
| **Model 1** | 0.844 | 0.886 | | | | |
| **Model 2** | 0.598 | 0.761 | 0.014 | | | |
| **Model 3** | 0.635 | 0.771 | | 0.021 | | |
| **Model 4** | 0.503 | 0.696 | | | 0.023 | |
| **Model 5** | 0.702 | 0.746 | | | | 0.026 |

The estimate results show that the coefficient of the severe disability category is always positive and statistically significant. This would mean that disability increases the number of absence days. The marginal effects indicate that workers with disability would fail to turn up to work 0.5-0.8 days per month more than workers without disability, on average. In estimations without any interaction (not shown), the marginal effect of disability amounted to 1.5 days. The distinction between severe and moderated disability suggest that the effect of both is positive, but the magnitude of the impact of suffering severe disabilities on absenteeism is larger (around two days) than suffering moderate disabilities (around 0.5 days).

Turning now to the interactions of suffering disabilities with those variables intended to capture health problems, they have a positive influence on absenteeism as expected, but these effects are rather small: they never exceed 0.1 additional absence days (see models 2-5). The exception to this result corresponds to the interaction of disability with poor subjective health (model 1). This interaction brings about an effect similar in size to the isolated influence of severe disability on absenteeism. Nonetheless, although we find that people with disabilities who visit a doctor (or who spend more nights at a hospital) report higher absenteeism, these effects turn out to be relatively small, those related to the disability itself and to the interaction of poor health and disability being the largest.

To fully appreciate the joint effect of disability (captured by the corresponding dummy variables plus the interactions), we have estimated the predicted days of absence for people with disabilities and for the rest of the population. These predictions have been obtained for all individuals. Table 4 reports the means, standard

deviations, minima and maxima for the five Poisson models considered previously[11]. The predicted average amounts to 3 absence days in the case of people with disabilities and to 0.8 absence days in the case of people without disabilities. Although this difference is lower than that observed in the raw data (5 and 0.7, respectively, in Table 1), the total effect of disability on absenteeism appears to be relevant even after discounting the effect of the rest of variables.

Table 4. Predicted average effect of disability on absence days (evaluated at the mean of the rest of variables, including interactions with disability).

| | | **Mean** | **Std. Dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Model 1 | With disabilities | 3.2 | 2.6 | 0.3 | 16.0 |
| | W/O disabilities | 0.8 | 0.5 | 0.1 | 6.9 |
| Model 2 | With disabilities | 3.0 | 2.9 | 0.3 | 31.1 |
| | W/O disabilities | 0.8 | 0.5 | 0.1 | 6.6 |
| Model 3 | With disabilities | 3.1 | 3.4 | 0.3 | 62.7 |
| | W/O disabilities | 0.8 | 0.5 | 0.1 | 6.8 |
| Model 4 | With disabilities | 3.0 | 2.9 | 0.3 | 30.4 |
| | W/O disabilities | 0.8 | 0.5 | 0.1 | 6.6 |
| Model 5 | With disabilities | 3.1 | 3.9 | 0.3 | 56.4 |
| | W/O disabilities | 0.8 | 0.5 | 0.1 | 6.7 |

Nevertheless, even without considering interactions, disability increases absence days in the range of 0.5 to 0.8 days per month. This finding confirms the usual employers' presumption that people with disabilities will fail to turn up to work more frequently because of their disabilities (and not simply because they go more frequently to a doctor or spend more nights in hospitals). This effect amounts to 6-10 days on annual base. If we consider that the cost of absenteeism for a firm consists of a worker's substitute earning the same wage (which can be considered a very rough approximation), the additional cost of hiring a person with disabilities ranges from 25 to 30 percent of her monthly wage per year. We note that this amount does not reflect a fixed cost assumed at the beginning of the work contract, but a cost per year for the whole life of the contract.

Therefore, the effect we have found is not negligible and should be considered in any public policy trying to promote labour market participation for people with

[11] We have obtained these predictions assuming that the random effects are equal to zero.

disabilities. If firms anticipate correctly this influence of disability on absenteeism, the expected results will be lower wages and/or lower hiring probabilities for this group of workers. Since our results provide information on the size of this phenomenon (6-10 days per year), any financial incentive for hiring people for disabilities should be at least enough to cover this loss, not only at the moment of hiring but continuously during the life of the work contract.

Furthermore, these results highlight one of the sources of statistical discrimination for these workers, since the effect on hiring would exist even if some given individuals do not exhibit higher absenteeism due to their disabilities. However, they will be judged by the average behaviour of people with disabilities and not by their individual behaviour. The reason lies in the informational limitations on the part of employers at the moment of hiring.

The findings related to other variables included in the estimations are worthy of comment. These are reported in Table 5, which displays the estimate results corresponding to the model 1 in Table 3.

Table 5 Estimates results of a random-effects Poisson regression model on absence days per month. ECHP 1995-2001 (Spain).

| **Variables** | **Coef.** | **Std. Err.** | **z** | **dy/dx[(b)]** | **Std. Err.** | **z** |
|---|---|---|---|---|---|---|
| Age: 16-24 | -0.33 | 0.081 | -4.09 | -0.205 | 0.045 | -4.58 |
| Age: 25-34 | -0.219 | 0.045 | -4.89 | -0.149 | 0.030 | -4.90 |
| Age: 45-54 | -0.157 | 0.045 | -3.49 | -0.107 | 0.030 | -3.59 |
| Age: 55-64 | 0.550 | 0.071 | 7.70 | 0.494 | 0.083 | 5.95 |
| Age at which the person started his/her working life | -0.039 | 0.009 | -4.33 | -0.028 | 0.007 | -4.24 |
| Gender (1=Female) | 0.585 | 0.107 | 5.45 | 0.456 | 0.094 | 4.86 |
| Civil Status (1=Married) | 0.614 | 0.057 | 10.85 | 0.398 | 0.040 | 9.88 |
| Educational level: Primary or no studies | -0.374 | 0.050 | -7.42 | -0.250 | 0.033 | -7.49 |
| Educational level: University | -0.628 | 0.042 | -14.85 | -0.447 | 0.038 | -11.80 |
| Occupation: Legislators, senior officials and managers | 0.763 | 0.135 | 5.65 | 0.796 | 0.204 | 3.91 |
| Occupation: Professionals | 0.004 | 0.087 | 0.05 | 0.003 | 0.062 | 0.05 |
| Occupation: Technicians and associate professionals | -0.035 | 0.057 | -0.61 | -0.024 | 0.039 | -0.62 |
| Occupation: Service workers and shop and market sales workers | 0.024 | 0.070 | 0.35 | 0.017 | 0.051 | 0.34 |
| Occupation: Skilled agricultural and fishery workers | 0.328 | 0.107 | 3.07 | 0.274 | 0.105 | 2.62 |
| Occupation: Craft and related trades workers | 0.375 | 0.072 | 5.22 | 0.301 | 0.066 | 4.57 |
| Occupation: Plant and machine operators and assemblers | 0.148 | 0.073 | 2.02 | 0.111 | 0.059 | 1.90 |
| Occupation: Elementary occupations | 0.229 | 0.068 | 3.35 | 0.176 | 0.057 | 3.08 |
| Working hours (per week) | 0.018 | 0.002 | 9.62 | 0.013 | 0.001 | 8.72 |
| Full time (1=Yes) | -0.315 | 0.065 | -4.83 | -0.258 | 0.062 | -4.15 |
| Open-ended contract (1=Yes) | 0.147 | 0.035 | 4.22 | 0.102 | 0.024 | 4.21 |
| Job status (1=Supervisory or intermediate) | -0.187 | 0.033 | -5.69 | -0.127 | 0.022 | -5.76 |
| Sector: Agriculture | -0.069 | 0.094 | -0.73 | -0.048 | 0.063 | -0.76 |
| Sector: Services | -0.159 | 0.049 | -3.23 | -0.115 | 0.037 | -3.13 |
| Institutional Sector (1=Private firm) | -0.161 | 0.052 | -3.11 | -0.119 | 0.040 | -2.98 |
| Satisfaction level with working conditions [(a)] | -0.049 | 0.008 | -6.01 | -0.035 | 0.006 | -5.84 |
| Sickness/invalidity benefits (1=Yes) | 0.219 | 0.048 | 4.53 | 0.174 | 0.043 | 4.03 |
| Disabilities (1=Yes) | 0.545 | 0.045 | 11.99 | 0.503 | 0.058 | 8.71 |
| Interaction: Health state*Disabilities (1=Bad health and disability) | 0.688 | 0.051 | 13.36 | 0.696 | 0.079 | 8.83 |
| Interaction: Visits to any doctor*Disabilities | 0.018 | 0.001 | 12.47 | 0.013 | 0.001 | 10.74 |
| Constant | 0.016 | 0.211 | 0.07 | | | |
| /lnalpha | 1.943 | 0.037 | | | | |
| Alpha | 6.979 | 0.258 | | | | |

Notes:
(a) This variable ranges from 1 (not satisfied) to 6 (fully satisfied).
(b) Marginal effects have been estimated assuming that random effects are equal to zero.

With regard to the variables capturing personal characteristics, the results do not differ from what was expected. First, absenteeism and age are positively correlated, so the older the worker, the higher the number of days lost due to absenteeism. Similarly, in line with what the empirical literature on absenteeism has

found (Leigh, 1983; Dunn and Youngblood, 1986), women exhibit higher levels of absenteeism than their male co-workers. In addition, married workers are more absent than their non-married counterparts. These findings may be reflecting that women (with dependent children) are more sensitive to family needs, thus being more likely to be absent than men. Finally, workers with secondary education appear to be the group who fails to turn up to work more frequently, in general (absenteeism is also lower for workers with primary or no studies).

Job and firm characteristics are deemed to be significant predictors of absenteeism. First of all, the institutional sector appears to be relevant to explain the number of days lost: workers in the private sector are absent 0.12 days per month less than workers in the public sector. This occurs after controlling for industry and occupation. Job characteristics related to working time and the type of contract also affect the number of absence days though: individuals reporting longer working weeks and holding a permanent contract fail to attend work more days. These effects agree in part with previous studies showing that absenteeism is used to adjust effective working time to the optimum time desired by individuals (Brown and Sessions, 1996) and that workers who enjoy more employment security are more likely to be absent (Jimeno and Toharia, 1996; Engellandt and Riphahn, 2005). The hierarchical position is also relevant, since working as a simple employee (not as supervisor or intermediate worker) increases absence days.

Finally, we have included a variable that captures the fact of receiving sickness/invalidity benefits and another variable related to the degree of job satisfaction with working conditions. On the one hand, if disability pensions usually exert a detrimental effect on labour market participation (Bound and Burkhauser, 1999, for the US, and Malo, 2004, for Spain), a positive effect of receiving sickness/invalidity benefits on absenteeism is expected. In fact, as Brown and Sessions (1996) show, there is wide empirical evidence documenting the effect of sickness benefits on longer absences. We find that receiving sickness/invalidity benefits are positively associated with absenteeism. But it should be borne in mind that our variable refers to the previous year of the survey and incorporates both short-term and long-term income transfers, so its coefficient is difficult to be interpreted.

On the other hand, when workers are dissatisfied with their working conditions, one way of expressing their discontent may be not attending work. This

would cause a negative effect on absenteeism, indicating that more dissatisfied workers are absent more days. In terms of the model of Steers and Rhodes (1978), workers who lack motivation to attend incur in more "avoidable" absence. This effect is precisely what we find in the estimations[12].

## 6. Conclusions

This paper has investigated the influence of disability (and health) on absenteeism reported by workers. This topic has been largely neglected in the economic literature on absenteeism, so our contribution lies in having tried to shed some light on it. We have found that disability increases absenteeism directly and in interaction with (subjective) poor health, visits to the doctor and nights spent in hospital. However, with the exception of that with poor health, these interactions have proven to exert a relatively small influence on the number of absence days. The total marginal effect of disability on absenteeism (evaluated at the mean of the variables in interaction) ranges from 6 to 10 additional absence days per year. The relevant point here is that firms will incur these costs during the whole life of the work contract and not only as a fixed cost at the beginning of the contract.

The interest of these results is twofold. On the one hand, we provide new evidence on the labour market behaviour of people with disabilities. While there is substantial literature which documents their lower probability of being economically active and their wage discrimination with respect to people without disabilities, studies focusing on their behaviour at work are very rare. In fact, up to our knowledge, this paper constitutes the first piece of research in economics that investigates the relationship between absenteeism and disability.

On the other hand, the results shed some light on the sources of statistical discrimination suffered by people with disabilities and provide some empirical evidence that could prove to be useful when discussing about the hypothetical amount of the financial incentives that firms should receive in order to be compensated (at least partially) for the impact of disabilities on absenteeism and, thus, productivity.

[12] In another set of estimations not shown, we included workers' satisfaction with respect to seven domains of work: earnings, security, work type, hours, working time, working conditions, and commuting distance. Three indicators (those relating to earnings, working conditions and commuting distance) were significant and negatively correlated with absenteeism. The satisfaction with working conditions displayed the strongest effect in all estimations. These results are available upon request.

Since disability increases absenteeism, when firms anticipate this effect in the hiring process, the discrimination suffered by people with disabilities due to this reason is statistical and not based on discriminatory tastes. Therefore, informational measures and financial incentives appear to be the most appropriate interventions in the labour market to mitigate this source of discrimination, which results in lower hiring probability and lower wages for people with disabilities.

Informational measures are needed since different types and degrees of disability presumably bring about diverging effects on absenteeism, so firms should receive accurate, objective information on the existence of this heterogeneity. Although the database used in this study has some limitations to account for it, we have obtained evidence that severe disabilities increases absences more than moderate disabilities.

Specialized labour market intermediation services may be very useful to cover that task. Our results support the promotion of this type of employment services. Furthermore, these results suggests that financial incentives to encourage the hiring of people with disabilities should not be a lump-sum transfer to the employer but a periodical transfer, since the higher cost due to absenteeism is not a fixed one. The estimate results obtained in our analyses also provide a minimum amount for financial incentives to hire people with severe disabilities: these transfers should cover at least the cost of 6 to 10 absence days per year.

We hope to extend our analysis to study further the differences between groups of workers with disabilities and to investigate potential differences across several European countries.

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