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THE CAREERS OF TOP EXECUTIVES AND FIRM OPENNESS: INTERNAL VERSUS EXTERNAL LABOUR MARKETS

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ABSTRACT

This paper studies the careers of top executives using a large panel of firms. The main objective is to empirically evaluate the role of learning and human capital acquisition in promotion dynamics along with variables capturing the degree of firm openness to the external labour market. We find that promotion is positively correlated with tenure, but that there is non-linear negative duration dependence with elapsed time since the last promotion event. More opened firms, those who hire a larger fraction of managers from the external labour market, are less prone to promote insiders. The career of a given worker inside a firm can be seen as a sequence of promotion decisions. This points to a nested structure of the promotion decisions over the workers career that we model using a nested logit model. Results show that the workers' progression nest into four types: loser, early starter, late beginner, and champion. The firm openness effect is found to be more pronounced for the losers and the early starters.

Keywords: internal labour markets, promotions, fast-track, firm openness
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THE CAREERS OF TOP EXECUTIVES AND FIRM OPENNESS: INTERNAL VERSUS EXTERNAL LABOUR MARKETS

1. INTRODUCTION

Most papers on wages and promotion dynamics stress the role of learning and human capital acquisition as possible explanations for the observed pattern of careers inside organizations (see, for example, Gibbons and Waldman, 1999b). This literature draws heavily on the concept of "internal labour market" (ILM), which goes back to the seminal work by Doering and Piore (1971). However, the existence of such an internal labour market is taken for granted in most of applications and empirical researchers have generally overlooked the conditions under which these types of labour markets features are formed inside the firm. In fact, we are not aware of any paper that explicit deals with the issue of measuring the firm internal labour market, and its impact on the promotion policy.

Our main goal in this paper will be to empirically evaluate the role of learning and (specific) human capital acquisition in promotion dynamics along with variables capturing the degree of firm openness to the external labour market, a measure of the existence of some kind of internalisation in the firm's human resources management practices. This is an important gap in the literature since most empirical exercises assume the existence of such an internal labour market environment (an example being Chiappori, Salanié, and Valentin, 1999), but do not test the underlying theories in multi-firms data sets.

There are not many studies on careers inside firms, mainly because there is a lack of suitable data. Baker, Gibbs, and Holmstrom (1994a, b) analysed 20 years of personnel data from one firm and offer one of the first and most complete works in the field. Additional examples of such studies are Ariga, Ohkusa and Brunello (1999) approach to the study of the promotion policy of a large Japanese manufacturing firm, and the Pergamit and Veum (1999) study on the causes and the consequences of promotions using the National Longitudinal Survey of Youth.[1] These studies show how difficult it is to get the best of two worlds: detailed individual information along with comparable firm level data on personnel policies. Our dataset is a matched employer-employee panel with detailed information on multiple firms, allowing to relate workers' attributes with the hierarchy and to identify how firms select workers, that is, the determinants of the individual career outcomes.

In order to use more than one firm one needs a high degree of coherence in at least two dimensions: on the one hand, each firm ranking and promotion systems must be comparable, and, on the other hand, the group of workers must be homogeneous in order to allow comparisons across firms. Our data come from *Quadros Pessoal* (QP), a nationally representative Portuguese annual data source, collected by the Portuguese government, covering virtually all firms in the Portuguese economy. There is a common workers ranking system that is roughly comparable across firms in the QP data set, which makes it possible to use a large number of firms to study promotion policies in the presence of different firm characteristics. In order to guarantee the homogeneity of the pool of observed workers we aim at analysing the career patterns

[1] Other examples of studies on this topic are McCue (1996) on position changes, Winter-Ebmer and Zweimüller (1997) on gender differences in career outcomes, and Seltzer and Merrett (2000) who extensively analyze personnel files from a single bank.

of a precisely defined group inside the organization: those classified as top executive workers.

In this paper we test whether the promotion policies of firms are a function of the degree of internalisation of workers careers inside the firm. This requires the identification a specific source of variation across both time and firms that captures the formation of these internal labour markets. In order to quantify the existence of these ILM, we will pay special attention to the impact of the degree of firm openness, measured by the importance of direct external recruitment to the top ranks in the company, on promotion prospects of workers inside the firm. We explore this issue in the context of the early starter-late beginner model (Chiappori, Salanié, and Valentin, 1999) and investigate how the model predictions can be granted in the absence of a strong internal labour market in more "open" organization (in the above mentioned sense).

The career of a given worker inside a firm can be seen as a sequence of promotion decisions. The current decision of whether to promote a worker is better modelled if we condition it on the whole history of each worker inside the organization. This points to a nested structure of the promotion decisions over the workers career that we try to explore in the econometric implementation. Thus, a nested logit model is applied to analyse this issue, and we identify four different career paths: the losers (workers never promoted), the early-starters (workers promoted early in their career, but not in the last periods), the late beginners (workers following an opposite path, with promotions concentrated latter in their careers), and the champions (those promoted in almost every periods).

We present econometrics results from promotion events of top executive workers from a sample of 2,356 Portuguese companies. To preview our main results, we find that promotion is positively correlated with tenure, but that there is non-linear duration dependence with elapsed time since the last promotion event. Workers with lower tenure have lower promotion probabilities that start to pick up after some time in the firm without a promotion. More opened firms, those who hire a larger fraction of managers from the external labour market, are less prone to promote insiders. Also, larger companies with larger managers ranks have larger promotion rates, thus a mixed of a learning model effects and of "efficiency" arguments might be needed to fully explain the observed promotion patterns. To reconcile this evidence with the early starters-late beginners models one would also need a differentiated role for firm specific human capital inside the organization. The nested logit model points in favour of an effect of firm openness that is more pronounced for the losers and the early starters.

The paper is mainly empirical. We start with a description of the data and a brief characterization of the ranking systems used to compare workers across firms. Next, we turn to the econometric strategy, namely the empirical specification used to analyse promotion within firms. We present the most relevant results of this investigation obtained so far. The fourth section explores the dynamics of the promotion event applying a nested logit model to the sequential promotion decision of the employer. Conclusions summarize the main findings and present further possible extensions.

2. DATA

The data used is a set of firms' personnel records gathered annually by the Portuguese authorities – the survey *Quadros de Pessoal* (QP) – a matched longitudinal employer-employee data set. The survey covers virtually every firm in the Portuguese economy and contains information about all of the workers who are employed therein. The employer must post the firm's responses (the information on employees) sent to the Ministry of Employment in a public place inside the firm, which considerably reduces the risk of measurement error and increases the confidence in the information contained in the survey.

The data used in this paper comprises all workers assigned to the top ranks of the hierarchy employed in firms with more than 10 employees. There are approximately 2,365 firms, covering 211,062 top executives from 1991 to 1998. The employers report the employees' age, tenure, education, job assignment, timing of promotions, and several other individual and firm attributes.

The QP uses two types of ranking systems: grade levels defined by law and the National Classification of Occupations. The strategy was to select those individuals classified in the top rank with at least one of these ranking systems. Note that every firm has to report the workers' hierarchical position using the same ranking systems, so the information is comparable across firms.

The summary statistics for the main variables are presented in Table 1. The first two columns are for all workers in the sample regardless the number of years the companies they work for are observed during the 1991-98 period. This makes 211,062

observations (with possibly repeated observation for each worker), from 2,365 firms. Alternatively, a smaller sample with the firms observed during the whole 8-year period is considered. This makes of a sample with 136,821 observations, from 1,252 different firms. Average tenure is high, at more than 13 years, and time since last promotion is also very high, on average a worker needs more than 5 years to be promoted. The promotion rate ranges from 12 to 15 per cent and the percentage of direct hires for top executive positions is just above 10 per cent.

Insert Table 1 here

Note also that workers with a college degree compose around 50 per cent of the sample and that average age is around 43 years. The vast majority of the workers are in the top rank of the companies in at least one criteria used to identify managers in the firm.

3. A STATIC PERSPECTIVE ON THE PROMOTION EVENT

What are the determinants of the worker's promotion? Typically, the worker is promoted if his ability is greater than a threshold level (Gibbons and Waldman, 1999a; Lazear, 2001). This promotion event will depend on individual attributes like, for example, education and tenure. It will also depend on the size of the firm, and firm performance. In addition, the number of co-worker competing for a promotion can also influence the changes of being promoted (Lazear and Rosen, 1981; Rosen, 1986). Finally, the proportion of external hires also influences the promotion probability: the employer has the choice of promote an insider or hire an outsider. The firms that recurrently hire new workers for every hierarchical layer – that is, do not have strict

port of entry – can be considered more open, in the sense that their workers (the insiders or incumbents) are not completely isolated from the external labour market.

A. Model Specification

The study of the promotion event leads to the following empirical specification. Define an unobserved latent variable Y_{it}^* as

$$Y_{it}^* = X_{it}\beta + \varepsilon_{it} \tag{1}$$

where X_{it} is a vector of individual and firm characteristics, β is a vector of coefficients to be estimated, ε_{it} is a i.i.d. disturbance independent of the X_{it}. The variable Y_{it}^* determines the occurrence of a promotion. Next, define the observable promotion event, Y_{it}, as

$$Y_{it} = \begin{cases} 1 & \text{if} \quad Y_{it}^* > 0 \\ 0 & \text{if} \quad Y_{it}^* \leq 0 \end{cases} \tag{2}$$

Thus, the promotion event is studied applying a probit model as defined in equations (1) and (2). This empirical specification is similar to what usually appears in the related literature. Recent applications used for estimating promotion determinants in different contexts are presented in Ariga, Ohkusa and Brunello (1999), Pergamit and Veum (1999), and Winter-Ebmer and Zweimüller (1997).[2] The main difference

[2] Medoff and Abraham (1980) also estimated the probability of promotion when discussing the relationship between experience and performance. The timing of the career events can be explicitly introduced, for example with a hazard specification. In this case, the relationships become much more complex in the sense that one must account for the initial position of the employee and all of his subsequent career progression. See McCue (1996), who studies the worker's position changes using the PSID and applying a hazard specification.

relates with the fact that the data set used in the present study comprises longitudinal information on multiple firms, with complete records concerning their work force.

The individual and firm characteristics considered in X_{it} are the following: tenure (with third order polynomial); time since last promotion (with third order polynomial); an interaction term of these two variables; education is defined by the last level attained; age and age squared; three dummies for the hierarchical ranks – employees classified by only one of the ranking systems (*Rank 1*), employees classified as top executives by both systems (*Rank 2*); and those in *Rank 2* who are classified at the highest hierarchical level (*Rank 3*); several variables that capture firm characteristics – dimension as measured by the (log) number of employees and the sector of activity. The firm "openness" is captured by a variable that measures the proportion of new entrants to the top ranks. The objective is to capture the trade-off facing the firm: promote an incumbent worker or hire a new one.

B. Results

The promotion event is studied with the empirical model described above. Two samples are used. One in which we included all workers in the sample regardless the number of years the companies they work for are observed during the 1991-98 period. This larger sample has 211,062 observations from 2,365 firms. The second is a smaller sample, in which in we only include the firms observed during the whole 8-year period. This results in a sample with 136,821 observations, from 1,252 different firms. The first set of results is presented in Table 2 and the second in Table 3.

Insert Tables 2 and 3 here

We are especially interested in the coefficients from two variables: *time to promotion*, which is the tenure in the rank and *entry rate*, which measures the degree of firm openness. The inclusion of the first variable makes it possible to interpret the results as a promotion hazards. The time dependence of the promotion event is shown to be quite important. The second variable captures the importance of internal labour markets in the promotion policies of firms.

Tables 2 and 3 present results of different model specifications, including different sets of industry and year dummies. The specific model considered does not significantly affect the main results. It turns out that there is negative time dependence in the promotion event. In fact, it takes quite a long time to a top executive worker to be promoted. On the other hand, more tenured workers are more likely to be promoted, an effect similar to what is generally found in the estimation of earnings equations, but the impact of tenure on promotion probability is decreasing. The interesting result concerning the time to be promoted variable is the shape of promotion likelihood over time. In order to capture possible nonlinear effects we added a quadratic and cubic terms of this variable, and both terms proved to be significantly different from zero. The underlying impact on the promotion probabilities for a newly hired worker is shown in Figure 1. The promotion probability is decreasing with tenure, while during the first couple of years the promotion probability is clearly above 20%, after five years without a promotion this probability is halved and it is halved again during the next five years, being around 5% after 10 years without a promotion. The interesting feature of this result is that not being promoted is a very bad sign on the worker's future promotion prospects.

Insert Figure 1 here

In Figure 2 we present the pattern of the promotion probabilities of workers that are promoted every year and of workers that were not promoted in the previous year. There is some evidence of a fast track behaviour in the promotion decisions inside the firm. Again, a promotion in a given year increases the probability of promotion in the following year. However, the presence of a fast-track effect fades away over time, as more tenured workers are less frequently promoted.

Insert Figure 2 here

A similar pattern can be observed from the results in Figure 3. We compare the differences in promotion probabilities between a worker who is promoted every year (top line in Figure 2) with the promotion probabilities of a unpromoted workers (solid line in Figure 1). The hump shaped curve has an interesting interpretation in terms of the existing literature on career promotions. In the context of the Gibbons and Waldman (1999a), the results point to the serial correlation of the promotion event: Figure 3 shows that the promoted worker (*star*) as a higher probability of being promoted next year than the unpromoted one (*loser*), though Figure 3 also shows that the difference in the promotion probabilities increase until 10 years of tenure at the firm and then decreases. In an environment of imperfect information, promotion

identifies the higher ability worker, but as the employer learns about the workers' abilities, this type of fast-track effect tends to fade away.[3]

Insert Figure 3 here

Another key result is the estimated coefficient on the *entry rate* variable. The main finding is that more opened firms – with higher entry rate in the top ranks – are less likely to promote insiders. This result points out to the importance of including variables capturing the weight of internal labour markets when investigating learning effects in career patterns and to the importance of firm openness to analyse fast track or early starters effects. We plan to further explore these two issues looking at the individual wage profiles and identifying fast track experiences in firms with different openness degree.

The results in Figure 1 show that firms with a high percentage of direct hires to their highest ranks are less likely to promote workers. Thus, it looks like our measure of firm openness is picking up the degree of internal labour market formation in the firm and that the existence of such an internal market has a significant impact on the promotion of workers from within the firm.

4. PROMOTION DYNAMICS

What is the relationship between subsequent career events? What are the determinants? The objective here is to disentangle the promotion dynamics, that is, the influence of past career events on the future promotion probabilities.

[3] See Bernhardt (1995) and Milgrom and Oster (1987) for a similar argument concerning the fast-track effect in a framework with imperfect information.

The top executive can be promoted or not in period one. In the second, the same decision faces the employer: to promoted the worker (again) or not. In every period the employer has to decide the future career of his employees. How these decisions depend on the individual attributes – human capital and ability – and all the other factors studied in the previous section? In a dynamic perspective, when looking at a worker's promotion prospects, one must consider the past career of the workers, namely, the timing of past promotions.

Consider two workers who are assigned to the same hierarchical level in period one. In period two, one is promoted and the other is not. In period three, if the worker previously promoted is not promoted he is identified as an early starter, and the previously unpromoted worker is promoted, being identified as a late beginner (see Figure 4). In this framework, the correlation between wages in period one and period three, controlling for wages in period two, should be negative, given the better prospects of the late beginner (Chiappori et al., 1999).

Insert Figure 4 here

The employer decides sequentially in each period whether to promote or not a worker. The objective of this section is to study this nested decision by the firm. Given that the decision to promote a worker in one period is clearly related with the promotion events observed in the previous periods, the promotion decisions can be modelled as a sequential problem. Due to the structure of the information available in the data and

the objective of identifying different types of careers, namely the early starters and late beginners, we consider three periods.

The probability of promotion in the first period is Prob(*prom1*), where *prom1* is a dichotomous variable equal to one if the employee was promoted. In the second period, the promotion probability is conditional on the first period promotion outcome, thus can be defined as Prob(*prom2*|*prom1*). In the same way, the conditional promotion probability in the third period is Prob(*prom3* | *prom1*, *prom2*). Finally, the unconditional probability of the observed choice at the bottom level (corresponding to the last period) is

$$\text{Prob}(prom3, prom2, prom1) =$$

$$= \text{Prob}(prom3 \mid prom1, prom2).\text{Prob}(prom2 \mid prom1).\ \text{Prob}(prom1)$$

Figure 4 presents the decision tree faced by the employer. Up until period three, we can identify four career types: the loser – the worker who is not promoted in the first two periods; the early starter – promoted in the period one and not promoted in period two; the late beginner – not promoted in period one, but promoted in period two; and the champion – workers promoted in period one and again in period two.

The econometric model suitable to this sequential decision is a nested logit. The employer decides to promote or not to promote an employee in order to maximize the

firm objective function.[4] The decision in periods one and two nest the workers' careers into the four types identified above.

Formally, the three level nested logit model as demonstrated by Greene (2000) and modified to our specification is as follows. We start by indexing the first-level alternative as i, the second level alternative as j, and the bottom level alternative as k. Let Xijk, Yij and Zi refer to the vector of explanatory variables specific to each of the three categories (i,j,k), (i,j) and (i), respectively. We want to estimate the following probabilities:

$$Prijk = Prk|ij\ Prj|j\ Pri$$

Note that the conditional probability Prk|ij will involve only the parameters β associated with the variables in X, and can be written as:

$$\Pr_{k|ij} = \frac{e^{\beta' X_{ijk}}}{\sum_{n} e^{\beta' X_{ijn}}}$$

When one moves up to other tree levels the dependence from lower level decisions is taken into account by the inclusive values, which are defined for both categories (i,j) and (i). The first (say I_{ij}) will depend exclusively on β, while the second (say J_i) will depend on the second level variables in vector Y, and the I_{ij} inclusive values.

[4] The nested logit model is widely used in consumer choice in a context of random utility maximization (e.g., Guadagni and Little, 1998; Ackerberg and Rysman, 2002), but there are other application, for example: currency crisis and central banks intervention (Yan, 2002); school choice (Montgomery, 2002); residency decision of the elderly with respect to live alone or with the offspring (Cameron, 2000); migration decisions (Knapp et al., 2001).

The nested logit model estimates each of the three probabilities listed above, along with the inclusive values for the two categories that define a decision node on the workers' promotion path. Note the conditional characteristic of these probabilities, which is the main distinctive feature of the model.

The results from the estimation of the nested logit model are presented in Table 4. First, note that the inclusive values parameters are different from one, confirming the validity of the proposed econometric model.5 Nevertheless, the fact that the parameters are higher than one in the second decision level for the first three nests seems to indicate that the first six outcomes should not be included pair wised but treated separately.

Insert Table 4 here

The top executives have a lower promotion probability in more opened firms, as in the last section. The estimation results show that this negative effect is more pronounced for the workers with less favourable long-term career types – the losers and the early starters, given the difference between the estimated coefficients, especially for the promotion of these workers. There is also a negative effect due the number of workers employed by the firm, more pronounced for the promotion event.

The results presented in this section are preliminary, but show the importance of studying the dynamics of the workers' careers to fully understand the firm's promotion policies.

[5] See, for example, Poirier (1996) and the references therein for a discussion.

5. DISCUSSION AND CONCLUSIONS

We study the promotion policies of top executive workers from a large sample of Portuguese companies. We have found that (i) a promotion event is positively influenced by tenure in the firm but at decreasing rates; (ii) the longer a worker remains without a promotion the less likely he is to be promoted but this probability starts to pick up after sometime time in the top rank of the firm without a promotion; (iii) more opened firms, those with larger fraction of direct hires to the top ranks, are less likely to promote insiders. Also, larger companies with larger managers ranks have larger promotion rates, thus a mixed of a learning model effects and of "efficiency" arguments might be needed to fully explain the observed promotion patterns.

Concerning the workers' career dynamics, the results allow us to identify four types of career progression: the losers, the early starters, the late beginners, and the champions. Thought there is still a negative effect due to firm openness, this effect is more pronounced for the losers and the early starters.

An additional line of research could explicitly consider the effect of the career dynamics on the decision to move. There are two possible outcomes with opposite signs: the worker can move to another firm to look for a better match due to poor prospects of career progression with the current employer (he was not promoted); or given that the worker is identified as a *champion*, he can move to another employer that bids him away form the current one.

In the current version of the paper we do not use any information on wage dynamics associated with promotion events. This is an important area of further research within this topic since the insulation of workers from the external labour market might occur either with a small entry rate of top executive workers for the firm or with a wage policy that increases wages above those of the outside market. One would also need to use information on wages to test for the early starter-late beginner model in the presence of different degrees of firm openness. We plan to include results along these two lines of research in the paper in future revisions.

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Table 1. Summary Statistics

	Mean	Std. Dev.	Mean	Std. Dev.
Promotion rate	0.123	0.329	0.103	0.304
Secondary	0.339	0.473	0.380	0.485
Tertiary	0.597	0.491	0.560	0.496
Age	43.779	9.282	45.457	8.294
$Age^2 * 10^{-2}$	20.027	8.348	21.352	7.670
Tenure	14.902	10.148	17.429	9.245
$Tenure^2 * 10^{-2}$	3.251	3.907	3.892	3.890
$Tenure^3 * 10^{-3}$	8.626	14.859	10.236	15.443
Time to promotion	5.800	5.659	6.919	6.144
Time to $promotion^2 * 10^{-2}$	0.657	1.607	0.856	1.774
Time to $promot^3 * 10^{-3}$	1.204	5.519	1.583	6.118
Tenure *Time prom$*10^{-2}$	1.081	1.776	1.385	1.921
Rank 2	0.391	0.488	0.406	0.491
Rank 3	0.011	0.105	0.011	0.106
Log # top managers	4.891	1.759	4.555	1.349
Log # workers	7.020	1.793	6.824	1.515
External	0.050	0.082	0.040	0.061
External Lag	0.047	0.088	0.036	0.059
Average external	0.053	0.074	0.042	0.053
External .25/..50 (dummy)	0.029	0.167	0.013	0.114
External >,5(dummy)	0.005	0.070	0.001	0.037
Observations		258,421		97,741

Notes: *Tenure*, *Time since last promotion* and *Age* are measured in years. The promotion rate is the fraction of promoted workers in all worker/year observations in the sample. *Entry rate* is the fraction of workers directly hired for a top executive position. *Rank 2* is for those classified as top executives by both ranking systems, and *Rank 3* is for those in *Rank 2* who are classified at the highest hierarchical level.

Table 2. Estimates of the Probit model defined by equations (1) and (2) – marginal effects

	Regression 1	Regression 2	Regression 3	Regression 4
Secondary	-0.009**	-0.010**	-0.009**	-0.009**
	(0.003)	(0.003)	(0.003)	(0.003)
Tertiary	-0.016**	-0.004	-0.016**	-0.016**
	(0.003)	(0.003)	(0.003)	(0.003)
Age	-0.009**	-0.006**	-0.009**	-0.009**
	(0.001)	(0.001)	(0.001)	(0.001)
$Age^2 *10^{-2}$	0.007**	0.004**	0.007**	0.007**
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.007**	0.005**	0.006**	0.007**
	(0.001)	(0.001)	(0.001)	(0.001)
$Tenure^2 * 10^{-2}$	-0.036**	-0.029**	-0.034**	-0.037**
	(0.003)	(0.003)	(0.003)	(0.003)
$Tenure^3 * 10^{-3}$	0.004**	0.004**	0.004**	0.005**
	(0.000)	(0.000)	(0.000)	(0.000)
Time to promotion	-0.020**	-0.017**	-0.020**	-0.021**
	(0.001)	(0.001)	(0.001)	(0.001)
Time to $promotion^2*10^{-2}$	0.064**	0.050**	0.063**	0.065**
	(0.005)	(0.005)	(0.005)	(0.005)
Time to $promot^3*10^{-3}$	-0.011**	-0.008**	-0.011**	-0.011**
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure *Time prom$*10^{-2}$	0.027**	0.020**	0.026**	0.027**
	(0.002)	(0.002)	(0.002)	(0.002)
Rank 2	0.025**	0.024**	0.025**	
	(0.001)	(0.001)	(0.001)	
Rank 3	0.017**	0.031**	0.018**	
	(0.006)	(0.006)	(0.006)	
Log # top managers	0.017**	0.019**	0.017**	0.025**
	(0.001)	(0.001)	(0.001)	(0.001)
Log # workers	-0.004**	-0.004**	-0.005**	0.017**
	(0.001)	(0.001)	(0.001)	(0.006)
External	-0.077**			0.018**
	(0.009)			(0.001)
External Lag		-0.031**		-0.004**
		(0.008)		(0.001)
Average external			-0.127**	
			(0.011)	
External .25/..50 (dummy)				-0.024**
				(0.003)
External >,5(dummy)				-0.049**
				(0.005)
Observations	258,421	226,500	258,421	258,421
LR chi^2 (df)	20,247.58 (47)	19,072.14 (47)	20,289.3 (47)	20,176.54 (48)

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Year and industry dummies included.

Table 3. Estimates of the Probit model defined by equations (1) and (2) – marginal effects

	Regression 1	Regression 2	Regression 3	Regression 4
Secondary	-0.003	-0.010***	-0.003	-0.003
	(0.004)	(0.003)	(0.004)	(0.004)
Tertiary	-0.007	-0.004	-0.006	-0.007
	(0.004)	(0.003)	(0.004)	(0.004)
Age	-0.007***	-0.006***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
$Age^2 *10^{-2}$	0.005***	0.004***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure	0.002**	0.005***	0.002*	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
$Tenure^2 * 10^{-2}$	-0.013***	-0.029***	-0.012**	-0.013***
	(0.005)	(0.003)	(0.005)	(0.005)
$Tenure^3 * 10^{-3}$	0.001*	0.004***	0.001	0.001*
	(0.001)	(0.000)	(0.001)	(0.001)
Time to promotion	-0.023***	-0.017***	-0.023***	-0.023***
	(0.001)	(0.001)	(0.001)	(0.001)
Time to $promotion^2*10^{-2}$	0.087***	0.050***	0.087***	0.087***
	(0.007)	(0.005)	(0.007)	(0.007)
Time to $promot^3*10^{-3}$	-0.014***	-0.008***	-0.014***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)
Tenure *Time prom$*10^{-2}$	0.023***	0.020***	0.022***	0.023***
	(0.003)	(0.002)	(0.003)	(0.003)
Rank 2	0.012***	0.024***	0.012***	0.012***
	(0.002)	(0.001)	(0.002)	(0.002)
Rank 3	0.019**	0.031***	0.018**	0.019**
	(0.008)	(0.006)	(0.008)	(0.008)
Log # top managers	0.012***	0.019***	0.011***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)
Log # workers	-0.003**	-0.004***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
External	0.002			
	(0.016)			
External Lag		-0.031***		
		(0.008)		
Average external			-0.095***	
			(0.021)	
External .25/..50 (dummy)				-0.007
				(0.008)
External >,5(dummy)				-0.057***
				(0.011)
Observations	97709	226500	97709	97709
Wald chi^2 (df)	4,941.19 (46)	4,638.38 (46)	4,96026 (46)	4,955.27 (47)

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Year and industry dummies included. Observations for firms observed during the whole 8-year sample.

Table 4. Careers – Estimates from the Nested Logit model

			Coefficient	Std. Error
3rd level promotion (2 years)				
Tertiary education	Looser	– promoted	0.023	0.053
	Late beginner	– not promoted	-0.113	0.054
		– promoted	0.168	0.068
	Early starter	– not promoted	0.195	0.160
		– promoted	0.171	0.187
	Champion	– not promoted	-0.483	0.705
		– promoted	-0.167	0.706
External	Looser	– promoted	-2.735	0.260
	Late beginner	– not promoted	-0.300	0.201
		– promoted	-5.743	0.483
	Early starter	– not promoted	-0.847	0.356
		– promoted	-1.602	0.483
	Champion	– not promoted	-6.770	1.855
		– promoted	-5.300	1.877
Log # workers	Looser	– promoted	-0.245	0.008
	Late beginner	– not promoted	-0.090	0.011
		– promoted	-0.127	0.013
	Early starter	– not promoted	-0.419	0.147
		– promoted	-0.583	0.147
	Champion	– not promoted	-1.974	0.581
		– promoted	-2.055	0.581
2nd level promotion (3 years)				
Tertiary education	Late beginner		-0.009	0.168
	Early starter		0.120	0.486
	Champion		0.641	0.504
External	Late beginner		0.270	0.333
	Early starter		0.336	0.724
	Champion		0.046	0.790
Log # top managers	Late beginner		0.434	0.033
	Early starter		-0.022	0.095
	Champion		0.366	0.098
1st level promotion (3 years)				
Tertiary education			-0.076	0.110
External			-0.917	0.337
Time to promotion			-0.695	0.021
Age			-0.004	0.003
Log # workers			-0.398	0.076
Inclusive values				
2nd level	Looser		12.491	1.114
	Late beginner		4.139	0.730
	Early starter		2.960	0.437
	Champion		0.688	0.208
1st level	Promotion		-0.421	0.070
	No promotion		-0.458	0.166
Observations			91,808	
LR chi squared (df)			14,656.19 (41)	
LR test of homosked chi squred			818.67 (6)	

FIGURE 1
Promotion probability as a function of the firm openess

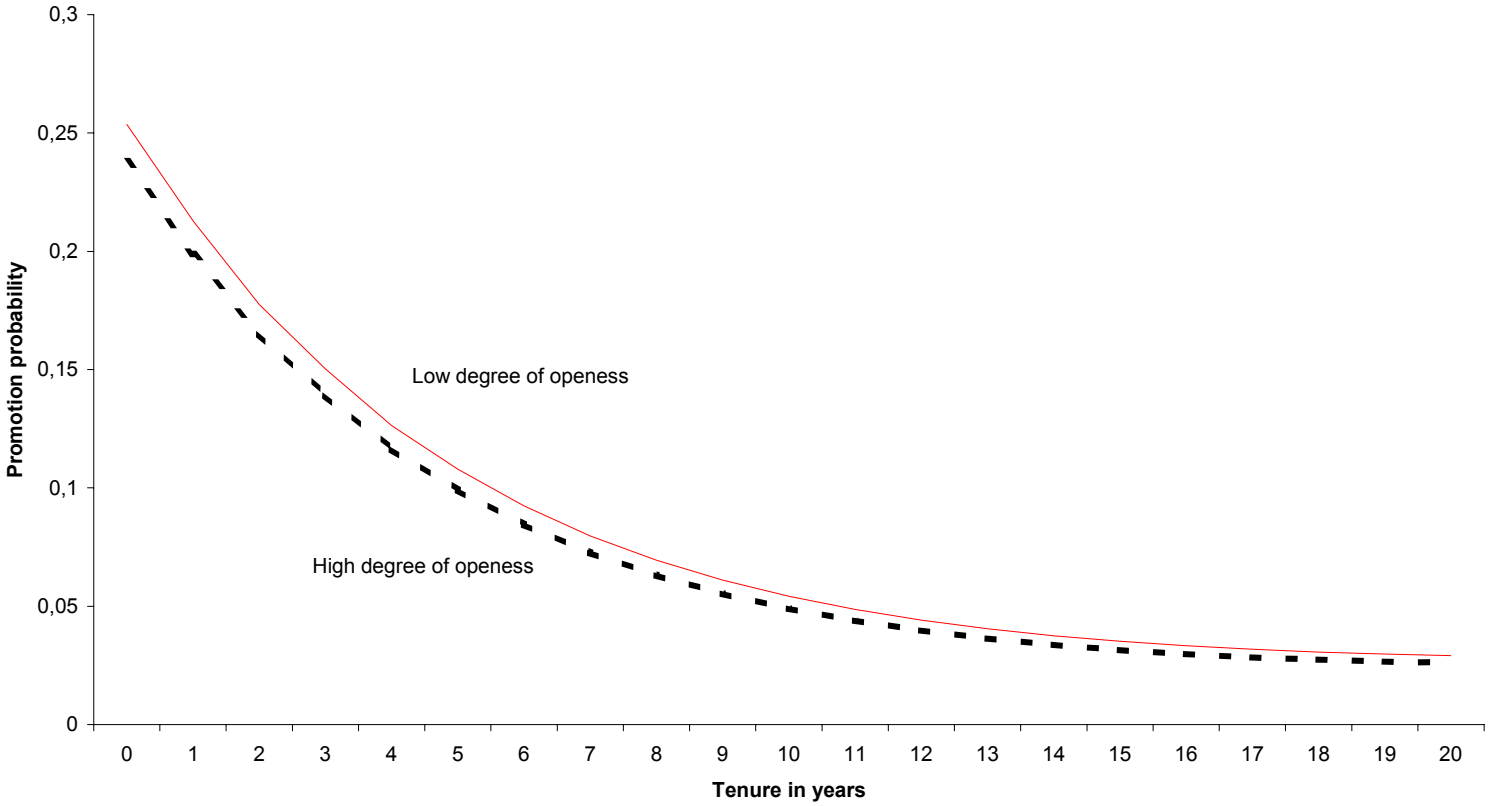

FIGURE 2
Promotion probability as a function o recent promotion events

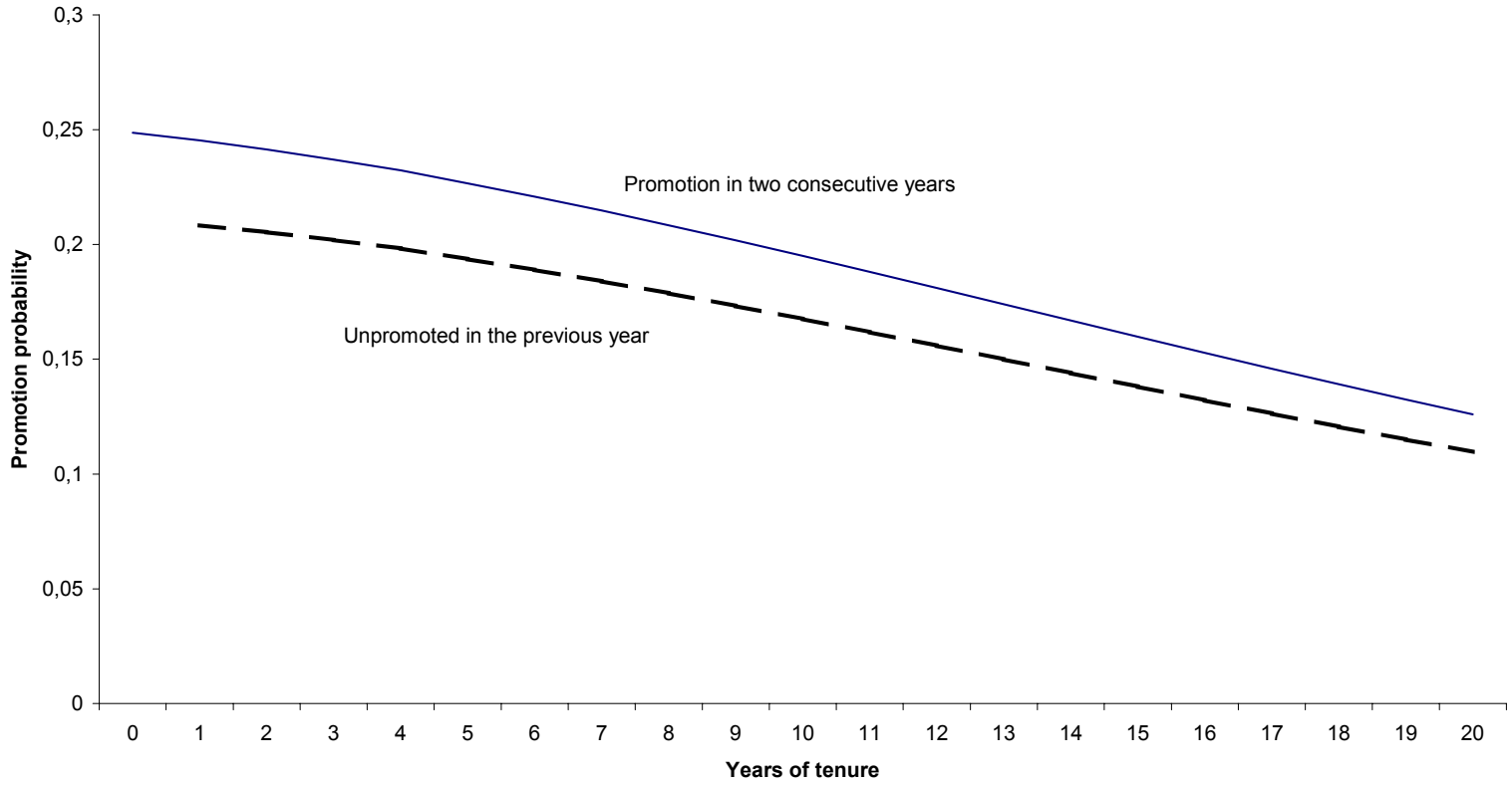

FIGURE 3
Stars versus losers:
comparison of promotion probabilities

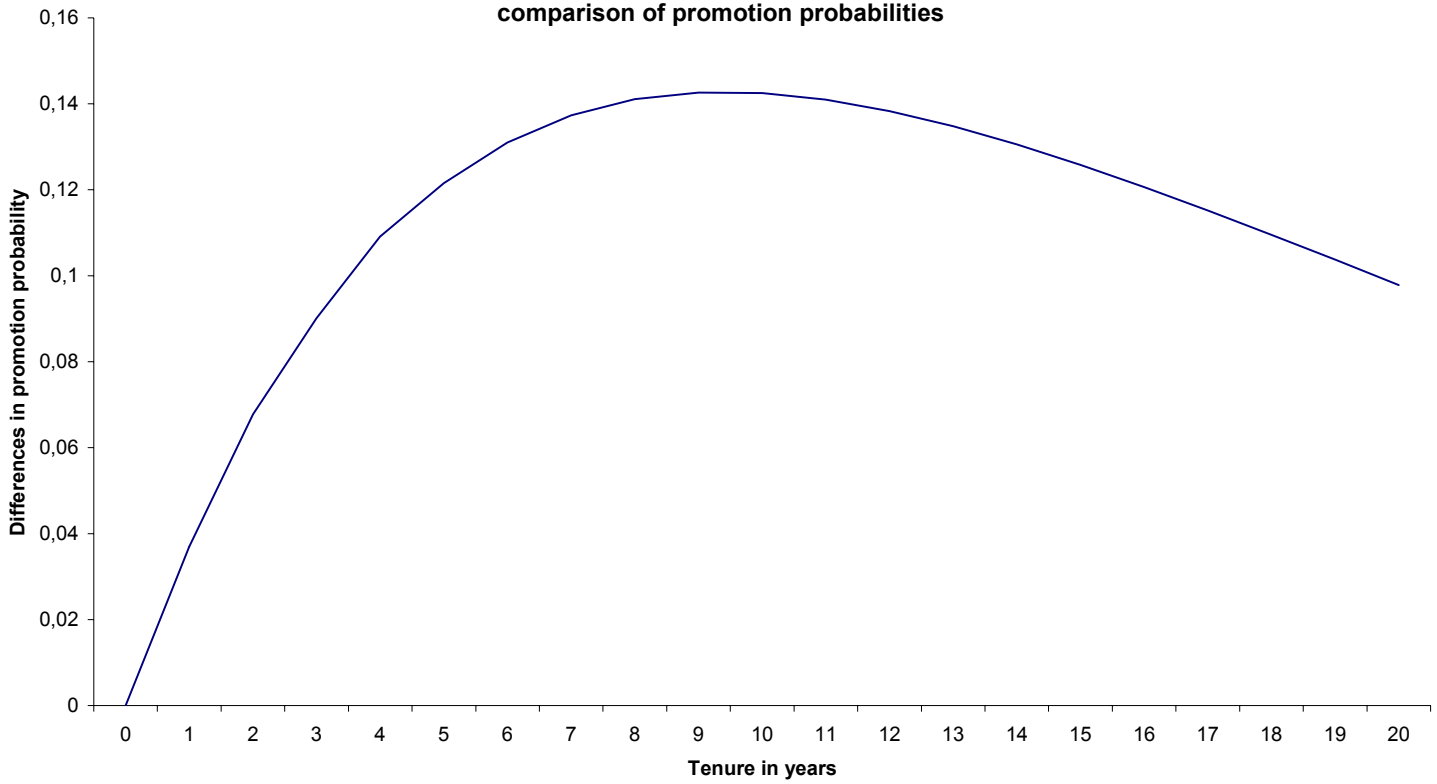

FIGURE 4
The decision tree: to promote or not to promote