**Do temporary contracts increase
work accidents? A microeconomic
comparison between Italy and Spain
by
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1. Introduction

Over the past few decades, European countries have been progressively adopting measures aimed at facilitating the use of fixed-term or temporary contracts (OECD, 2002). The extensive use of temporary work has raised concerns about its economic consequences, not only in terms of the increased volatility of employment in recessionary times but also in terms of the consequences of this type of employment for job quality and working conditions. One of the most prominent examples of the latter refers to work accidents.

Indeed, aggregate indicators do suggest that some relationship might exist between the use of temporary contracts and the incidence of work accidents. Figure 1 plots that incidence against the proportion of temporary (or fixed-term) employees in a number of countries for 1998¹. The simple linear-regression, upward-sloping line and the coefficient of determination for that regression do appear to suggest that in countries where the proportion of temporary employment is high the rate of work accidents tends also to be high. Spain is above the regression line, implying that the accident rate is lower than predicted by the simple regression, while the opposite tends to happen in Italy. Still, it is true that Spain is the country with the highest incidence of both temporary employment and work accidents. As a matter of fact, if Spain is taken out from the regression, the determination coefficient drops almost by half. Also, there are several examples of countries with similar incidences of temporary employment and very divergent accident rates (e.g. the UK and Belgium, or Sweden and Germany).

¹ Data refer only to males because they show the highest accident rates. However, similar results are found for females.

Figure 1.
Incidence of temporary employment and accident rates: a cross-country comparison, male employees

(Source: The European Statistics on Accidents at Work and European LFS)

This evidence, while suggestive, is too aggregate to be conclusive. More specifically, what is relevant is not so much whether, say, Spain has a higher rate of work accidents as compared to other countries but whether *within* Spain, temporary workers tend to show higher rates of work accidents than their permanent (or to be more precise “open-ended”) counterparts. And the same applies to the other countries. This is precisely the purpose of this paper, which approaches the problem from a microeconomic point of view, for the cases of Spain and Italy, taking advantage of the specific LFS module on accidents carried out in 1999. There are several reasons why this comparison is particularly interesting. First, both Italy and Spain have been generally considered among the OECD countries with the strictest employment protection legislation, especially for permanent (or “open-ended”) employees (Bertola et al, OCDE, 1999). Secondly, both countries have been classified as epitomizing the so-called “Mediterranean Welfare State” (Esping-Andersen, 2000), a model

characterized, among other things, for having the lowest participation rates within the EU. Finally, both countries have experienced relatively similar processes of labour market deregulation, albeit at different moments in time². Thus, while in Spain the rise of temporary employment dates back to the eighties³, in Italy it is a much more recent phenomenon which, as yet, has not reached in any way the intensity it reached in Spain: the proportion of employees under temporary contracts is about 10 percent in Italy (a proportion which, in any case, has doubled in the past 10 years), while it has remained at around 30 percent in Spain since 1992, when it seemed to reach a steady state after a significant increase.

Thus, the main objective of this paper is to analyze the differences in work accidents by contract type in Italy and Spain, and to try to determine whether these differences can be attributed to the contract per se or to the fact that temporary workers tend to be concentrated in the sectors and occupations, and also have personal characteristics, which are prone to work accidents. The data used, coming from a survey to workers themselves, is very novel, as it is based on a comparative project and it also allows to consider the invaluable and complete information available in labour force surveys.

The paper is organized as follows. In section 2, we discuss the previous studies on accidents both in Spain and Italy, emphasizing the differences in approach and information which our paper provides. We next present the basic information and data on the LFS specific module as well as the basic descriptive statistics that follow from it. Section 4 then turns to our first econometric

² For a comparison between “atypical work” in Italy and Spain, see Cebrián *et al.* (2002).

³ For an early analysis, see Segura *et al.* (1991). Later analyses have talked of a model based on a “flexibility at the margin” (see Saint Paul, 1996, Toharia and Malo, 2000 and Toharia 2002), because only labour market entry was deregulated, leaving the core of the labour market (dismissal costs for open-ended workers) untouched.

analysis, where by estimating a series of probit regressions, we conclude that the gross difference in probabilities of accident between open-ended and temporary workers vanishes when the personal and, above all, job characteristics of those involved. This first analysis is supplemented in section 5 with a decomposition study of the probability differences, using a novel approach (Yun, 2004) which develops a method to undertake an analysis similar to the classic Blinder-Oaxaca decomposition in the case of non-linear regressions such as those used to explain the probability of being involved in a work accident. Section 6 concludes.

2. Background

Safety at work has been dealt in the literature from a theoretical and an empirical point of view. In theoretical terms, there have been models which have justified the presence of public regulation based on the lack of perfect information or the existence of incomplete markets (Oi, 1974, Diamond, 1977, among others), because without market failure riskier jobs would simply receive higher compensation and agents would have right incentives to properly invest in job safety. From an empirical point of view, Bahuer *et al.* (1999) use a *bivariate count data model* to analyze the differences in work accident rates between German and immigrant workers in manufacturing in Germany. Graham *et al.* (1990) study the relationship between the existence of a segmented market and work accidents. Worrall *et al.* (1983) analyze the differences in health conditions and accident risk between workers belonging to a trade union and others.

In Spain, several studies (Huguet, 1999, Cebrian *et al.*, 2001, Hernanz 2004, among others) have studied the labour market segmentation which has arisen in Spain alongside the huge increase in temporary employment observed

since the mid-eighties. One may wonder to what extent such a structure, which departs from the competitive model, affects work accidents. In particular, our interest here is to deal with the relationship between contract type and incidence of work-related accidents.

Given the lack of databases containing a detailed information on the personal and job characteristics of workers suffering work accidents, there are very few studies which have dealt with this issue of relating contract type and work accidents. However, in the Spanish case there have been a few of them. The basic reference is the so-called “Duran report” (Durán *et al.*, 2001)⁴. This report concludes that a clear, strong relationship exists between temporary employment and work accidents. Amuedo-Dorantes (2002) uses the 1997 Encuesta Nacional de Condiciones de Trabajo (National Survey on Working Conditions), concluding that the higher rate of work accidents observed in the case of temporary workers may be attributed to their worse working conditions, because once these are controlled for, temporary workers show an even lower probability of suffering a work accident than do open-ended workers. However, Guadalupe (2003), using the administrative statistics published by the Ministry of Labour for the period 1989-1998 concludes that it is possible to identify a specific, positive, effect of temporary contracts on the probability of suffering a work accident.

For the Italian case, Barone *et al.* (2001), using the European Community Household Panel and also data from the Bank of Italy, observe that workers in riskier occupations tend to be males under 55 with lower skill levels, shorter tenures with their firms and a higher number of unemployed in their

⁴ After Federico Durán, the president of the Economic and Social Council (CES), a tripartite consultative agency where employers, unions and other organisations discuss and advise governmental policies. The Durán report, however, was not produced by the CES, but rather by an experts commission appointed by government. Durán chaired it.

household. In addition, they find that these workers receive a small wage compensation for their higher risk at work.

Finally, Dupré (2001), on the basis of the *ad hoc* LFS module and the European accident statistics, compares the differences in work accident rates among the European countries as well as between the different types of workers and jobs. He shows, among other things, that a lower job tenure is associated with a higher accident probability. For example, for workers with a permanent, or open-ended, contract, with less than 2 years of tenure, the incidence of work-related accidents is 26 percent higher than average.

On the whole, and with the significant exception of Guadalupe (2003), the evidence tends to suggest that temporary employment, while correlated on average with higher accident rates, is not so significant when personal and job characteristics are controlled for.

Against this background, our paper adds new evidence based, more clearly and consistently than earlier studies, on individual information on both accidents and workers personal and job characteristics. As already mentioned, the comparative dimension of our study and the use of new econometric methods are further novel elements included in our paper.

3. Data and descriptive statistics

3.1. Data

In this section, we present the data used in our paper and summarize its main descriptive statistics. The Statistical Office of the European Union (Eurostat) started in 1999 a new programme of special modules to be added to each of the successive surveys corresponding to the second quarter of each

year⁵. The first of those modules was devoted to work accidents and professional diseases. Although undertaken in all European countries, the micro data for the modules have not been made available for researchers on a general basis, although some national statistical institutes have made available their own. This is the case of Spain and Italy, the two countries on which our study is based. The questions in the module are added to the general information contained in the Labour Force Survey.

According to this module, 297.6 thousand employees working in Spain, equivalent to 2.68% of the total number of employees, declared in 1999 that they had suffered a work-related accident in the previous 12 months; the figures in Italy were 655.7 thousands and 4.40%. The breakdown by contract type shows that in Spain, temporary workers have a higher rate of accidents: 3.45% as compared to 2.30% in the case of employees with an open-ended contract. In Italy, on the contrary, permanent employees show a higher rate of accidents: 4.5% as compared to 3.5% for temporary workers.

Needless to say, information based on personal interviews of workers who have suffered a work-related accident is subject to several problems which need to be addressed. First, in the case of Spain (though not so much in Italy), the total number of accidents which follows from the LFS module⁶ is significantly lower than the number appearing in the administrative statistics compiled by the Ministry of Labour, which constitute the basis for the European

⁵ Before 1999, not all countries undertook quarterly interviews and Eurostat only required yearly information. The new regulations passed in 1998 required member states to carry out quarterly interviews as of 1999. In the cases of Spain and Italy, this was not relevant as both already had implemented the quarterly scheme. The accident module was appended to the second quarter LFS in Spain; in Italy, however, it was carried out in the third quarter.

⁶ This number corresponds to all persons who may have been victims of an accident, i.e. people currently employed and people who left their job in the 12 months preceding the interview. The total number of accidents can be computed because each person is asked how many accidents they suffered in the reference period of 12 months.

Statistics on Accidents at Work (ESAW)⁷: approximately 60 percent. Secondly, the survey informs of the current contract type held by workers while the accidents refer to the previous year. It is thus possible that the contract type of the worker at the moment of the accident might have been different from that observed at interview time. Given the high job turnover existing in the Spanish labour market, some of the workers having suffered an accident while holding a temporary contract might be out-of-work at interview time, and hence out of the sample under analysis, thus biasing downwards the observed accident rate for temporary workers⁸.

Regarding the first point, it should be noticed, to begin with, that the number of occupational diseases, which is very small in the administrative statistics (less than 5% of the number of accidents), is much higher in the LFS module, almost doubling the number of accidents. This might suggest that some of the events which the administrative statistics might consider as “accidents” are remembered by the victims as “diseases”. The fact that administrative regulations only consider a closed list of diseases and all cases not fitting that list are treated as “accidents” clearly reinforces that view⁹. One could try to correct this misclassification on the basis of the types of diseases; however, this might involve other, unknown, biases. More important is the fact that the break down of accidents in the LFS module more or less corresponds to that stemming from administrative sources for a number of variables, such as industry or region (INE, 2000)¹⁰.

⁷ These statistics are compiled on the basis of administrative registrations of accidents implying an absence higher than 3 days and which have been notified by employers over a full year.

⁸ 73 per cent of workers who suffered an accident and who are out of work at interview time declare that the reason for leaving their job was “end of contract”.

⁹ In the LFS module, the list of diseases was much wider and open-ended.

¹⁰ In the case of regions, one problem arises in the case of Madrid and neighbouring Castilla-La Mancha. The weight of Madrid in administrative records is significantly higher than in the LFS module, while that of Castilla-La Mancha is significantly smaller. The fact that administrative

As for the second point, one should take into account the fact that, given the short tenure of many temporary workers, the probability of observing an accident is clearly reduced. On the other hand, the fact that many workers are observed in a jobless situation may affect the memory problem regarding what happened in the last year regarding accidents. On this issue, administrative records indicate that the total number of accidents suffered by open-ended contract workers in 1998-99 was around 300 thousands, while the equivalent number for temporary workers was around 450 thousands¹¹, implying that temporary workers account for some 60% of total accidents. The LFS module provides lower figures. Thus, considering all accidents suffered by people currently employed and by people who left their job over the 12 months preceding interview time, and proxying in the latter case the contract type by the reason for leaving the last job (i.e. equating temporary contract to the answer “end of contract” and open-ended contract to all other answers), the share of temporary workers in total accidents amounts to 40%. Breaking down this figure between those currently at work and those without a job suggests that the problem is with the latter group, which reports a much lower number of accidents (with an accident rate of 1.26% only, compared to the 3.45% of temporary workers currently at work). However, the share of temporary workers when only considering those at work at interview time, at 43%, remains significantly smaller than the percentage stemming from administrative figures.

On the whole, it seems that the LFS sample underestimates the number of accidents suffered by temporary workers. However, to the extent that the sample is otherwise evenly distributed (by industry and regions, for example), it

statistics register the province of the firm while the LFS considers the residence of the worker is likely to be behind this result. No other examples of this regional cross-border situation exist in Spain.

¹¹ These figures come from the yearly statistical book of the Ministry of Labour and Social Affairs; they are approximate average figures of the number of accidents in 1998 and 1999; it should be

can be assumed that the underestimation will be similar across the personal and job characteristics of workers which shall later be used in the multivariate analysis. If this is so, then the LFS sample may be safely used in the analysis, as it provides a representative subsample of accidents by temporary workers¹².

3.2. Descriptive statistics

Once the data used in the paper has been discussed, we now turn to present some descriptive statistics to complete the information provided in the preceding subsection. Tables 2 and 3 in the Appendix summarise many of these.

Here we concentrate only in three dimensions: seniority, occupation and industry, generally thought to be the most significant ones in terms of accidents and contract type.

Figure 2 presents the gross probability of suffering an accident in Italy and Spain, according to the LFS module, desegregated by contract type and job seniority. The analysis is restricted to those with less than one year of seniority as this the segment where temporary workers tend to be concentrated. In general, no clear pattern emerges from Figure 2, with the only exception that Spanish open-ended workers clearly show a lower proneness to accidents, while no such clearcut pattern emerges for the Italian case. It would thus seem that seniority, at least in the Spanish case, is not a significant element in explaining the differences between temporary and open-ended workers as regards accidents: open-ended workers show lower accident rates right from the beginning of their tenure.

recalled that the LFS module was made in the middle of 1999, so the reference period covers part of 1998 and part of 1999.

¹² Administrative statistics do not allow for a further analysis of this hypothesis. This would require detailed broken-down figures by contract type and other variables such as industry, regions or age.

Figure 2.
Gross probability of suffering a work accident by contract type and job seniority,
employees with less than one year seniority

(Source: LFS module)

As for the hypothesis that temporary workers are more heavily concentrated in those occupations and sectors with a higher probability of suffering work-related accidents, the data included in Tables 2 and 3 of the Appendix suggest that, while the sectors and occupations with highest accident rates tend to be the same in both countries (mining, construction and agriculture; blue-collar less skilled occupations), it turns out that only in Spain do these sectors and occupations appear to have higher proportions of temporary employment. These figures suggest that the higher probability of having an accident of Spanish temporary workers will probably be explained by their concentration in sectors and occupations with high accident proneness. This does not appear to happen in Italy, where, to begin with, open-ended workers do show higher accident rates. The conclusion is similar, then. Indeed, if temporary workers were concentrated in Italy in sectors and occupations with higher accident rates, the compounded effect would imply higher aggregate rates,

contrary to what is observed. It appears that temporary employment is playing different structural roles in the Spanish and the Italian economies. At any rate, these seeming results will have to be confirmed by the multivariate analysis to be undertaken in later sections.

To complete the descriptive analysis stemming from the LFS module data, it is worth considering not only the quantitative dimension of accidents (their rate of incidence) but also some qualitative elements such as the situation of workers *after* the accident and the time out of work implied by the accident. This will provide complementary information of the relative differences between temporary and open-ended contract as regards work-related accidents.

To begin with, Table 1 shows that most workers come back to the same activity they were undertaking before the accident, without significant differences being observed by contract type. However, it has to be mentioned that work accidents seem to be of more consequence for Spanish workers, as the proportion of those still out of their job is higher than in Italy, with a small difference against temporary workers. This result could be interpreted as meaning that Spanish interviewees (and probably interviewers) have tended to give more relevance to the more severe accidents. This might underlie the observed underreporting in Spain, although it cannot explain the heavier underreporting by temporary workers.

Table 1. Situation of workers after the accident by contract type, percentage distribution (Source: LFS ad hoc module, 1999)				
	Has returned to the same job	Has returned but to a different job	Has not yet returned	Has decided not to return
SPAIN				
Open-ended	83.78	0.53	15.57	0.12
Temporary	81.50	1.09	17.41	0.00
ITALY				
Open-ended	92.08	2.05	5.62	0.30
Temporary	93.52	3.30	3.18	0.00

Another aspect of interest as regards the consequences of accidents is presented in Figure 3, which presents the distribution of the number of working days lost after the accident. Although, as before, no significant differences are observed by contract type, more significant variations are observed between countries.

Almost one-third of Italian employees return to their job on the same day of the accident, whereas Spanish employees remain out of work for longer periods. In addition, in the Spanish case, temporary workers tend to concentrate in the accidents with shorter absences, less than 15 days lost, while open-ended workers tend to show longer absences from work after the accident. This is a natural result given the very nature of the contract: temporary contracts are not likely to imply longer absences because they might result in a termination of the contract itself.

As with the evidence presented in Table 1, the data in Figure 3 suggest that Spanish employees tend to have underreported the least consequential accidents, maybe considering them as occupational diseases, as already mentioned.

Figure 3.
Distribution of working days lost as a consequence of the accident, by contract type

(Source: LFS *ad hoc* module, 1999)

On the whole, the descriptive data presented in this section suggest that, despite the clear underreporting of accidents, especially in the case of temporary workers in Spain, there are reasons to believe that such underreporting, probably related to a misinterpretation of the meaning of accident, will not negatively affect the multivariate analysis which shall be presently undertaken, as it seems to be more or less evenly distributed across the relevant characteristics of the sample. This view has been supported by the analysis of the consequences of accidents, broken down by contract type. Also, the descriptive data discussed tend to suggest that the gross differences observed between accident rates of permanent and temporary workers, both in Italy and Spain (although with different signs) might be attributable to the concentration of workers (temporary in Spain, permanent in Italy) in sectors and occupations with higher propensity to suffer work accidents. The analysis in the two coming sections shall deal with this issue in a more rigorous way.

4. The probability of having an accident

As already mentioned, one of main novelties of the LFS ad hoc module is that it allows a joint analysis of the characteristics of individuals who have suffered an accident together with those of the jobs. In this section, we use this information to undertake a first multivariate analysis of the probability of suffering a work accident. More specifically, we run several probit regressions of the probability of having an accident, including as regressors various sets of variables, reflecting the characteristics of individuals and the characteristics of the jobs they hold. The study centers on the difference in the probability of suffering a work-related accident between temporary and open-ended workers.

Table 2 presents the main results of the analysis. Regressions have been run for all employees in Italy and Spain and also, to check for the robustness of the estimations, regressions have also been run for employees with at most 3 years of tenure, this being the legal maximum duration of temporary contracts in Spain. The upper panel of Table 2 presents the results for all employees; the lower panel presents the results for employees with at most three years of tenure in their current contract situation. The numbers in the table reflect the differential “in favour” of temporary workers (i.e. the coefficient of the contract type variable converted into probability).

The results in Table 2 indicate that having a temporary contract increases the gross probability of suffering a work-related accident in Spain, but it *lowers* it in Italy. Moreover, this result does not substantially vary when personal characteristics (gender, age, level of education, region of residence) are accounted for. In both countries, the differences in probability diminish, but they remain statistically significant. More importantly, when only job characteristics (sector, occupation, working time and job experience) are controlled for, the

differences are much smaller and, what is more, become statistically insignificant. Adding then personal characteristics to the regression does not alter in any significant way the results.

Table 2.		
Influence of contract type on the probability of suffering a work-related accident, Spain and Italy, 1999 (probit estimates based on LFS module data)		
	Difference in probability	t-statistic
All employees		
Italy		
Without controlling for other characteristics	-0.0086	-2.9800
Controlling for personal characteristics	-0.0085	-3.1100
Controlling for job characteristics	-0.0054	-1.6100
Controlling for both job and personal characteristics	-0.0044	-1.3500
Spain		
Without controlling for other characteristics	0.0118	7.7100
Controlling for personal characteristics	0.0082	5.7100
Controlling for job characteristics	0.0033	1.8200
Controlling for both job and personal characteristics	0.0031	1.7600
Employees with 3 years of seniority or less		
Italy		
Without controlling for other characteristics	-0.0121	-3.1300
Controlling for personal characteristics	-0.0071	-1.9600
Controlling for job characteristics	-0.0035	-0.8600
Controlling for both job and personal characteristics	-0.00005	-0.0100
Spain		
Without controlling for other characteristics	0,0073	2,800
Controlling for personal characteristics	0,0036	1,620
Controlling for job characteristics	0,0004	0,180
Controlling for both job and personal characteristics	0,0006	0,300

These results are observed in both samples, but more clearly so when job seniority is controlled for in the case of open-ended contracts (by definition, temporary workers cannot hold jobs for very long periods). It can thus be concluded that the higher or lower probability that temporary workers suffer vis-à-vis their open-ended counterparts can be explained to a very large extent by the nature of the jobs they hold in terms of proneness to work accidents and not by any intrinsic characteristics that could be attributed to the fact that they hold a temporary contract (e.g. it could be argued that the temporary nature of the

contract reduces the commitment of the worker with the firms and hence reduces their care at work).

5. Decomposition analysis of the probability of suffering a work accident

To complete the analysis presented in section 4, we now present a different way of dealing with the differences in accident probability between permanent and temporary workers. We have examined the sources of these differences following the methodology proposed by Yun (2004) for decomposing differences in the first moment. These models allow us to apply the Oaxaca-Blinder decomposition to a non-linear function. That is, we are able to decompose the differences in the incidence rate of work accidents by type of contract into those related with differences in characteristics and those related with differences in coefficients.

Therefore, here we try to disentangle whether differences in the incidence of work accidents can be associated with differences in characteristics or with a differential effect of the same characteristics by group of workers. In addition, in order to eliminate the possible sample bias associated with the selection of temporary or permanent workers for each probit model a bivariate probit model is specified, as in Davia and Hernanz (2002), where a selection probit equation is estimated jointly with the probit model for the probability of having an accident.

However, in this case, this decomposition is slightly more complicated than the standard Oaxaca-Blinder given that estimated probit models are a non-linear function. For these cases, Yun (2004) provides a general methodology to decompose differences in the mean value of any variable of interest which does

not depend on the functional form of the estimated model¹³. As a result, in a similar way than Oaxaca-Blinder, this methodology decompose the differences in the mean value of the variable of interest in three terms: the effect of the differences in characteristics, the effects of the differences in coefficients and an additional residual term appears related with the linear approximation of the non-linear function.

In Table 3 we present the results of these decompositions¹⁴. As in the previous section we present them both for the complete sample of employees workers and for those with at most 3 years of tenure. From these results, it is remarkable that although the overall difference in accident probability is positive in Spain and negative in Italy, its decomposition provides similar results. We find that in both countries and for both samples, the effect of the differences in characteristics between temporary and permanent employees tends to increase the relative probability of having an accident for temporary workers. That is, in both countries personal and job characteristics associated with a temporary contract are riskier. Thus, if we only take into account these differences in characteristics between both types of workers, temporary employees would show a higher accident probability in both countries. However, coefficient differences play the opposite role. The same characteristics are associated with more accidents for permanent workers in both countries. In Spain, however, the intensity of this effect is not enough to offset the other components, so that the total differential is positive (higher probability for temporary workers), while in Italy it tends to overcome the other effects.

¹³ We just need the dependent variable to be a function of a linear combination of independent variables and the function is once differentiable.

¹⁴ The complete estimation results for these bivariate probits may be found in tables 6 and 7 in the appendix

Table 3.
Yun decomposition of differences in probability of suffering a work-related accident
(temporary less open-ended)

All employees		
	Spain	Italy
Characteristics effects	0.0734	0.0083
Coefficients effects	-0.1581	-0.0429
Selection bias	0.0126	0.0015
Residual effect	0.0839	0.0237
TOTAL	0.0118	-0.0095
Employees with 3 years of seniority or less		
	Spain	Italy
Characteristics effects	0.0219	0.0321
Coefficients effects	-0.1507	-0.0117
Selection bias	0.0062	-0.3064
Residual effect	0.1303	0.2736
TOTAL	0.0077	-0.0124

On the whole, the decomposition analysis has suggested that the effects in both countries are similar: job and personal characteristics of temporary workers tend to be associated with higher work accident probabilities; however, the intrinsic nature of the contract is associated with higher accident probabilities for permanent or open-ended workers. The only difference between both countries resides in the different relative intensity of the various effects involved, which imply a total differential between temporary and permanent workers which turns out to be positive in Spain and negative in Italy.

6. Conclusions

This paper has studied the effect of the contract type on the rate of work-related accidents in Italy and Spain, using the LFS *ad hoc* module undertaken in 1999 at European scale. This database provides, for the first time, the possibility of analysing not only work accidents by contract type; it also allows to relate these variables to a wide array of personal and job characteristics of the victims of accidents as compared to those not suffering such accidents, and also on a cross-country comparative analysis. Given the high significance of temporary employment in Spain, the results for this country are probably more relevant;

however, given the increasing importance of temporary work in Italy, the results obtained for this country, different in terms of gross probabilities but similar in terms of the analytical results, should also be thought as important.

The initial numbers indicate that the incidence of work accidents vary with contract type and, especially, that contract type does not appear to be the main determinant of the risk of accidents. Thus, although the gross probability of having an accident is higher for temporary workers in Spain and lower in Italy, there are a number of sectors and occupations which show similarly high accident rates in both countries.

Given these basic descriptive results, the paper has turned to a more rigorous multivariant analysis in order to determine how much of the differences in the probability of suffering a work accident between open-ended and temporary workers are due to contract type itself or to the different distribution of these two types of workers across industries, occupations and other job and personal characteristics. The results indicate that the probability differentials virtually vanish when job characteristics are controlled for. This happens in both countries and similar results are achieved when the sample is restricted to workers with at most 3 years of tenure.

To complete the analysis, a decomposition analysis of the mean differences in probabilities has been undertaken, following the novel analysis by Yun (2004). This analysis has shown that, both in Italy and Spain, personal and job characteristics tend to increase the probability of having an accident for temporary workers, but that the specific influence of the contract type favours these temporary workers, who tend to show a lower probability on this account. However, the different relative strength of these effects in both countries

explains why the total effect is against temporary workers in Spain and against permanent workers in Italy.

Appendix

Table 1:
Labour market situation of workers who have suffered a work-related accident in the last year – Spain. (Source: LFS module data)

	Current situation (1999)	Situation recalled one year earlier (1998)
Military Service	0.2	0.6
Employees	92.3	87.2
% Employers over total work force	14.9	16.1
% Employees over total work force	84.9	83.8
% Other situations over total work	0.1	0.1
Unemployment	3.9	9.5
% end of contract was the reason for leaving the last job		73.09
Inactive	3.7	2.7

Table 2:
Incidence of temporary employment by personal and job characteristics, Italy and Spain
(Source: LFS module data)

	Italy	Spain
Gender		
Male	8.46	31.53
Female	12.08	34.92
Age		
16-24	29.83	70.17
25-34	11.04	40.1
35-49	5.88	21.04
>50 years	5.68	14.42
Educational attainment		
Low-education	10.89	37.07
High school	8.87	30.9
University	9.49	24.11
Type of journey		
Full-time	7.35	30.4
Part-time	38.2	58.46
Seniority		
< 1 year	49.49	83.93
From 1 to 3 years	18.02	48.83
>3 years	2.67	5.28
Occupation		
Skilled white-collars	6.83	20.09
Lower skilled white collars	13.86	29.4
Skilled blue-collars	7.95	37.84
Unskilled blue-collars	21.08	45.37
Industry		
Agriculture	39.49	61.37
Mining	3.81	14.29
Manufacturing	6.28	28.47
Building	13.43	61.55
Trade	10.19	32.9
Hotels and restaurantes	29.64	45.21
Transport	5.26	23.88
Finance	3.44	12.42
Business Services	12.45	30.84
Public Services	8.85	16.5
Social Services	6.47	24.94
Personal Services	16.93	33.69

Table 3.
Incidence of work-related accidents by personal, job characteristics and type of contract, Spain and Italy
 (Source: LFS module data)

	Spain		Italy	
	Open-ended	Temporary	Open-ended	Temporary
Sex				
Male	2.76	4.73	5.59	4.32
Female	1.27	1.31	2.81	2.69
Age				
16-24	1.87	3.18	4.54	3.56
25-34	2.49	2.82	5.44	3.61
35-49	2.09	4.27	4.01	3.43
>50 years	2.25	3.72	4.28	3.47
Educational attainment				
Low-education	2.98	4.32	6.11	3.91
High school	2.02	2.77	3.50	3.52
University	0.77	0.43	1.91	1.84
Seniority				
< 1 year	2.07	3.18	3.89	3.18
From 1 to 3 years	2.65	3.67	5.16	4.38
>3 years	2.16	3.73	4.39	2.67
Occupation				
Skilled white-collars	0.71	0.76	2.53	2.31
Lower skilled white collars	1.47	1.41	5.25	4.22
Skilled blue-collars	4.59	6.01	7.04	5.97
Unskilled blue-collars	2.90	3.69	5.58	1.90
Industry				
Agriculture	4.38	3.50	5.59	2.52
Mining	5.31	7.26	3.61	10.18
Manufacturing	3.20	4.22	5.85	5.60
Building	4.59	6.57	8.80	6.53
Trade	1.91	2.82	3.79	3.83
Hotels and restaurantes	2.22	2.04	4.59	2.59
Transport	2.11	3.33	4.46	1.16
Finance	0.58	0.00	1.93	5.01
Business Services	1.00	0.84	2.90	1.08
Public Services	1.47	1.74	3.78	2.23
Social Services	1.59	1.46	2.92	2.47
Personal Services	0.95	0.66	3.80	3.56
Size of (private) firm				
0-19	2.05	2.59		
20-99	3.28	3.83		
100-499	2.24	4.66		
500+	2.14	3.19		
Don't know but more than 10	2.17	3.88		
Total	2.22	3.35	4.52	3.54

Table 4.
Probit models on the probability of having work-related accident (Spain) (Source: LFS module data)

	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
Temporary contract	0,0118	7,71	0,0082	5,71	0.003	1.820	0.003	1.760
Males			-	-13,50			-0.010	-7.030
			0,0183					
25-34			0,0021	1,07			0.002	1.190
35-49			0,0034	1,74			0.003	1.630
50-65			-	-0,23			0.000	0.010
			0,0005					
High school			-	-6,27			-0.003	-2.040
			0,0086					
University			-	-12,76			-0.011	-4.480
			0,0218					
Aragón			0,0025	0,69			0.000	-0.060
Asturias			0,0067	1,41			0.002	0.450
Baleares			-	-2,91			-0.011	-3.050
			0,0116					
Canarias			0,0091	2,78			0.008	2.570
Cantabria			0,0035	0,70			0.000	0.050
Castilla la Mancha			0,0095	3,23			0.006	2.370
Castilla y León			0,0188	5,70			0.015	4.920
Cataluña			0,0075	2,81			0.006	2.310
Comunidad Valenciana			0,0115	3,95			0.009	3.510
Extremadura			0,0018	0,46			0.001	0.150
Galicia			0,0091	2,76			0.006	2.040
Madrid			-	-1,56			-0.005	-1.660
			0,0049					
Murcia			0,0234	5,12			0.018	4.430
Navarra			0,0164	3,13			0.012	2.500
País Vasco			0,0096	2,77			0.006	1.920
La Rioja			-	-2,05			-0.013	-2.600
			0,0120					
Ceuta y Melilla			0,0002	0,03			0.000	-0.060
Part-time					-0.011	-4.480	-0.008	-3.280
Mining					0.018	2.790	0.018	2.820
Manufacturing					-0.002	-0.600	-0.001	-0.360
Building					0.008	2.590	0.007	2.200
Trade					-0.002	-0.630	-0.001	-0.220
Hotels and restaurants					0.001	0.270	0.004	0.960
Transport					-0.001	-0.200	-0.001	-0.170
Finance					-0.013	-2.580	-0.011	-2.150
Business Services					-0.010	-3.070	-0.007	-2.050
Public Services					-0.005	-1.310	-0.004	-0.950
Social Services					0.005	1.200	0.013	2.950
Personal Services					-0.012	-3.900	-0.009	-2.720
Skilled white-collars					0.019	6.630	0.013	4.210
Lower skilled white collars					0.060	15.700	0.040	10.380
Skilled blue-collars					0.047	13.500	0.031	8.470
Unskilled blue-collars					-0.001	-0.450	-0.001	-0.370
11-19 workers					0.007	2.820	0.007	2.970
20-49 workers					0.006	2.470	0.007	2.930
50 o more					0.005	2.820	0.006	3.650
Don't know but more than 10					0.002	1.180	0.003	1.770
Temporary Agency					0.000	0.070	0.001	0.110
1 to 3 years					0.004	2.270	0.004	1.970
> 3 years					0.001	0.340	-0.001	-0.35
N	53.155		53.155		52800		52800	

Table 5.
Probit models on the probability of having work-related accident (Italy) (Source: LFS module data)

	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
Temporary contract	-0.009	-2.98	-0.009	-3.11	-0.005	-1.63	-0.004	-1.36
Females			-0.022	-12.2			-0.016	-8.16
25-34			0.009	2.75			0.012	3.68
35-49			-0.003	-1.1			0.002	0.7
50-65			-0.006	-1.87			0.001	0.14
High school			0.017	4.73			0.012	3.28
University			0.039	10.99			0.021	5.26
Lombardia			0.002	0.52			0.001	0.25
Trento			-0.001	-0.15			-0.001	-0.21
Veneto			0.025	5.19			0.022	4.59
Friuli			0.037	5.54			0.036	5.39
Liguria			0.009	1.52			0.011	1.79
Emilia			0.025	4.77			0.022	4.29
Toscana			0.012	2.4			0.012	2.32
Umbria			0.027	3.76			0.024	3.38
Marche			0.031	4.5			0.028	4.1
Lazio			0.028	5.71			0.026	5.18
Abruzzo			0.018	2.59			0.016	2.33
Molise			-0.007	-1.13			-0.011	-1.64
Campania			0.020	4.05			0.022	4.21
Puglia			0.004	0.88			0.006	1.08
Basilicata			0.002	0.29			0.002	0.28
Calabria			0.041	6.27			0.045	6.56
Sicilia			-0.006	-1.21			-0.002	-0.48
Sadergna			0.034	5.05			0.026	3.84
Part-time					-0.012	-3.57	-0.008	-2.32
Mining					-0.007	-0.79	-0.006	-0.74
Manufacture					0.002	0.46	0.005	1.03
Building					0.032	4.49	0.025	3.8
Trade					-0.005	-0.94	-0.003	-0.54
Hotels and restaurants					-0.002	-0.24	0.001	0.2
Transport					-0.005	-0.94	-0.005	-0.89
Finance					-0.015	-2.31	-0.011	-1.72
Business Services					-0.005	-0.82	-0.002	-0.26
Public Services					-0.003	-0.63	-0.002	-0.37
Social Services					-0.002	-0.44	0.008	1.45
Personal Services					0.001	0.08	0.005	0.82
Lower skilled white collars					0.027	8.43	0.018	5.84
Skilled blue-collars					0.045	14.22	0.030	9.35
Unskilled blue-collars					0.028	6.79	0.015	3.74
12-35 months					0.016	3.8	0.015	3.76
3 years o more					0.010	2.99	0.009	2.74
N				51150		47431		47431

Table 6:
Probit model estimated by maximum likelihood with sample bias correction (Source: LFS module data)

All observations	SPAIN				ITALY			
	Temporary		Open-ended		Temporary		Open-ended	
	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
25-34	-0.0913	-1.62	0.1330	1.50	0.1697	1.07	0.1742	2.71
35-49	-0.1235	-1.47	0.0891	0.77	0.1312	0.57	0.0729	0.96
50-65	-0.2686	-2.34	0.0422	0.32	0.1881	0.72	0.0601	0.75
High school	-0.1022	-2.10	-0.0400	-1.02	0.1422	0.86	0.1354	2.70
University	-0.5502	-4.47	-0.1541	-2.12	0.0900	0.53	0.2492	4.70
Part-time	-0.2580	-3.25	-0.2433	-2.72	-0.2334	-1.08	-0.1558	-1.80
Mining	0.1859	0.84	0.1859	1.43	0.1893	0.44	-0.1054	-0.77
Manufacturing	-0.0006	-0.01	-0.1452	-1.61	0.0141	0.05	0.0044	0.04
Building	0.2713	3.60	-0.0032	-0.04	0.2907	1.37	0.2567	2.71
Trade	-0.0246	-0.25	-0.1923	-1.99	-0.0178	-0.06	-0.1052	-1.00
Hotels and restaurants	0.0313	0.28	-0.0723	-0.67	-0.2913	-1.45	0.0176	0.18
Transport	-0.0084	-0.07	-0.1466	-1.36	-0.5633	-1.51	-0.0675	-0.64
Finance	-4.9526	0.00	-0.4000	-2.50	0.2644	0.63	-0.2244	-1.76
Business Services	-0.4916	-3.07	-0.2890	-2.55	-0.2306	-0.74	-0.0759	-0.68
Public Services	-0.3008	-2.08	-0.1772	-1.66	0.0134	0.06	-0.0481	-0.50
Social Services	0.0738	0.64	0.0562	0.58	0.0966	0.36	-0.0134	-0.13
Personal Services	-0.4109	-3.01	-0.4562	-4.06	-0.0334	-0.13	-0.0181	-0.17
Lower skilled white collars	-0.0476	-0.44	0.2938	4.41	0.3153	2.49	0.2051	5.53
Skilled blue-collars		3.64	0.7384	10.46	0.4929	3.75	0.3623	10.15
Unskilled blue-collars	0.2891	2.66	0.6414	8.60	-0.0012	-0.01	0.2243	4.68
1 to 3 year	0.0700	1.64	0.0234	0.33	0.1392	1.59	0.0541	1.63
>3 year	0.0813	1.26	-0.0849	-1.33				
Intercept	-2.1092	-16.31	-2.2408	-10.80	-2.2104	-9.39	-2.1585	-12.31

Table 7:
Probit model estimated by maximum likelihood with sample bias correction. Workers with less than 3 years of seniority
 (Source: LFS module data)

SPAIN					ITALY			
Employees with 3 years of seniority or less								
	Temporary		Open-ended		Temporary		Open-ended	
	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
25-34	-0.0128	-0.24	0.0843	0.85	0.0986	0.77	-0.0398	-0.42
35-49	0.0572	0.94	0.0651	0.57	0.0077	0.05	-0.1575	-1.43
50-65	-0.0503	-0.59	0.1459	0.98	0.1151	0.65	-0.0552	-0.46
High school	-0.1109	-2.11	0.0956	1.16	0.0818	0.46	0.1803	1.31
University	-0.5320	-4.04	0.0829	0.52	0.0201	0.11	0.2950	1.89
Part-time	-0.2271	-2.74	-0.3034	-1.79	-0.0095	-0.05	0.2918	1.71
Mining	0.3506	1.54	0.6267	2.36	0.2312	0.56	-5.5896	.
Manufacturing	0.0771	0.84	-0.0377	-0.22	-0.1120	-0.46	-0.4336	-2.31
Building	0.2565	3.28	-0.0162	-0.09	0.2857	1.24	-0.2529	-1.37
Trade	0.0227	0.22	-0.1824	-0.97	-0.2200	-0.87	-0.4861	-2.51
Hotels and restaurants	0.0484	0.41	0.0428	0.20	-0.2446	-1.13	-0.2213	-1.38
Transport	0.0865	0.65	-0.1586	-0.70	-0.8915	-2.18	-0.4618	-2.33
Finance	-4.7342	0.00	-0.3314	-0.81	0.1845	0.49	-0.7663	-2.67
Business Services	-0.4682	-2.69	-0.3539	-1.53	-0.2536	-0.86	-0.4479	-2.28
Public Services	-0.2389	-1.56	-0.6863	-1.81	0.0251	0.12	-0.3996	-2.50
Social Services	0.0300	0.24	-0.1947	-0.85	0.0200	0.08	-0.3398	-1.98
Personal Services	-0.3443	-2.27	-0.3455	-1.58	-0.0594	-0.25	-0.5094	-2.91
Lower skilled white collars	-0.0661	-0.56	0.2027	1.25	0.3318	2.49	0.1606	2.22
Skilled blue-collars	0.3378	2.86	0.8281	5.07	0.5723	4.02	0.2496	3.33
Unskilled blue-collars	0.2166	1.82	0.6365	3.78	-0.0553	-0.32	0.2383	2.68
1 to 3 year	0.0788	1.82	0.0144	0.20	0.0089	0.04	-0.1901	-1.23
intercept	-2.0484	0.1468	-2.3198	-6.11	-2.2740	-9.61	-1.0308	-1.71
(1) Low-education in Italy								

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