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The Determinants of Promotions and Firm Separations

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Non-technical summary

This study focuses on the determinants of mobility of workers within and between firms and adds to the existing literature in two distinct ways. First, we study the determinants of promotions and firm separations. Second, the use of matched employer-employee data allows us to relate job mobility to both worker and firm characteristics. Furthermore, although collective agreements, the usual way of regulating employment relationships in Portugal, make provisions for within firm career progress analysis of job mobility in Portugal are rare.

Economic theories have long addressed the mechanisms generating labour mobility, within and between firms. Following the theoretical development of the topic, many empirical studies have tried to assess the determinants of promotions and separations from firms and whether these determinants differ across genders. However, most studies analyse promotions and job-to-job transitions separately. This makes the comparison of the effects of different characteristics on each type of job mobility difficult. In this paper we study the determinants of promotions within a firm and separations from a firm jointly. Hence, we are able to compare the determinants of mobility of workers within and between firms. The use of the Portuguese longitudinal matched employer-employee data set allows us to include a range of individual and firm characteristics in our specifications. The latter are often ignored in the literature, yet promotions in particular are based entirely on firm-level decisions. Furthermore, while in the previous literature it is common to differentiate mobility between firms by their type, whether they are initiated by workers (quits) or firms (layoffs), it is less common to distinguish between types of promotions, i.e. whether they are due to merit or seniority. In our analysis we test the empirical relevance of distinguishing between automatic and merit promotions, and between separations resulting in short-term non-employment and those resulting in longer term non-employment.

The distinction between types of promotion, made in our study, proved fruitful as it seems to explain gender differences in promotion probabilities. We show that the impact of gender on promotions depends crucially on how promotions are defined. Women are more likely than men to receive automatic promotions, but as likely to receive merit promotions. The chance of experiencing movements between firms is smaller for women than for men. The effect of education depends on the type of promotion considered. The level of education is only a factor for automatic promotions and not for promotions that involve a change in the tasks performed. This suggests that automatic promotions may be actually reflecting some appraisal of the abilities of workers made by the employers, and supports the view that a promotion, understood as a form of career progress that involves a greater commitment of workers with their firms, may not necessarily involve a change in the tasks performed. We are also able to verify the importance of the firm in the mobility process. We found that there is more variability in firms regarding promotions than in separations. This emphasizes that promotions are mainly a decision of the employer, and suggests that studies that do not control for firm characteristics when analysing within firm career progress provide only a limited perspective.

The determinants of promotions and firm separations.*

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Abstract

This paper identifies and compares the determinants of within- and between-firm job mobility in Portugal. Estimates are based on models that distinguish promotions by whether or not they involve a change in the tasks performed, and separations by the time workers take to enter a new firm. Both worker and firm observed characteristics emerge as important factors in the analysis. Firm unobserved heterogeneity is relevant, evidence suggests that firms vary more in their unobserved propensity to promote than in the case of separations. Overall, this study highlights two main issues; the role of firms in the process of job mobility, and the importance of distinguishing not only between types of separations from firms, but also between types of promotions within firms.

Keywords: promotions, separations, duration models, matched employer employee data
JEL Classification: C41, J62, J63

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1 Introduction

This study focuses on the determinants of mobility of workers within and between firms using continuous time duration models and adds to the existing literature in two distinct ways. First, we study the determinants of promotions and firm separations jointly in a competing risks framework. Second, the use of matched employer-employee data allows us to relate job mobility to both worker and firm characteristics. Furthermore, job mobility in Portugal has rarely been studied. Exceptions include Lima (2004), Lima and Pereira (2003), and Lima and Centeno (2003), but these analyses are focussed mainly on careers within firms.

Economic theories have long addressed the mechanisms generating labour mobility, within and between firms. The neoclassical model of the labour market assumes that the interaction of workers and employers determines the price (wage) and quantity (employment) offered in equilibrium, and predicts that workers change jobs in response to differing wage rates. In equilibrium, workers earn the value of the marginal product of labour which is equal in every firm. If workers are homogeneous, turnover is not an issue because firms can easily find an equally skilled worker and workers can find a compatible firm. However, workers differ in terms of human capital, which can be general or specific to the firm. While general human capital increases the marginal productivity of employees by the same amount in every firm, specific human capital increases the marginal productivity more in the firm where the worker is located. Consequently, turnover becomes an important topic. As firms pay (at least) part of the training costs, they are particularly concerned about the turnover of employees with firm-specific human capital and, recognizing that quits depend on wages, they may offer these workers a higher wage that could not be easily matched by competing firms. Given the potential to increase profitability, employers may also create a promotion scheme and commit to an associated wage structure to motivate workers to invest in firm-specific human capital. A promotion is then a consequence of human capital investment. Promotions can also be interpreted in the context of tournaments (Lazear and Rosen, 1981; Rosen, 1986; Bognamo 2001). A promotion is a prize that is allocated to workers who rank higher than all other workers in a group over a given period. The probability of promotion provides incentive to exert effort, and winners are moved to higher positions that involve *e.g.* higher prestige, higher responsibility, or higher earnings.

Firms can also recruit from outside but, to keep the incentive for incumbents to exert effort, they can create a scheme in which external contestants have to be significantly superior to win (Chan, 1996). If external competition is allowed, separations from firms occur due to the arrival of better external alternative job offers (Burdett, 1978). If a system of counter offers exists, then better external offers might not lead to separations, and may instead lead to promotions within the firm instead (Mortensen, 1978). In matching models, separations are a consequence of optimal reassignment caused by the accumulation of better information about the quality of the worker-firm match as time elapses. If the worker-firm pairing is a mismatch, a separation is likely to happen. But, in good matches, investment in firm-specific human capital will be greater and the match will be less likely to end (Jovanovic, 1979a, 1979b, 1984). Promotion may be the optimal response of the firm after learning about the productive ability of the worker. Job shopping theory (Johnson, 1978) predicts that inter-firm mobility occurs to a greater extent early in the career because workers are not aware of their own abilities or the characteristics of the labour market. Given the uncertainty on the returns in various jobs, workers will try a variety of jobs.

Following the theoretical development of the topic, many empirical studies have tried to assess the determinants of promotions and separations from firms and whether these determinants differ across genders. For the UK and the USA, analysis of promotions within firms has received some attention in the empirical literature in terms of the characteristics of promoted workers (Wise, 1975; McCue, 1996; Pergamit and Veum, 1999; Francesconi 2001), the evolution of promotion chances with time within the firm (Rosenbaum 1979), differences in promotion probabilities by gender (Lazear and Rosen, 1990; Jones and Makepeace, 1996; Booth *et al.,* 2003), the importance of performance or/and seniority in promotions decisions (Abraham and Medoff, 1985; Bell and Freeman, 2001), and the impact of promotions on wages (McCue, 1996; Pergamit and Veum, 1999; Francesconi, 2001). Also, some authors model the impact of promotion on worker performance and check for the possible occurrence of the Peter Principle (Fairburn and Malcomson, 2001; Lazear, 2004), according to which workers are promoted to their level of incompetence. The probability of promotion is generally found to increase with seniority, education and firm growth. Some results suggest that if more educated workers are

not promoted quickly they will never be promoted. The impact of gender on promotion rates differs across studies.

Some of these studies focus on internal labour markets (Wise, 1975; Rosenbaum, 1979; Abraham and Medoff, 1985; Jones and Makepeace, 1996; Baker *et al.* 1994a,b), which allow for a clearer definition of promotion but are not representative of the labour market as a whole. Some others use longitudinal data on individuals (Topel and Ward, 1992; Farber, 1994; McCue, 1996; Francesconi, 2001; Booth *et al.,* 2003) but, in these, a promotion is measured by the worker's report, hence the definition of promotion depends on the individual's own perception. However, a promotion is a decision made by the employer. In addition to only having the worker's perception of events, in most studies there is little information collected on the characteristics of the firm.

Furthermore, the definition of promotion also varies between studies that use individual-level data. In some cases workers who have changed job within the firm are asked if they were promoted (McCue, 1996; Francesconi, 2001; Booth *et al.,* 2003). In others a promotion is self-reported by the worker (Pergamit and Veum, 1999). In both, promotion is identified by the worker. Sometimes promotions are identified from observed changes in occupations or levels within the hierarchy (Rosenbaum, 1979; Sicherman and Galor, 1990; Jones and Makepeace, 1996). In the data used here, the firm reports the promotion which, as well as providing a clearer definition of promotion, may also disclose promotion policies of the firm.

In contrast to intrafirm mobility, interfirm mobility can be directly determined by the worker. Why workers move between firms, the consequences of such movements and comparisons with workers who remain in the firm is also an important research topic. Some studies try to identify the characteristics of workers who move between firms (Booth *et al.,* 1999). Farber (1994) concludes that heterogeneity and state dependence are important determinants of firm separations. Topel and Ward (1992) study the determinants of turnover and the associated wage growth and conclude that wages are strong determinants of changes of firm, but they are also determined by the process of search and mobility. Anderson and Meyer (1994) try to identify the importance of firm characteristics on the propensity to separate, and conclude that both worker and firm characteristics are important.

Some authors have tried to identify gender differences in the probability of separation from firms. Viscusi (1980) and Blau and Kahn (1981) focus on individual characteristics to examine these differences, and find that, although the overall quit rates are higher for women than for men, once controls for job and individual characteristics are included and held constant, the quit rates of men and women are the same. On the other hand, Royalty (1998) concludes that differences in separation rates between men and women are due to the behaviour of less educated women. Light and Ureta (1992) emphasise that gender differences in separation probabilities exist for older cohorts, and are due to unobserved individual heterogeneity. In younger cohorts, the authors conclude, controlling for observed and unobserved characteristics of individuals women would have a lower rate of separation than men. However, if unobserved characteristics are ignored, then men have lower propensity to separate.

More recently, Frederiksen (2008) accounts for labour market sorting by using linked employer-employee data. The main findings of this study are that there are no gender differences in separation probabilities for men and women working in similar workplaces. Like Royalty (1998), the study also stresses the importance of distinguishing the destination type, as women's employment stability is low because they are more likely to make job-to-nonemployment instead of job-to-job transitions. Overall, this literature draws our attention to the importance of unobserved heterogeneity of workers and firms in determining the conditional rates of separation from firms. Due to the characteristics of the data used in this study we will be able to control for these characteristics and therefore have a more accurate analysis of the determinants of separations from firms.

Analysis focussing simultaneously on the determinants of promotions and changes of firm are less common. Sicherman and Galor (1990) develop a theory of career mobility which predicts that schooling, ability and job experience determine promotions, and that the optimal spell length to quit a firm is shorter for individuals who were not promoted than for individuals that have received a promotion. Bishop (1990) concludes that quit and promotion rates are sensitive to productivity, the size of the firm, and who pays for training. Booth and Francesconi (2000) study the impact of gender on mobility patterns (quits, layoffs, promotion) and find that the probabilities of promotion and quits are similar for men and women, but gender differences

emerge with respect to layoffs. Bernhardt and Scoones (1993) and Scoones and Bernhardt (1998) model the relationship between the acquisition of human capital and preemptive wage offers with promotion and turnover.[1]

As it is apparent from the literature review show above, most studies analyse promotions and job-to-job transitions separately. This makes the comparison of the effects of different characteristics on each type of job mobility difficult. In this paper we study the determinants of job mobility using hazard models which allow us to specify the determinants of promotions and firm separations jointly within a competing risks framework. Hence, we are able to compare the determinants of mobility of workers within and between firms. The use of the Portuguese longitudinal matched employer-employee data set allows us to include a range of individual and firm characteristics in our specifications. The latter are often ignored in the literature, yet promotions in particular are based entirely on firm-level decisions. Furthermore, while in the previous literature it is common to differentiate between types of mobility between firms, promotions are always assumed to be of one type only. In our analysis we will test the empirical relevance of distinguishing between automatic and merit promotions, and between separations resulting in short-term non-employment and those resulting in longer term non-employment.

We show that the impact of gender on promotions depends crucially on how promotions are defined. Women are more likely than men to receive automatic promotions, but as likely to receive merit promotions. The hazard of experiencing between firm separations is smaller for women than for men. The effect of education depends on the type of promotion considered. The level of education is only a differentiating factor for automatic promotions and not for promotions that involve a change in the tasks performed. This suggests that automatic promotions may be actually reflecting some appraisal of the abilities of workers made by the employers, and supports the view that a promotion, understood as a form of career progress that involves a greater commitment of workers with their firms, may not necessarily involve a change in the tasks performed. Firms emerge as important determinants of job mobility both in terms of observed and unobserved characteristics. We found that firms vary more in their propensity to promote than in the case of separations. These results reinforce the view that analyses of

[1] Preemptive wage offers are those that are high enough to prevent competing firms from acquiring information about a worker with whom the current firm matches well.

promotions are incomplete when these only focus on worker's characteristics, and the measure of promotions depends on changes in tasks performed.

The rest of the paper is organized as follows. Section 2 introduces the data set, clarifies the concepts used and describes the reorganization of the data to multivariate survival data format. Section 3 describes the empirical specification of the hazard regression models. Empirical results and checks of robustness are discussed in Section 4. Section 5 concludes the analysis.

2 Data set and concepts used

2.1 The *Quadros de Pessoal* data

The data used in this analysis is the *Quadros de Pessoal* (Lists of Personnel) from Portugal. The *Quadros de Pessoal* is a longitudinal data set with matched information on workers and firms. Since 1985, the survey has been annually collected (in March until 1993, and in October from 1994 onwards) by the Portuguese Ministry of Employment and the participation of firms with registered employees is compulsory. The data include all firms (about 200 thousand per year) and employees (about two million per year) within the Portuguese private sector. The analyses in this paper are derived from data collections for each year from 1986 to 2000, with 1990 excluded because the database was not built in that year. Although the survey continues, the data currently available for analysis ends in 2000. Each firm and each worker has a unique registration number which allows them to be traced over time. All information − on both firms and workers − is reported by the firm. In general, the information refers to the situation observed in the month when the survey is collected. In some cases, namely information on dates, reported data may refer to dates in the past (*i.e.*, before the data collection month or to previous years) but is limited to the past within the specific firm where the worker is employed. Information on workers includes, for example, gender, age, education level, level of skill, occupation, date of admission in the firm, date of last promotion, monthly wages (split into some of its components) and monthly hours of work. Firm level data include, for example, the industry, location, number of workers, number of establishments, and legal structure.

Some data management was carried out before implementing any analysis. First, we conver-

ted the data from a set of time series-cross sections into longitudinal panel data format. Second, to overcome computer memory size limitations, a 10% random sample of workers was selected from the cleaned panel data set. The analysis in this paper is based on the 10% sample drawn from *Quadros de Pessoal* that contains information on 520,222 individuals, which corresponds to 2,522,278 observations over time.

2.2 Concepts used

Employment relationships and career progress in Portugal are regulated by collective agreements between unions and employers. These agreements mention two different types of promotion as means of career advancement: automatic promotions and merit promotions. Automatic promotions are primarily a consequence of accumulated length of service, although there is the possibility for the employer to demand an appraisal of the employee's abilities. Merit promotions mostly depend on the employers's will and imply a change to the contract of employment.

It is not possible to formally distinguish these two types of promotions in our data. So, we categorize promotions according to whether or not there is a change in the tasks performed over two observations for the same individual. Some previous studies suggest that reported promotions for which we do not observe a change in occupation may still reflect some analysis of performance made by the employer. For example, Abraham and Medoff (1985) develop a model which implies that a negative impact of seniority on the probability of being promoted is consistent with a promotion process that is based purely on merit, and that a positive coefficient on seniority signals that seniority plays an important role but does not rule out the importance of merit. Rosenbaum (1979) gives promotions two functions within firms: (i) recruitment to upper levels of the hierarchy; and (ii) rewards that can be material or symbolic. Promotions without changes in the tasks performed can be related to the latter. In both cases, however, organizations can benefit from greater compliance and commitment of workers. Pergamit and Veum (1999) mention that "limiting promotions to be a subcategory of position changes results in severe underestimation of the extent to which workers report being promoted". Further, Büchel and Mertens (2004), while analysing overeducation and undereducation in the context of career mobility, refer to the latent impossibility of mobility between certain occupations and

conclude that changes between different occupations are by themselves not a valid indicator of upward career mobility. Given that, in our data, employers are clearly requested to take into consideration the tasks the worker is performing regardless of their level of education, and to record occupations at the most detailed level possible (6 digits), it seems reasonable to assume that a change in occupation will reflect a change in the tasks performed.

Therefore, three definitions of promotion are considered in our empirical analysis: (i) all promotions − identified by the reported date of last promotion in year t; (ii) promotions without a change in the tasks performed − identified by the reported date of last promotion in year t, without an observed change in occupation between two consecutive observations (automatic promotions); (iii) promotions with a change in the tasks performed − identified by the reported date of last promotion in year t, with an observed change in occupation (identified at the 6 digit level) between two consecutive observations for the worker (merit promotions).

Mobility of workers between firms is identified by the workers' date of admission to the firm and by the firm identification code. Typically in the literature, workers are distinguished using the reason for leaving the firm: either quits or layoffs. Such a distinction is used to signal the quality of the match and the quality of the worker. In this sense, good workers can quit to improve their career prospects somewhere else. But workers can also change firms for several other reasons. One possibility is that firms close down, and the characteristics of workers may be less important in determining the probability of changing firms in these circumstances. It is well established that large firms stand a better chance of survival than small and medium sized firms. In the Portuguese market, however, more than 75% of the firms have less than 10 workers, meaning that firm closures are common.[2] This suggests a high rate of firm creation and destruction in Portugal, which will induce movements of workers in the labour market that are not strictly related to pure mismatch between workers and firms. Therefore, what may better distinguish the quality of workers is the length of time (gap) that it takes to find a new job. Thus, for our purposes, separations have been distinguished by the length of time a worker takes to enter a new firm after separation, and so re-enter private sector employment. Three kinds of separations are analysed: (i) all separations; (ii) separations with a gap of less than

[2]For example, Mata and Portugal (1994) found that only 50% of new firms survived for a period of four years.

12 months until re-entry; (iii) separations with a subsequent gap of 12 months or more until re-entry.[3]

When promotions and separations are considered together without any additional distinction, the analysis refers to two competing risks of failure. When promotions are distinguished according to whether or not they involve a change of tasks, and separations are distinguished according to the length workers take to reappear in another firm, we have four competing risks of failure. A brief description of the process of converting the data set from panel to multiple spell data is presented in the following subsection.

2.3 From panel to multivariate survival data

The construction of the job spells data set is based upon: the date of admission to the firm and the date of last promotion within the firm. The former allows the determination of the beginning of a spell within a firm. The latter allows identification of how long it takes for a worker to be promoted within the firm. Given their importance, these two variables were subject to tests of consistency.[4]

Worker's movements between firms are identified by combining the information on the identification code of the firm and the date of admission to the firm. If both these variables change from one record (of the same individual) to another, then the worker changed firm. Using the reference month in which the survey was completed by the firm, it is possible to measure the spell length for separations. Some spells will be right-censored, either because the panel ends or due to withdrawal. Withdrawal can happen for reasons such as retirement, movements to the public sector (which is not covered by the data), unemployment, non-employment, and self-employment (without registered employees).

Although the survey is collected annually, information on dates (date of entry to the firm, date of last promotion, date of the survey) is reported in the format year/month. Therefore, the time unit of analysis is the month. The length of the first reported event is equal to the

[3]Note that although absences from our dataset can be caused by periods of inactivity of the worker, unemployment, self-employment, or employment in the public sector, the choice of the 12 month threshold for the gap length is related to the distinction of unemployment spells officially made in Portugal. Workers are short (long) term unemployed if they are in that employment status for less (more) than one year.

[4]The procedure followed to check the consistency of this variables is not described here, but is available upon request to the author.

difference between the date when the event occurred and the date of admission to the firm. Higher order spell lengths are equal to the difference between the date of the current event and the date of the previous recorded event. The length of right-censored spells is equal to the difference between the date of the last survey where the individual appears plus one month, and the date of the previous recorded event (if he was promoted) or the date of admission to the firm (if he was not).

After constructing the time to each event some consistency checks were implemented. First, some events happened before or at the onset of observation. These records corresponded to 36% of the number of promotions within firms and were dropped from the sample. Second, some overlapping events (1.5%) appeared to be caused by a change in the firm identification code. In these cases, if all the information (date of admission, date of last promotion, and event type) was equal from one record to the other, the event of the second year was recoded to missing. That is, it was assumed that the worker did not move between firms and only that record was eliminated as it was duplicating one single event. Third, observations for which inconsistencies remained were dropped. Additionally, records with the following characteristics were dropped from the sample: (i) spells of order greater than one with length greater than 180 months (because the length of the panel is 15 years); (ii) events that occurred in a year for which the worker does not appear in the data set; (iii) records for non-employees; (iv) records for which the age of the worker at the beginning of the spell is greater than 64 (retirement age is 65).

Because we do not consider time varying covariates in our analysis, the data contains only one line per worker per event. Therefore, the sample used contains information on 480,354 workers contributing 886,346 spells (some workers experience multiple events). Descriptive statistics of these spells are presented in Table 1.

[Table 1 about here]

Nearly 44% of the observations relate to completed job spells, with median survival time of 28 months. The remainder are right-censored. When two competing risks are considered, 28% of the spells end with promotion, and 16% end with firm separations. The median survival time to promotion is 48 months, while the median survival time to firm separation is close to 13

years. When four competing risks are considered, 8% of the spells are promotions that involve a change in tasks and 21% are promotions that do not involve such a change. One in four workers receives an automatic promotion within 2 years, while it takes more than 8 years for a similar proportion to receive a merit promotion. Separations with a subsequent non-employment spell of less than 12 months are the rarest event (5% of the spells). Separations with a subsequent spell of non-employment lasting 1 year or more account for about 10% of the spells and 75% of jobs last more than six years before experiencing this.

3 Empirical specification

Our data set has several distinctive features worth noting. First, each individual can experience multiple transitions and so appear more than once in the data. Second, because we are considering promotions and between firm mobility, spells may or may not terminate into the same type of event. Finally, not only are we likely to have repeated spells for the same individuals, but we also have multiple spells within the same firm. These features require careful consideration when modelling the time to job mobility for each worker because: (i) if a worker experiences multiple transitions of the same type, the transition intensities can depend on the entire history of the process; that is they can depend on the completed durations not only of the current spell but also of previous spells; (ii) in the presence of multiple destinations, the latent durations to the different destinations may not be independently distributed; (iii) mobility decisions within and between firms depend on behaviours and characteristics of workers and firms, observed and unobserved.

Estimation is carried out assuming: (i) a parametric form for the baseline hazard function; (ii) that the competing risks of failure are independent; and (iii) that only unobserved characteristics of firms are relevant in the process of job mobility. These assumptions reduce the estimation procedure to one similar to a single spells problem, and may thus appear to be strong. In fact, it is possible to find in the literature examples of studies that make fewer assumptions. There is a considerable amount of research on multivariate mixed proportional hazard models (for a survey see van den Berg, 2001), that is models with multiple spells that allow for dependence between competing risks of failure. Regarding the levels of frailty terms,

e.g. Horny *et al.* (2009) have defined a model that conditions the hazard function on two levels of unobserved effects (worker and firm), and allow for correlation between the two. However, in the context of the current analysis, both correlation between risks of failure and controls for unobserved worker and firm effects are difficult to implement, if not infeasible given the dimension of the data and the availability of software.

Although we make several simplifying assumptions, the models can still assume a variety of forms. This section deals with the choices made with respect to the specification of the hazard function, the choice of the explanatory variables and how unobserved heterogeneity is taken into account.

3.1 Choice of parametric specification

Economic theories suggest that after a match is formed, both workers and firms engage in a screening process to identify the quality of the match. As the quality of the match is identified, poor matches may lead to separations from firms while good matches to promotions. Since the quality of the match is identified early the probability of job mobility will increase initially, and then be monotonically decreasing. Non-parametric smoothed hazard functions of job mobility in our data have this shape (see Figure 3).[5]

[Figure 3 about here]

Hazard plots were used as a preliminary check for the suitability of four different parametric distributions: lognormal, loglogistic, Weibull and exponential.[6] Under the assumption that the model is valid, OLS estimates can be used to determine the parameters of the distribution and the R^2 statistic can be used to identify which distribution best fits the data (Blossfeld *et al.*,1989). The hazard plots are shown in figures 1 and 2. In our study, for every failure event, the lognormal and loglogistic distributions were preferred.[7] Therefore, we proceeded with these

[5]For similar empirical results in the case of promotions, see Rosenbaum (1979) and McCue (1996), and in the case of changes of firm see, for example, Farber (1994).

[6]Because of its flexibility the generalized gamma distribution is commonly used to evaluate and select a parametric model. In this study, however, it is not informative given that the Wald test of the hypothesis of appropriateness of the lognormal and the Weibull distributions rejects each of these models. The use of hazard plots follows suggestions by Nelson (1972, 1982).

[7]We chose the two best fitting specifications because these graphical checks do not prove that a specific distribution is the correct one, but signal if a model is inappropriate (Klein and Moeschberger, 2003).

models which assume a linear relationship between the natural logarithm of survival time and the set of explanatory variables.

3.2 Choice of explanatory variables

In our specifications we control for characteristics of workers and firms. Job shopping models predict that younger workers are more likely to move, therefore we include age (and its square) at the beginning of the spell to control for life-cycle trajectories. Because women and men can have different labour market behaviours due, for example, to different non-market opportunities, we include a dummy for gender. To control for human capital and abilities we include as regressors the skill level (high, medium, low) and the education level (ISCED 0/1, ISCED 2, ISCED 3, ISCED 5/6) of the worker. Workers are also distinguished by whether or not they work full time (in the presence of negative shocks, firms may choose to dismiss part-time workers first), and by whether or not they have experienced mobility in the past (to control for mobility behaviour of the workers). The vector of firm characteristics includes firm size (micro, small, medium and large firms), and legal structure of the firm (public, sole proprietor, anonymous partnership, limited liability company). Firms with foreign capital may have different employment policies, and so a variable measuring the percentage of foreign capital is also included. Region (20 districts), industry (two digit level of SIC, 18 industries) and the type of instrument of collective regulation used complete the vector of firm characteristics. To control for some macroeconomic conditions a categorical variable for the period when the event occurred is used. This variable is created according to patterns in the unemployment rate, which was declining until 1992 (category 1), increasing between 1992 and 1996 (category 2) and declining again after 1996 (category 3).

Summary statistics are presented in Table 2. The average age of workers experiencing a promotion is nearly 4 years greater than those experiencing separations. Promotions that involve no change in tasks are the event most likely to be experienced by women (41%). More educated and high skilled workers are more likely to be merit promoted and have a firm separation that involves short periods of non-employment. Part-time workers are more likely to move between firms. Workers are about 20 percentage points more likely to have been previ-

ously promoted than to have experienced a separation in the past. Promotions are more likely in large firms while the opposite happens with firm separations. The average percentage of foreign capital is greater when we are considering promotions (7–10%) than firm separations (6%). Regarding the legal structure of the firm, promotions are more likely in public firms and anonymous partnerships, while separations are more likely in sole partnerships and limited liability companies.

[Table 2 about here]

3.3 Choice of level of frailty

Survival times may be correlated within individuals and within firms, because workers can experience an event more than once (recurrent events), or because several individuals belong to the same firm. In the case of recurrent events, correlation comes from two sources. First, heterogeneity across individuals influences the likelihood that they will experience an event, resulting in within-subject correlation in the occurrence and timing of events. Second, there may be event dependence, *i.e.*, the occurrence of one event may make further events more or less likely. Therefore, unobservable characteristics of workers (ability, motivation, ambition) or firms (promotion policies, market image) that may accelerate or decelerate the survival time to job mobility are included in our models through frailty terms shared, in turn, at the worker, firm and match level. In models with frailties shared across groups of observations, causing observations within the same group to be correlated, we assume a parametric form for the hazard function individuals face and not a distribution for the hazard function of the population. The population hazard function is what results from the estimate of the variance of the frailty terms and the assumed distribution of the frailties, which in this study we assume follow a Gamma distribution.

To choose the appropriate level of frailty three models were specified – one with firm level frailty, one with worker level frailty, and one with match (worker-firm interaction) level frailty. The results obtained suggest that, although all of the alternatives for controlling for frailty effects were statistically significant, the best fitting specifications (the ones with largest log likelihood, or smallest Akaike information criterion value) were those that allowed for correlation

within firms (see Table 3). This result perhaps indicates that the observable characteristics better capture the heterogeneity of workers than the heterogeneity of firms, and emphasizes the importance of firms in determining the job mobility process. Therefore, in what follows, the analyses reported control for unobserved firm effects.[8] Within the specifications that control for firm frailty terms, the loglogistic specification is preferred because it obtains a smaller AIC (in 5 out of 6 models).

[Table 3 about here]

Mincer and Jovanovic (1981) suggest that prior mobility variables are strong indicators of mobility in the following period. Their inclusion in the model shows the existence of heterogeneity in mobility behaviour. Heckman and Borjas (1980) and Heckman and Singer (1985) suggest using prior mobility variables to account for occurrence dependence. Therefore, we allow some correlation at the worker level by letting the baseline hazard vary as a function of previous events. We do this by introducing a dummy variable that takes the value one if the worker has previously experienced the event under analysis, and zero otherwise. This variable will capture occurrence dependence.

4 Results

4.1 Overall estimates

Estimates from the models are displayed in Table 4.[9] Columns (1) and (4) contain the coefficients from the specification with two competing risks – promotions and moves between firms, respectively. Columns (2), (3), (5) and (6) contain the coefficients obtained from the model with four competing risks – promotions that involve a change in tasks, promotions that do not

[8] Horny *et al.* (2009) analyse job durations using discrete-time duration models with worker and firm specific effects. Their results imply that observed characteristics explain between 40-60% of the variation of survival time, and unobserved firm effects explain around 30% of this variation. Worker unobserved effects are the least important and account for at most 12% of the variation. Therefore, the authors conclude that including only worker observed and unobserved characteristics when modelling job transitions is insufficient. Although these results were obtained under a model specification different from that used here, they provide some support for our decision towards the inclusion of frailty terms at the firm level.

[9] All models are implemented using Stata 9's -streg- command with the options for loglogistic distribution, and gamma frailty terms shared at the firm level.

involve such a change, between firm mobility with a subsequent period of non-employment less than one year, and separations with a subsequent gap length of one year or more, respectively. Given the functional form of the model, the coefficients measure relative changes in survival time for a one unit change in the value of the regressors (or, in the case of dummy variables, a change from zero to one). A positive coefficient indicates that survival time is lengthened; if negative, survival time is shortened.

[Table 4 about here]

The results are sensitive to the definition of promotion adopted. In particular, the definition of promotion seems to explain gender differences in the hazard of promotion found in previous studies. When considering all promotions, and promotions that do not involve a change in occupation, women are found to have a shorter times to promotion than men (2% and 3% for all promotions and automatic promotions, respectively). However if promotions are defined in terms of a change in tasks, then women have time to promotion similar to that of men. Therefore, women are more likely than men to experience an automatic promotion, but are as likely as men to experience a merit promotion. These findings may demonstrate why results on the impact of gender on promotion from previous research are not conclusive.

Two arguments are made in the literature regarding women's probability of quitting firms. On the one hand, Lazear and Rosen (1990) assume women have better non-market opportunities than men and, consequently, are more likely to leave the firm (or the labour market) while keeping a high level of utility.[10] On the other hand, if women engage less in employed job search than men (Keith and McWilliams, 1999), possibly because they have more non-market responsibilities and therefore less opportunity to undertake on the job search, or because they face fewer opportunities and incentives (Severn, 1968), then they would be less likely than men to quit the firm. Portugal has been reported to have the lowest median income in the EU 15 group in terms of purchasing power standards, and the highest inequality index and poverty rate (Berthoud, 2004). In such a context, it does not seem reasonable to suppose that women could afford to consider non-labour market opportunities as alternatives to labour market participation. On the contrary, women may have stronger attachment to the labour market and

[10] We have no data on, e.g. marital status or number of children, that may identify non-market opportunities.

to firms.[11] Our results are consistent with this hypothesis not only because Portuguese women are more likely than men to be promoted as a consequence of accumulated length of service, but also because, on average, the time for changing firms is 16% longer for women when compared to men (column 4).[12] Given the high rate of labour market participation of Portuguese women, we do not consider this to be a result specific to the particular group of women in this sample. However, it could be argued the results can be determined by the fact that these are job-to-job transitions, while women would be more likely to make job-to-nonemployment movements (Frederiksen, 2008). We have tested this hypothesis by considering the observations that are right-censored before the end of the panel as another transition of interest, *i.e.* a fifth independent competing risk of failure. We find that women take 1.7% longer than men to leave the panel, hence are not more likely than men to make transitions from job-to-nonemployment.

The effect of education level also depends on the type of promotion considered. Our results suggest that firms make promotion decisions based on worker ability because the likelihood of automatic promotion increases with the level of education. If schooling is related to abilities of workers, then the fact that more educated workers have a shorter survival time to automatic promotions indicates that such promotions are not just a consequence of elapsed duration. Firms may indeed be using promotions as a reward for higher productive ability. Furthermore, as more educated workers tend also to have faster rates of transition between firms, it is not possible to argue that more educated workers have greater degrees of attachment to firms (thus being more likely to be automatically promoted). However, education is only a differentiating factor for automatic promotions, and not for merit promotions. If education is an indicator of accumulated general human capital, then merit promotions are compensating other types of characteristics, possibly the accumulation of firm-specific human capital. Firms also clearly distinguish the skill level of the workers. Compared to medium skilled workers, high skilled workers have higher hazards of merit promotions (survival time shortened by 23%), and lower hazards of automatic promotions (survival time lengthened by 12%) despite these workers being

[11] Portuguese women have increased their participation in the labour market in recent years. The female labour force participation rate in Portugal was 56% in 1986, while in 2000 68% of women were active (male's labour force participation rate was 84% over the period). Further, Spiess et al. (2004) document the lack of a childbirth effect in Portugal – the pattern of average hours worked by women does not change after the first childbirth. This is consistent with the hypothesis of there being no better non-market opportunities.

[12] For similar results on women's turnover rates in the USA see Farber (1994) and Bishop (1990).

less likely to separate from the firm.

It is interesting to note the effect of schooling in the two competing risks for leaving firms (columns 5 and 6). Both types of moves between firms are monotonically associated with the level of schooling. However, the more educated a worker is the greater the hazard rate to separate and return to work within one year. For example, workers with a university degree have much faster transition rates for separations from firms that involve returning to work within one year. These results may be due to the fact that the quality of the match is identified faster for highly educated workers, hence these workers are either promoted or change firms sooner. But school attainment can also be correlated with the cohort of workers. Minimum compulsory schooling in Portugal was six years from the 1970s until mid-1980s when minimum compulsory schooling became nine years. Therefore, from the mid-nineties onwards the minimum level of schooling an entrant to the labour market could have is ISCED level 2. Also, during the 1990s Portugal experienced a boom in the supply of workers with university degrees. Therefore, more educated workers are expected to have lower labour market experience and so, according to job shopping theories, will be less aware of their own preferences and characteristics of the labour market, hence having higher rates of job mobility.

Part-time workers have less attachment to the firm than full-time workers and are very likely to change firms. On average, their time to separations is 40% lower than for full-time workers, and this effect is particularly apparent when considering separations followed by a long period of non-employment (column 6).[13]

We find strong evidence for occurrence dependence, workers who have been promoted or changed firms before are more likely to do so again (the coefficients on the previous failure variable range between -1.9 and -0.9, for promotions; and between -3 and -2 for separations). This indicates that there are some workers with a high propensity to be promoted, and suggest the possible existence of fast trackers. Some others have a greater propensity to change firms, suggesting that some workers are movers while others are stayers.

Overall, the effects of observed firm characteristics are also important in our models. Workers in small and medium sized firms have lower hazards into promotion: their survival times

[13] Specifications with interaction terms for gender and hours of work (part/full-time) were also estimated (not presented here). The coefficients on these interactions were generally not significant.

are 6% to 18% longer than the one observed for workers in large firms. Because smaller firms are less likely to have a structure that supports workers' career progress, opportunity seems to be a relevant determinant of the likelihood of promotion.[14] The legal structure of the firm is also a statistically significant predictor of job mobility. In particular, workers in public firms and anonymous partnerships have lower hazards of being promoted and of changing firms. On the other hand, firms with legal structure sole proprietors are more likely to promote, but they are also firms from which workers try to escape faster. Sole proprietor firms may have difficulty in obtaining credit because risk is concentrated in one single individual. It is possible that workers realize that these firms are potentially less stable, act rationally and move to another firm in order to find a potentially more stable employment relationship. The coefficient on the percentage of foreign capital is very small, but always significant. Workers in firms with a greater share of foreign capital are more likely to receive merit promotions, but less likely to experience other types of job mobility.

The shape parameter (γ) reflects the pattern of duration dependence. In the case of the loglogistic distribution, hazards can be initially rising, reach a maximum and then decline monotonically (when gamma is $\leq$ 1) or reflect strict negative duration dependence (when gamma is greater than one). In the case of promotions the hazard follows the former pattern, but this is not observed for every type of separation. In the case of all separations combined, and separations with a subsequent gap of one year or more, the hazard initially rises and then declines. In the case of separations with a gap of length less than one year, negative duration dependence is observed at all survival times.

The parameter measuring the estimated frailty variance (η) reflects the degree of heterogeneity among firms, and the closer it is to zero the less important are unobserved firm-specific effects. For each risk, the frailty variance is significantly different from zero and it is greater for promotions than for moves between firms. That is, firms seem to vary more in their unobserved propensity to promote than in the case of separations. Furthermore, individual (conditional)

[14] Wise (1975) suggests that promotions are dependent on the opening of vacancies, and that this effect is likely to be more important the closer one is to the top of the hierarchy. On the contrary, promotions at low levels are less likely to depend on the occurrence of openings.

and population (unconditional) hazard functions (see Figure 4) were plotted.[15] For every type of event, population and individual hazard functions these had the same shape. I therefore conclude that whereas unobserved heterogeneity is important, the resulting pattern of duration dependence is not altered by its presence.

[Figure 4 about here]

4.2 Estimates by gender

Because the effects of our covariates may differ for women and men, the models were estimated: see Table 6. We performed a likelihood ratio Chow test and concluded that the regression coefficients obtained in the previous section do not differ between gender (see test statistics in Table 5). In fact, when comparing these separate results with the set of pooled estimates, we generally find that the coefficients differ in their magnitude, but not in sign. Despite this result, t-tests performed on each coefficient separately reveal that some coefficients differ in magnitude.[16]

[Table 6 about here]

Having a university degree (ISCED 5/6) has a greater impact for women than for men in every type of job mobility, except for changes of firms that involve long periods of nonemployment. The effect of the level of skill is also statistically different by gender. However, what differs between genders is the magnitude of the effect and not its direction. Working part-time has a similar impact on the mobility for both men and women: the waiting time is lengthened in the case of promotions and shortened in the case of job separations. The characteristics of firms seem to have a similar impact on the rates of transition of men and women.

We find evidence of occurrence dependence among both men and women. The coefficient on the previous mobility covariate is always large (ranging from -3 to -0.9) and highly statistically

[15] We have assumed that the frailty terms (v) follow a gamma distribution with mean one and variance η. Therefore, estimated population hazard functions are those obtained after adjusting for the estimated frailty variance (η) and for the assumed frailty distribution. Individual hazard functions are conditional to an arbitrary frailty effect, and are estimated assuming that $v \equiv 1$ (the mean frailty effect) in which case population hazards reduce to their individual counterparts.

[16] These tests were performed after specifying a model with interaction between every covariate and gender. This means that both genders were assumed to have, for example, the same shape parameter and the same frailty variance.

significant. We also find significant unobserved heterogeneity at the firm level. For both genders, there is more heterogeneity among firms (the frailty variance is larger) in promotions than in firm separations. The gender difference in the variance of frailties is greater for promotions that involve a change in tasks (variance is 0.46 for men and 0.72 for women), and separations that involve gaps of length less than one year (the frailty variance is 0.36 for men and 0.63 for women).

Estimated individual and population hazards by gender were plotted (not presented here). The pattern of duration dependence obtained is similar to the one produced for the complete sample. The estimated hazards of promotions that involve a change in the tasks performed is lower for women. Women have also lower estimated hazards of experiencing any type of separation. Therefore, gender-specific estimates confirm the result obtained on the coefficient on gender in the pooled sample (Table 4).

4.3 Estimates from flow data

Our data are essentially a stock sample with the follow up of individuals. Some problems may therefore arise in defining the appropriate distribution for the durations that occurred before the individuals became under observation. Lancaster (1992) suggests that if the models do not involve person-specific unmeasured heterogeneity, then a sample of observations that start after the sampling date could be selected to construct a flow data likelihood function. Given the scale of left truncation (some spells lasted nearly 600 months) the models were re-estimated on a sample of spells starting after January 1985 (640,131 records).[17] Estimates from these regressions are displayed in Table 7.

[Table 7 about here]

Most of the coefficients are equal in sign to the ones obtained with the full sample, and only a few differences arise. As previously reported, women are more likely than men to receive automatic promotions and as likely as men to receive merit promotions. It is confirmed that women take longer than men to experience a separation, especially for transitions that involve a

[17] Note that 1985 is the year when Quadros de Pessoal started.

period of non-employment in the private sector of length of less than one year.[18] The magnitude of the impact of schooling is reduced if we consider the flow sample. In the case of promotions (of any type) the results are similar to the ones obtained before: education increases the hazard of being promoted. For firm separations we find that schooling increases the hazard of having a separation with a short gap of non-employment, and reduces the hazard of experiencing a separation that involves a period of non-employment of length of one year or more for workers with ISCED 2 and 3.

As for the case of workers' characteristics, firm effects are also less strong but remain significant determinants of job mobility. Exception is made for firm size effects which are greatly attenuated in the case of promotions, and become generally insignificant in the case of separations.

Inspection of the shape of conditional and unconditional estimated destination-specific hazard functions (not presented here) supports the results obtained previously with the difference that for separations that involve a gap of length of less than one year are also initially increasing and then monotonically decreasing. Evidence is also found for occurrence dependence and unmeasured firm heterogeneity.

5 Summary and conclusions

This paper has analysed in detail the determinants of job mobility in Portugal. Two main contributions are made to the literature. Firstly, two types of job mobility are analysed jointly, promotions and moves between firms. These events can be defined in a variety of ways. Assuming that the determinants of mobility may depend on the definition adopted, promotions were differentiated by whether or not they were associated with a change in the tasks performed. Similarly, separations were disaggregated according to the length of time workers take to find a new job. These distinctions proved to be fruitful in the sense that differences emerged in the impact of observed factors, and interesting comparisons and links were possible between the determinants of promotion and separations. One finding that clearly emerged relates to gender

[18] As previously, we estimated the hazard of job-to-nonemployment transitions. The same result was obtained, survival time of women 3.5% longer than that of men to experience this type of mobility.

differentials in promotions. Their existence depends heavily on the definition of promotion adopted.

The second contribution is the introduction of firms' characteristics in the analysis. A major conclusion is that firm characteristics cannot be ignored in explaining job mobility. Not only were such variables important determinants of job mobility, but models including unobserved frailty at the firm level were always preferred to models with frailty at the worker or match level. The third contribution is that rather than using data from one single firm, the data set used is economy wide and allows for conclusions applicable to the labour market as a whole.

Some questions for further work arise from this study. In this paper we have assumed that the competing risks were independent, and we had to choose at which level to control for frailty effects. Although models that assume correlation between risks are available, it would be of useful to estimate more complex models that, for example, would allow identification of the degree of correlation between competing risks. It would also be interesting to estimate two-way frailty models and identify how the effect of unobserved worker and firm characteristics varies across types of job mobility.

It is common to find empirical studies analysing promotions, that restricts them to changes in the task performed within the firm. However, this study suggests that the distinction between types of promotions reveals different mechanisms ruling the decision of the firms. Also, some authors suggest that even if a promotion does not involve a change in task nor a pay increase, it can result in greater commitment of the worker to the firm. Therefore, can we estimate the non-wage benefits of promotions and identify their effect on the stability of employment relationships, worker productivity and job satisfaction? This would involve the collection of different information in most surveys. One step is to make the definition of promotion independent of changes in tasks/jobs within the firm. Another step is, for example, to collect data on the flexibility of working hours, if the workers receive company cars or phones or other benefits after a promotion.

Regarding firm separations, we know that some separations are *forced* or a consequence of firm shutdown, and not a consequence of a pure mismatch between workers and firms. Do workers perceive the hazard of firm shutdown? How does this hazard rate affect the hazard of

separation from firms? And of what workers? There are also questions related to the type of workers firms export to the labour market, and the type of those that they hire, either when replacing workers that have separated or to fill new positions. Some answers to this last set of questions are possible with the *Quadros de Pessoal* data and are likely to be part of my research agenda.

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Tables

Table 1: Summary statistics of events

	Frequency	Percent	Incidence rate	Survival time 25%	50%	75%
Records:	886,346	100				
Right-censored	497,802	56.16				
Completed	388,544	43.84	0.016	12	28	75
Two competing risks:						
Promotions	249,476	28.15	0.010	20	48	171
Separations	139,068	15.69	0.006	37	154	
Four competing risks:						
Promotions, different task	66,828	7.54	0.003	96		
Promotions, same task	182,648	20.61	0.008	24	79	
Separations, small gap	47,990	5.41	0.002	183		
Separations, big gap	91,078	10.28	0.004	76	321	

Note: These estimates of survival time account for right-censoring. Competing risks are treated as independent. The incidence rate is the number of new failures divided by the sum of the length of time each individual was exposed to the risk. Source: Own calculations based on Quadros de Pessoal (1986-2000).

Table 2: Descriptive statistics of selected covariates

	All	Promotions			Separations		
	spells	All	Different task	Same task	All	Small gap	Big gap
Age	30.48	30.68	29.46	31.13	26.85	27.45	26.53
Gender							
Male	59.72	60.28	63.34	59.16	62.76	62.83	62.72
Female	40.28	39.72	36.66	40.84	37.24	37.17	37.28
Education							
ISCED 0/1	69.21	66.67	66.36	66.78	76.58	71.28	79.37
ISCED 2	12.01	12.80	12.64	12.86	9.47	10.74	8.81
ISCED 3	13.54	14.97	14.81	15.03	10.42	12.92	9.11
ISCED 5/6	5.23	5.56	6.19	5.33	3.52	5.06	2.71
Skill Level							
High	18.28	21.32	28.30	18.76	13.49	14.83	12.79
Medium	42.16	44.70	39.48	46.60	40.11	42.59	38.80
Low	39.56	33.99	32.21	34.64	46.40	42.58	48.40
Type of work							
Full-time	82.05	87.99	89.30	87.51	80.36	82.48	79.25
Part-time	10.66	7.45	6.36	7.85	12.25	11.09	12.87
Previous experience of event							
No	80.35	52.89	74.62	62.82	78.23	89.67	86.55
Yes	19.65	47.11	25.98	37.18	21.77	10.33	13.45
Size of firm							
Micro	18.99	12.68	10.25	13.56	21.20	21.86	20.86
Small	27.42	23.43	22.58	23.74	31.69	32.73	31.14
Medium	24.21	23.56	26.00	22.67	25.99	25.61	26.19
Large	29.37	40.34	41.17	40.03	21.12	19.80	21.82
Legal structure of firm							
Public (private mkt law)	3.25	7.34	5.37	8.06	0.87	0.63	0.99
Sole proprietor	10.60	7.67	6.16	8.23	14.06	15.70	13.19
Anonymous partnership	24.32	29.84	32.07	29.02	17.25	17.78	16.97
Limited liability company	55.79	50.00	50.33	49.88	63.79	61.89	64.79
Type of collective regulation							
Collective agreement	3.65	6.18	5.57	6.40	1.24	1.71	0.99
Collective contract	82.93	73.97	75.92	73.26	91.51	90.94	91.80
Regulating law	4.29	3.39	3.68	3.28	4.23	4.64	4.01
Firm agreement	6.91	14.62	12.85	15.26	1.55	1.21	1.72
% of foreign capital	7.59	8.10	9.79	7.48	5.77	5.97	5.67
No. of spells	886,346	249,476	66,828	182,648	139,068	47,990	91,078

Note: Apart from age and percentage of foreign capital, all variables are categorical and their percentage distribution is presented. The statistics presented are computed over the number of spells for each column. Due to rounding, or to the exclusion of categories labelled as "other" the sum of frequencies does not equal 100 in some cases. Source: Own calculations based on Quadros de Pessoal (1986-2000).

Table 3: Choice of parametric distribution and of level of frailty, selected estimates

	Worker frailty		Firm frailty		Match frailty		Worker Frailty		Firm Frailty		Match frailty	
	Llogistic	Lnormal	Llogistic	Lnormal	Llogistic	Lnormal	Llogistic	Lnormal	Llogistic	Lnormal	Llogistic	Lnormal
2 Risks:	All Promotions						All separations					
γ	0.683		0.614		0.681		0.922		0.916		0.921	
	(0.001)		(0.001)		(0.001)		(0.002)		(0.002)		(0.002)	
σ		1.252		1.208		1.254		1.705		1.649		1.689
		(0.002)		(0.003)		(0.002)		(0.004)		(0.004)		(0.004)
η	0.245	0.175	1.402	1.230	0.247	0.162	0.377	0.341	0.448	0.466	0.432	0.434
	(0.005)	(0.004)	(0.015)	(0.014)	(0.005)	(0.004)	(0.008)	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)
LL	–507,589	–510,396	–456,971	–460,615	–507,891	–510,702	–357,850	–359,779	–350,208	–351,334	–358,452	–360,127
AIC	1,015,323	1,020,935	914,085	921,373	1,015,925	1,021,549	715,844	719,703	700,561	702,812	717,048	720,399
4 Risks:	Promotion, different task						Promotion, same task					
γ	0.852		0.744		0.849		0.756		0.655		0.753	
	(0.003)		(0.003)		(0.003)		(0.002)		(0.002)		(0.002)	
σ		1.613		1.533		1.611		1.387		1.316		1.387
		(0.005)		(0.005)		(0.005)		(0.003)		(0.003)		(0.003)
η	0.243	0.185	1.200	1.086	0.272	0.202	0.329	0.262	1.577	1.396	0.342	0.256
	(0.011)	(0.010)	(0.024)	(0.022)	(0.013)	(0.011)	(0.006)	(0.006)	(0.018)	(0.016)	(0.007)	(0.006)
LL	–209,707	–209,367	–199,689	–199,533	–209,687	–209,359	–437,225	–438,090	–397,230	–398,583	–437,426	–438,350
AIC	419,558	418,877	399,523	399,209	419,518	418,863	874,593	876,324	794,604	797,310	874,996	876,844
	Separations, gap<12 months						Separations, gap≥12 months					
γ	1.098		1.057		1.080		0.963		0.969		0.953	
	(0.004)		(0.004)		(0.004)		(0.003)		(0.003)		(0.003)	
σ		2.223		2.127		2.180		1.815		1.791		1,793
		(0.008)		(0.008)		(0.008)		(0.005)		(0.005)		(0.005)
η	0.217	0.170	0.738	0.718	1.113	0.951	0.592	0.520	0.504	0.500	0.820	0.716
	(0.017)	(0.017)	(0.018)	(0.017)	(0.058)	(0.056)	(0.012)	(0.012)	(0.009)	(0.009)	(0.018)	(0.017)
LL	–182,831	–183,013	–179,407	–179,658	–182,679	–182,888	–255,229	–257,539	–251,173	–253,036	–255,449	–257,757
AIC	365,805	366,171	358,959	359,460	365,502	365,919	510,602	515,222	502,489	506,216	511,041	515,500

Note: In all specifications the number of spells is 886,346. The number of workers is 480,137, the number of firms is 165,128 and the number of matches is 632,914. The number of degrees of freedom is 72. Standard errors in parentheses All models include as regressors age (and its square), percentage of foreign capital, and dummies for: gender, education, scheme of work, size of firm, legal structure of the firm, instrument of collective regulation, industry, region and time. Gamma and sigma are the shape parameters of the loglogistic and lognormal distributions, respectively. The frailty effect (η) is always highly statistically significant. Lnormal and Llogistic stand for lognormal and loglogistic, respectively. Source: Own calculations based on Quadros de Pessoal (1986-2000).

Table 4: Estimates of job mobility

	Promotions			Changes of firm		
	All	Different task	Same task	All	Small gap	Big gap
	(1)	(2)	(3)	(4)	(5)	(6)
Age	0.064	0.066	0.057	0.077	0.059	0.058
	(0.001)	(0.002)	(0.001)	(0.002)	(0.004)	(0.003)
$Age^2/100$	-0.072	-0.070	-0.064	-0.052	-0.037	-0.017
	(0.001)	(0.003)	(0.002)	(0.003)	(0.005)	(0.004)
Female	-0.022	0.012†	-0.033	0.159	0.277	0.156
	(0.004)	(0.009)	(0.005)	(0.009)	(0.014)	(0.011)
ISCED 2	-0.161	-0.171	-0.179	-0.155	-0.296	-0.054
	(0.006)	(0.012)	(0.007)	(0.012)	(0.019)	(0.016)
ISCED 3	-0.208	-0.171	-0.237	-0.245	-0.461	-0.094
	(0.006)	(0.012)	(0.007)	(0.012)	(0.019)	(0.016)
ISCED 5/6	-0.277	-0.173	-0.320	-0.644	-1.028	-0.371
	(0.009)	(0.017)	(0.011)	(0.021)	(0.032)	(0.029)
High skilled	0.037	-0.231	0.116	0.150	0.230	0.115
	(0.005)	(0.010)	(0.007)	(0.012)	(0.020)	(0.016)
Low Skilled	-0.174	-0.120	-0.173	-0.507	-0.417	-0.540
	(0.004)	(0.009)	(0.005)	(0.008)	(0.013)	(0.010)
Part-timer	0.037	0.205	0.021	-0.401	-0.267	-0.444
	(0.007)	(0.014)	(0.008)	(0.011)	(0.019)	(0.014)
Previous mobility	-0.931	-1.942	-1.095	-2.164	-3.301	-2.530
	(0.004)	(0.011)	(0.005)	(0.010)	(0.028)	(0.017)
Micro firm	0.063	0.366	0.171	-0.044	-0.038†	-0.109
	(0.012)	(0.023)	(0.015)	(0.019)	(0.032)	(0.024)
Small firm	0.109	0.286	0.213	-0.061	-0.119	-0.079
	(0.011)	(0.019)	(0.014)	(0.017)	(0.029)	(0.022)
Medium firm	0.176	0.249	0.244	0.019†	0.021†	0.007†
	(0.010)	(0.018)	(0.012)	(0.016)	(0.027)	(0.021)
Public	0.087	0.360	0.061	0.515	0.467	0.443
	(0.014)	(0.031)	(0.017)	(0.054)	(0.103)	(0.068)
Sole proprietor	-0.060	-0.023	-0.075	-0.279	-0.514	-0.145
	(0.010)	(0.018)	(0.011)	(0.013)	(0.020)	(0.017)
Anonymous partnership	0.068	0.052†	0.053	0.193	0.229	0.199
	(0.009)	(0.016)	(0.012)	(0.015)	(0.024)	(0.019)
% of foreign capital	0.000	-0.001	0.001	0.001	0.002	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	3.682	4.973	3.914	4.356	5.474	5.716
	(0.023)	(0.045)	(0.029)	(0.042)	(0.067)	(0.053)
Shape parameter (γ)	0.585	0.698	0.635	0.855	1.027	0.924
	(0.001)	(0.002)	(0.001)	(0.002)	(0.004)	(0.003)
Variance of frailties (η)	0.910	0.666	1.096	0.245	0.460	0.315
	(0.011)	(0.017)	(0.013)	(0.005)	(0.013)	(0.007)
No. of failures	249,476	66,828	182,648	139,068	47,990	91,078
LL	-429,184	-182,040	-373,961	-329,518	-172,519	-240,639
AIC	858,497	364,208	748,050	659,164	345,167	481,407

Note: The base categories are: male, ISCED 0/1, medium skill, full time, no previous failure, large firm, and limited liability companies. Controls for instrument of collective regulation, industry, region and year are included but not reported. The no. of observations is 886,346, the no. of firm frailty terms is 165,128. Standard errors in parentheses. Coefficients are generally significant at the 1% level of significance, except those marked with † which are not significant at any conventional level of significance. Source: Own calculations based on Quadros de Pessoal (1986-2000).

Table 5: Likelihood-ratio test statistics

	Promotions			Changes of firm		
	All	Different task	Same task	All	Small gap	Big gap
Test statistic: LR χ^2	–7583.7	–1186.7	–6448.54	–637.9	–350.4	–413.6
p-value	1.0	1.0	1.0	1.0	1.0	1.0

Note: All test statistics have 62 degrees of freedom. All models include the same covariates as in Table 4.
Source: Own calculations based on Quadros de Pessoal (1986-2000).

Table 6: Estimates of job mobility, by gender

	Women						Men					
	Promotions			Changes of firm			Promotions			Changes of firm		
	All	Different task	Same task	All	Small gap	Big gap	All	Different task	Same task	All	Small gap	Big gap
Age	0.055	0.062	0.046	0.086	0.084	0.060	0.072	0.072	0.065	0.067	0.044	0.049
	(0.002)	(0.004)	(0.002)	(0.004)	(0.006)	(0.005)	(0.001)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)
$Age^2/100$	-0.063	-0.070	-0.052	-0.056	-0.065	-0.006†	-0.081	-0.076	-0.072	-0.043	-0.018	-0.011
	(0.003)	(0.005)	(0.003)	(0.006)	(0.009)	(0.008)	(0.002)	(0.004)	(0.002)	(0.004)	(0.006)	(0.005)
ISCED 2	-0.132	-0.155	-0.153	-0.178	-0.336	-0.068	-0.189	-0.198	-0.208	-0.153	-0.292	-0.057
	(0.010)	(0.020)	(0.011)	(0.020)	(0.032)	(0.026)	(0.007)	(0.015)	(0.009)	(0.016)	(0.025)	(0.021)
ISCED 3	-0.241	-0.223	-0.267	-0.282	-0.513	-0.134	-0.207	-0.167	-0.240	-0.239	-0.453	-0.074
	(0.010)	(0.020)	(0.012)	(0.020)	(0.032)	(0.026)	(0.008)	(0.015)	(0.010)	(0.017)	(0.025)	(0.022)
ISCED 5/6	-0.364	-0.253	-0.428	-0.701	-1.124	-0.367	-0.257	-0.160	-0.293	-0.612	-0.971	-0.369
	(0.016)	(0.032)	(0.019)	(0.036)	(0.055)	(0.050)	(0.011)	(0.021)	(0.014)	(0.026)	(0.040)	(0.036)
High skilled	0.041	-0.337	0.161	0.051	0.140	0.000†	0.033	-0.199	0.096	0.195	0.275	0.163
	(0.010)	(0.019)	(0.012)	(0.022)	(0.037)	(0.029)	(0.006)	(0.012)	(0.008)	(0.015)	(0.024)	(0.019)
Low Skilled	-0.191	-0.244	-0.162	-0.571	-0.464	-0.613	-0.169	-0.053	-0.189	-0.497	-0.421	-0.524
	(0.007)	(0.015)	(0.008)	(0.014)	(0.023)	(0.018)	(0.006)	(0.012)	(0.007)	(0.010)	(0.017)	(0.013)
Part-timer	0.054	0.293	0.036	-0.388	-0.266	-0.416	0.029	0.152	0.018†	-0.418	-0.283	-0.472
	(0.010)	(0.023)	(0.012)	(0.018)	(0.030)	(0.023)	(0.009)	(0.019)	(0.011)	(0.015)	(0.025)	(0.019)
Previous failure	-0.927	-2.011	-1.064	-2.225	-3.354	-2.595	-0.970	-1.966	-1.154	-2.149	-3.319	-2.511
	(0.006)	(0.019)	(0.008)	(0.018)	(0.049)	(0.030)	(0.005)	(0.014)	(0.007)	(0.013)	(0.034)	(0.021)
Micro firm	0.066	0.385	0.136	-0.162	-0.115	-0.279	0.031	0.290	0.137	0.009†	-0.040†	-0.054
	(0.018)	(0.035)	(0.022)	(0.030)	(0.050)	(0.038)	(0.016)	(0.027)	(0.020)	(0.023)	(0.037)	(0.029)
Small firm	0.095	0.280	0.172	-0.155	-0.208	-0.211	0.075	0.217	0.178	-0.016†	-0.106	-0.037†
	(0.016)	(0.030)	(0.019)	(0.027)	(0.045)	(0.034)	(0.014)	(0.023)	(0.018)	(0.021)	(0.033)	(0.026)
Medium firm	0.192	0.271	0.247	-0.002†	0.027†	-0.045†	0.126	0.179	0.200	0.012†	-0.025†	0.009†
	(0.014)	(0.027)	(0.017)	(0.025)	(0.043)	(0.032)	(0.013)	(0.021)	(0.016)	(0.019)	(0.032)	(0.025)
Public	0.095	0.492	0.106	0.669	0.856	0.519	0.083	0.300	0.047	0.509	0.413	0.472
	(0.026)	(0.059)	(0.032)	(0.109)	(0.204)	(0.137)	(0.017)	(0.036)	(0.021)	(0.060)	(0.113)	(0.075)
Sole proprietor	-0.085	-0.003†	-0.102	-0.356	-0.609	-0.212	-0.040	-0.032†	-0.051	-0.214	-0.441	-0.088
	(0.015)	(0.029)	(0.017)	(0.021)	(0.034)	(0.027)	(0.012)	(0.022)	(0.015)	(0.016)	(0.026)	(0.021)
Anonymous partnership	0.030	0.060	0.034	0.059	0.162	0.033†	0.082	0.064	0.065	0.244	0.258	0.265
	(0.014)	(0.027)	(0.017)	(0.025)	(0.041)	(0.032)	(0.012)	(0.019)	(0.015)	(0.017)	(0.028)	(0.023)
% of foreign capital	0.000†	-0.001	0.000	0.001	0.001	0.001	0.000†	-0.002	0.001	0.001	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	3.861	5.318	4.118	4.396	5.397	5.863	3.590	4.842	3.874	4.521	5.761	5.881

(Continued on next page)

Table 6: (continued from previous page)

	Women						Men					
	Promotions			Changes of firm			Promotions			Changes of firm		
	All	Different task	Same task	All	Small gap	Big gap	All	Different task	Same task	All	Small gap	Big gap
	(0.037)	(0.073)	(0.044)	(0.070)	(0.112)	(0.089)	(0.031)	(0.056)	(0.038)	(0.052)	(0.082)	(0.066)
Shape parameter (γ)	0.587	0.724	0.636	0.869	1.052	0.934	0.586	0.698	0.641	0.845	1.017	0.918
	(0.002)	(0.004)	(0.002)	(0.003)	(0.007)	(0.005)	(0.001)	(0.003)	(0.002)	(0.003)	(0.005)	(0.003)
Variance of frailties (η)	0.849	0.722	1.014	0.292	0.632	0.356	0.764	0.458	0.982	0.212	0.358	0.285
	(0.016)	(0.027)	(0.020)	(0.009)	(0.026)	(0.013)	(0.013)	(0.017)	(0.017)	(0.005)	(0.014)	(0.009)
No. of failures	99,087	24,498	74,589	51,793	17,837	33,956	150,389	42,330	108,059	87,275	30,153	57,122
LL	-177,116	-70,344	-155,944	-127,139	-66,319	-92,014	-255,859	-112,289	-221,090	-202,698	-106,375	-148,831
AIC	354,359	140,815	312,015	254,404	132,764	184,155	511,845	224,704	442,307	405,522	212,877	297,789

Note: The base categories are: ISCED 0/1, medium skill, full time, no previous failure, large firm, and limited liability companies. Controls for instrument of collective regulation, industry, region and year are included, but not reported here. The no. of observations is 356,985 women and 529,361 men. The no. of frailty terms is 87,252 in models for women, and 112,224 in models for men. Standard errors in parentheses. Coefficients are generally significant at the 1% level of significance, except those marked with † which are not significant at any conventional level of significance. Source: Own calculations based on Quadros de Pessoal (1986-2000).

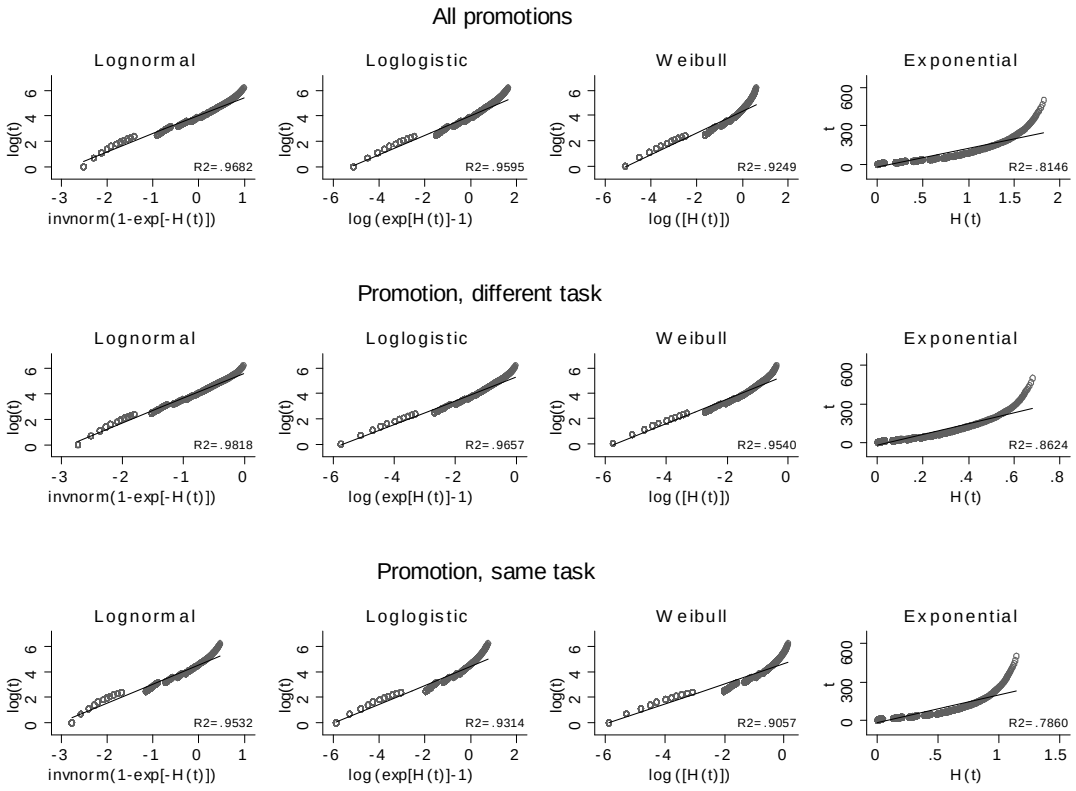
Table 7: Estimates of job mobility, flow sample

	Promotions			Changes of firm		
	All	Different task	Same task	All	Small gap	Big gap
Age	0.056	0.072	0.049	0.084	0.061	0.054
	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)
$Age^2/100$	-0.066	-0.079	-0.057	-0.069	-0.046	-0.021
	(0.002)	(0.004)	(0.002)	(0.003)	(0.005)	(0.004)
Female	-0.038	-0.000†	-0.055	0.110	0.199	0.111
	(0.005)	(0.009)	(0.006)	(0.009)	(0.014)	(0.012)
ISCED 2	-0.136	-0.099	-0.142	-0.082	-0.187	0.033
	(0.007)	(0.013)	(0.009)	(0.013)	(0.019)	(0.017)
ISCED 3	-0.174	-0.092	-0.192	-0.136	-0.292	0.030
	(0.007)	(0.013)	(0.009)	(0.013)	(0.020)	(0.017)
ISCED 5/6	-0.258	-0.110	-0.292	-0.447	-0.749	-0.133
	(0.011)	(0.020)	(0.014)	(0.022)	(0.032)	(0.031)
High skilled	0.048	-0.192	0.138	0.101	0.192	0.043
	(0.007)	(0.012)	(0.009)	(0.013)	(0.021)	(0.017)
Low Skilled	-0.196	-0.119	-0.195	-0.474	-0.393	-0.496
	(0.005)	(0.009)	(0.006)	(0.008)	(0.013)	(0.011)
Part-timer	0.051	0.167	0.043	-0.387	-0.264	-0.434
	(0.008)	(0.015)	(0.009)	(0.012)	(0.019)	(0.015)
Previous failure	-0.979	-1.853	-1.172	-2.044	-3.069	-1.969
	(0.005)	(0.013)	(0.007)	(0.010)	(0.026)	(0.016)
Micro firm	-0.014†	0.302	0.024	0.051	0.029	-0.031†
	(0.014)	(0.021)	(0.018)	(0.019)	(0.030)	(0.025)
Small firm	0.022	0.222	0.067†	0.011	-0.069†	-0.024†
	(0.013)	(0.019)	(0.016)	(0.017)	(0.028)	(0.023)
Medium firm	0.090	0.168	0.118	0.039†	0.004†	0.020†
	(0.012)	(0.017)	(0.015)	(0.016)	(0.026)	(0.022)
Public	0.155	0.145	0.211	-0.021†	0.244	-0.223
	(0.032)	(0.059)	(0.038)	(0.078)	(0.131)	(0.102)
Sole partnership	-0.048	-0.009†	-0.053	-0.233	-0.437	-0.098
	(0.010)	(0.017)	(0.012)	(0.013)	(0.020)	(0.017)
Anonymous partnership	0.056	0.006†	0.050	0.108	0.127	0.111
	(0.011)	(0.016)	(0.013)	(0.015)	(0.023)	(0.020)
% of foreign capital	0.001	-0.001	0.001	0.002	0.002	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	3.973	4.524	4.297	4.001	5.094	5.470
	(0.028)	(0.045)	(0.034)	(0.043)	(0.068)	(0.056)
Shape parameter (γ)	0.602	0.629	0.656	0.832	0.961	0.896
	(0.001)	(0.003)	(0.002)	(0.002)	(0.004)	(0.003)
Variance of frailties (η)	0.781	0.505	0.917	0.181	0.352	0.298
	(0.012)	(0.017)	(0.015)	(0.005)	(0.013)	(0.008)
No. of failures	155,545	41,982	113,563	107,324	37,796	69,528
LL	-306,126	-121,456	-263,572	-269,447	-140,403	-196,440
AIC	612,381	243,040	527,273	539,022	280,934	393,009

Note: The base categories are: male, ISCED 0/1, medium skill, full time, no previous failure, large firm, and limited liability companies. Controls for instrument of collective regulation, industry, region and year are included. The no. of observations is 636,595, the no. of frailty terms is 149,694. Standard errors in parentheses. Coefficients are generally significant at the 1% level of significance, except those marked with † which are not significant at any conventional level of significance. Source: Own calculations based on Quadros de Pessoal (1986-2000).

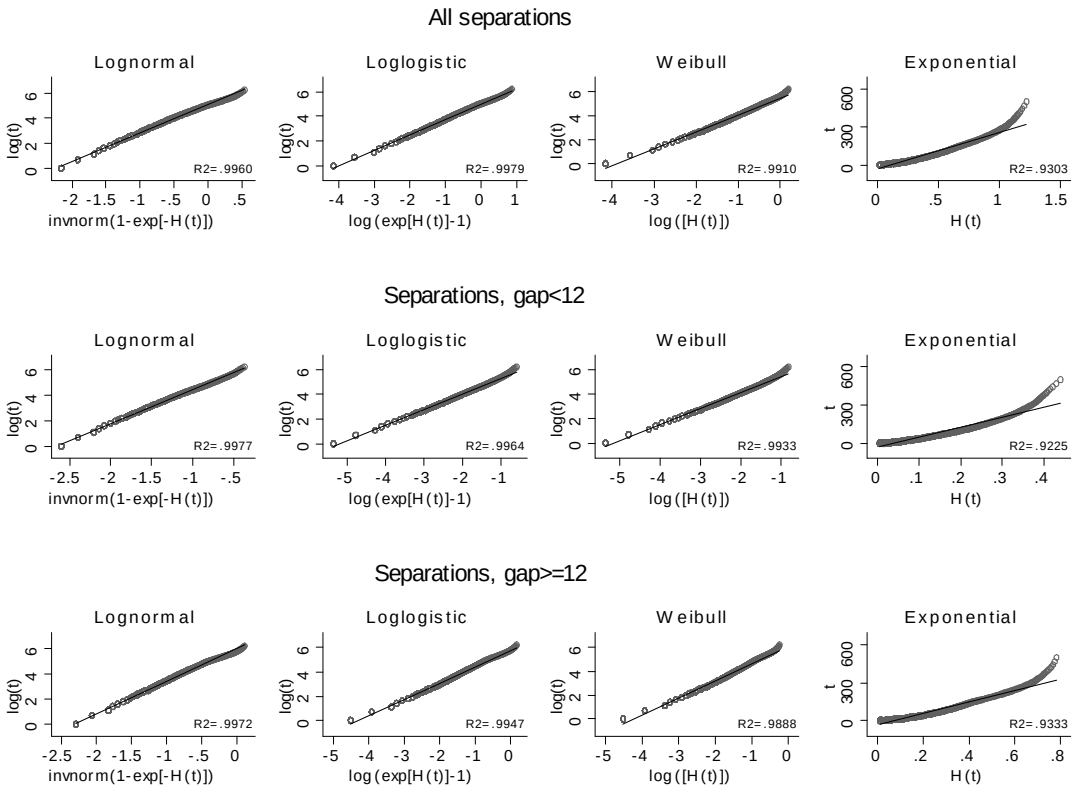
Figures

Figure 1: Hazard plots, promotions



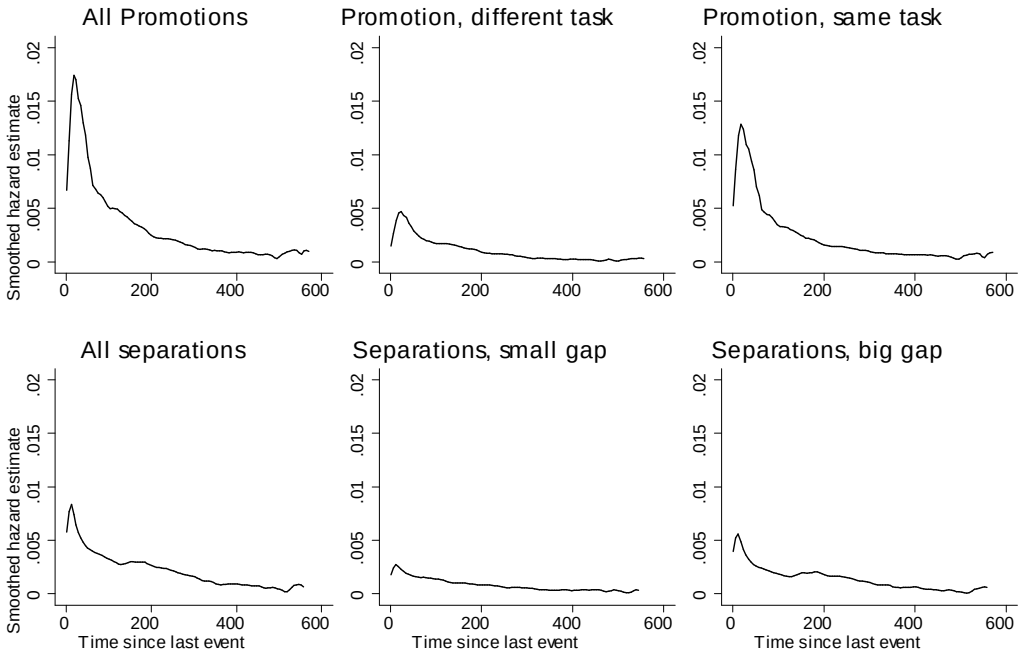
Note.- Graphs are based in 1000 quantiles of the distributions. (t) is elapsed time since previous failure. H(t) is the integrated hazard. Source: Own calculations based on Quadros de Pessoal (1986-2000).

Figure 2: Hazard plots, separations



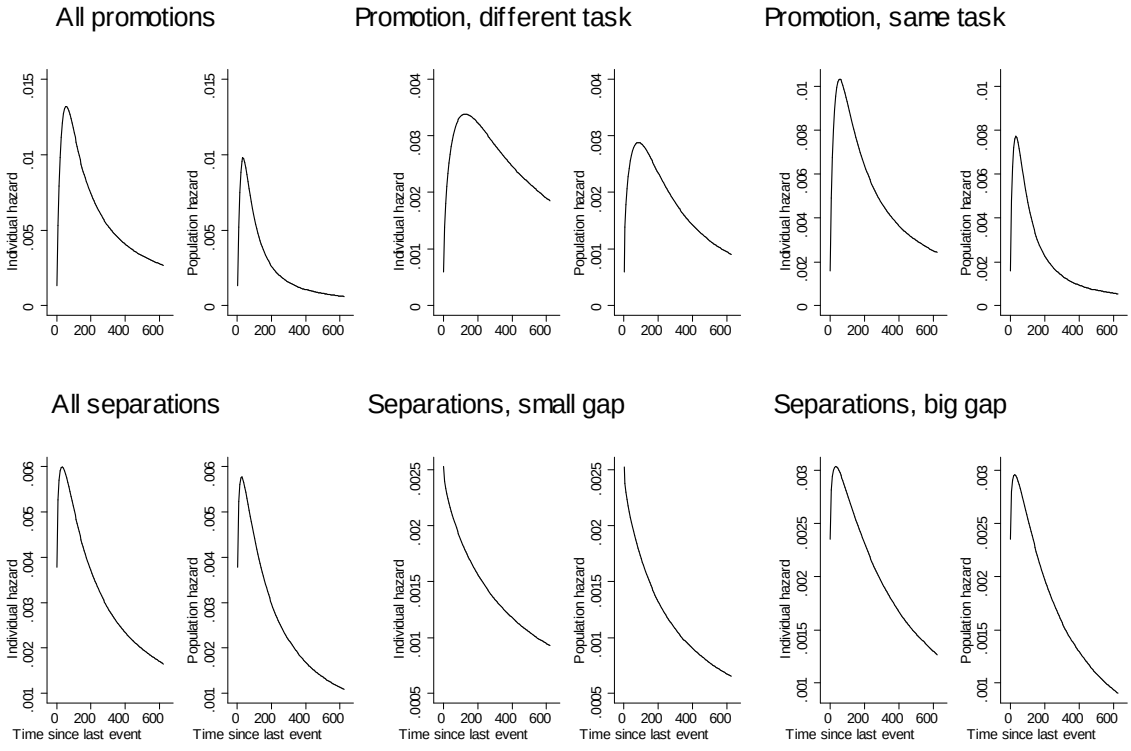
Note.- Graphs are based in 1000 quantiles of the distributions. (t) is elapsed time since previous failure. H(t) is the integrated hazard. Source: Own calculations based on Quadros de Pessoal (1986-2000).

Figure 3: Smoothed Hazard estimates



Note.- Estimates based on the Epanechnikov kernel with a bandwidth of 7 months.
Source: Own calculations based on Quadros de Pessoal (1986-2000).

Figure 4: Estimated individual and population hazard functions



Source: Own calculations based on Quadros de Pessoal (1986-2000).