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

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The Careers of Top Managers and Firm Openness: Internal versus External Labour Markets

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Abstract

This paper studies the careers of top managers 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 formation of internal labour market (ILM) practices. We find that promotion is negatively correlated with tenure, but that there is a non-linear negative duration dependence with elapsed time since the last promotion event. Firms showing a weaker degree of ILM are less prone to promote insiders. We next take the manager's career inside a firm as a sequence of promotion decisions, and use a nested structure of the promotion decision modelled as a nested logit model. Results show that the top manager's progression nest into four types: loser, early starter, late beginner, and champion, and that the degree of ILM has a significant impact on the process of learning inside the firm.

Key words: Keywords: internal labour markets, promotions, nested logit,

personnel economics JEL-Code: J41, M12, M51

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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 applications and empirical researchers have generally overlooked the conditions under which the distinctive features of these ILMs are formed inside the firm. In fact, we are not aware of any paper that simultaneously deals with measures of the firm internal labour market and studies 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 formation of ILM practices inside the firm. These variables aim at measuring the existence of some kind of internalisation in the firm's human resources management practices, as recently discussed in Lazear and Oyer (2003). 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-firm datasets. This paper tries to fill in this gap.

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), who study 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 us to relate the 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, a high degree of coherence in at least two dimensions is necessary: on the one hand, each firm's ranking and promotion systems must be comparable, and, on the other hand, the group of workers must be homogeneous in order to allow for comparisons across firms. Our data come from Quadros de Pessoal (QP), a nationally representative Portuguese annual data source, collected by the Portuguese government, covering virtually all firms in the economy. There is a common ranking system that is roughly comparable across firms in the QP dataset, 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 of a precisely defined

[1] See also McCue (1996) on position changes, Winter-Ebmer and Zweimüller (1997) on gender differences in career outcomes, Seltzer and Merrett (2000), who extensively analyse personnel files from a single bank, Booth, Francesconi, and Frank (2003) on promotion and gender, Treble et al. (2001) on a replica of the Baker, Gibbs, and Holmstrom (1994a) paper, Eriksson (1999) with a test of tournaments, and Lazear (1999) on promotion and wage growth.

group inside the organization: those classified as top managers.

We need to identify specific sources of variation across firms that capture the formation of ILM practices. In doing so we will use two different proxies to "firm openness": a direct indicator of the existence of ports of entry which is related to the firm's hiring process (see Lazear and Oyer, 2003) and an indicator of the steepness of the wage profile – more precisely an estimate of the firm-specific returns to tenure.

Having characterized the promotion event, we explore this issue in the context of the early starter-late beginner dynamic model (Chiappori, Salanié, and Valentin, 1999). The model states that late beginners (workers who were not promoted in the first stage of the relationship) would be systematically favoured in future promotion decisions. We extend the empirical test of Chiappori, Salanié, and Valentin (1999) to the context of a multi-firm sample, and empirically investigate how the model predictions are affected by different degrees of ILM, more specifically, we are interested in discussing if the late beginner effect is present in more "open" organisations.

The decision of whether to promote a top manager is better modelled if we condition it on her whole history inside the organization. This suggests a nested structure of the promotion decision over the manager's career that we try to explore in the econometric implementation. Thus, a nested logit model is applied and four distinct career paths are identified: the losers (never promoted), the early-starters (promoted early in their career, but not in the last periods), the late beginners (with promotions concentrated later in their careers), and the champions (promoted in almost every period).

We present econometric results from promotion events of top managers using

a sample of 2,704 Portuguese companies. We find that promotion is negatively correlated with tenure, but that there is non-linear duration dependence with elapsed time since the last promotion event. Firms with weaker ILMs − those without ports of entry or with less steep tenure-wage profiles − are less prone to promote incumbent top managers. Also, larger companies with larger managerial ranks have higher promotion rates, thus a mix of learning model effects and efficiency arguments might be needed to fully explain the observed promotion patterns. The results from the nested logit model identify four distinct career paths. Our findings also show that the late beginner effect depends on the degree of ILM in the firm. In firms that use ports of entry the late beginner effect is more likely to be observed.

We start with a description of the data, along with a characterisation of the ranking systems used to compare top managers across firms, and a discussion of ILM practices. In Section 3 we analyse the determinants of promotions. The fourth section explores the promotion dynamics applying a nested logit model to the sequential promotion decision of the employer. We conclude summarising our main findings.

2 Data and indicators of ILM practices

2.1 Data

The data used are a set of firms' personnel records gathered annually by the Portuguese authorities – the survey Quadros de Pessoal (QP) – a matched longitudinal employer-employee dataset. 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. [2]

The dataset comprises all workers assigned to the top ranks of the hierarchy employed in firms having more than 10 employees. There are approximately 2,704 firms, covering 279,404 top managers 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 summary statistics for the main variables are presented in Table 1. The first two columns are for all top managers in the sample regardless of the number of years the companies they work for are observed during the 1991-98 period. We also use a smaller sample with the top managers observed during the whole 8-year period. This yields a sample with 98,999 top manager-years, from 1,728 different firm-years. Note that top managers with a college degree compose almost 60 per cent of the sample and that average age is around 43 years. Given these demographic characteristics, it is not surprising that average tenure is high, more than 13 years. Elapsed time since last promotion is also very high: on average a manager needs more than 5 years to be promoted. The promotion rate ranges from 11 to 14 per cent.

Insert Table 1 here

[2] Recent applications using QP data at the firm and worker levels include Cabral and Mata (2003), Lima and Pereira (2003) and Vieira (2000).

2.2 Organizational hierarchy and promotion

The QP uses two types of ranking systems: grade levels defined by law and the National Classification of Occupations. These two ranking systems complement each other, thus our strategy was to select those individuals classified in the top rank according to at least one of these ranking systems. Note that every firm must report the worker's hierarchical position using both ranking systems, so the information is complete and comparable across firms.

Grade levels are defined by law and the firm is required to classify jobs using them (see Appendix Table A1 for a full description of the levels). The classification is made according to the task performed and skill requirement, and each level can be considered as a layer in a hierarchy defined in terms of increasing responsibility and task complexity. There are eight hierarchical levels: 1) apprentices, internships, trainees; 2) non-skilled professionals; 3) semi-skilled professionals; 4) skilled professionals; 5) higher-skilled professionals; 6) supervisors, team leaders; 7) intermediary managers; 8) top managers.

The National Classification of Occupations (NCO) also identifies the workers who are top managers and the subgroup of top executives. Behind the NCO is an implicit hierarchical structure. Although the two classification systems are not entirely compatible, they can be considered as complements given their different objectives: grade levels are used as a basis to the bargaining process and are not directly linked with the worker's education and/or training; while the NCO's main objective is to classify occupations, without necessarily considering the job content of the worker, as occurs with the grade levels.

In order to capture both dimensions we combine the two ranking systems and

consider three ranks of top managers: Rank 1 for those workers classified as top managers by only one of the ranking systems (grade levels or NCO); Rank 2 is for those classified as top managers by both ranking systems; and Rank 3 is for those in Rank 2 who are classified at the highest hierarchical level by the NCO (those included in the subgroup of top executives). The vast majority of the top managers, 60 per cent, are in rank 1 (top managers classified as such by one of the ranking systems). Only one percent are in rank 3, the one closest to a CEO definition.

The QP allows to track with accuracy the timing of promotions given that, every year, the firm has to directly report the date of last promotion. Chiappori et al (1999) study the promotion decisions of top managers within a single firm, and use the firm's internal scale to identify promotions within this narrowly defined group of workers. A promotion of a top manager in QP reflects a progression of the manager's career within the top level, which conveys information similar to the one used in Chiappori et al. in a multi-firm framework.

2.3 Indicators of ILM practices

The key variables in the paper are the indicators of ILM practices. Firms that recurrently hire new workers for every hierarchical layer – that is, do not have strict ports of entry – can be considered to be more open, in the sense that their workers (the insiders or incumbents) are not insulated from the external labour market (Lazear and Oyer, 2003). [3]

[3] In an ILM environment wages are determined internally and may be free from market pressure. In the wordings of Doeringer and Piore (1972), workers are not subject to the "vagaries" of the external labor market.

In order to quantify the existence of firm characteristics consistent with ILM, we need to consider different features that may yield such an environment. It is not easy to identify ILM practices, but the existing literature can be used as a guide to perform this task. The most common explanations for the formation of ILM are: the existence of firm-specific human capital (Becker, 1962); mobility costs or matching effects (Jovanovic, 1979); or specific systems of incentives (Lazear, 1979). All of these aspects result in labour management practices in which most hiring at high levels in the firm are from within and, as a result, these firms will be characterised by the existence of specific ports of entry (Lazear and Oyer, 2003) and they may also deliver positive (and relatively higher than average) returns to tenure (Jovanovic, 1979).

We use two different indicators of ILM practices. The first indicator is a proxy for the existence of ports of entry in the firm. At an extreme, the existence of ports of entry would imply that all new employees enter the firm at the lowest level and higher levels are filled exclusively from within the firm. To capture the existence of ports of entry we follow Lazear and Oyer (2003). The identification of ports of entry requires that most of the firm's new employees enter the firm at a specific hierarchical level. There is no specific threshold for this proportion. Thus we define a dummy variable that equals one if the fraction of workers entering the firm in one of the hierarchical levels is greater than 50 per cent. The definition of this variable is based on average entry at each of the seven lower hierarchical levels (excluding the top manager level), as defined by the grade levels, during the whole sample period. Table 1 shows that the ports of entry indicator is on average equal to 0.775.

The second one draws on the returns to tenure literature. It is simply a firm-specific wage-tenure elasticity, estimated from a firm level log-wage regression.

We use data from the first year the firm is observed in QP. We restrict our estimation to firms having more than 20 workers and the specific model is:

$$\ln w_{ij} = \alpha_0 + \alpha_{1j} \ln(T_{ij}) + \beta_j X + \varepsilon_{ij}, \quad j = 1, ..., J$$

where w_{ij} is the wage of worker i in firm j and α_{1j} is the firm-specific wage-tenure elasticity. This firm-specific elasticity is used as an explanatory variable in the estimation of the promotion probability. We interpret a larger elasticity of wages with respect to tenure as a stronger indication of an ILM. The vector X comprises age (with a second order polynomial), and dummies for education, gender, and hierarchical levels. [4]

3 The promotion event

What are the determinants of the worker's promotion? Typically, the worker is promoted if her performance is greater than a threshold level (Gibbons and Waldman, 1999a; Lazear, 2004). Previous literature on the promotion event tend to associate it on individual attributes such as ability, education and tenure (see Gibbons and Waldman, 1999b and Pergamit and Veum, 1999). It will also depend on the firm size and performance in the market. In addition, the number of co-workers competing for a promotion can also influence the odds of being promoted (Lazear and Rosen, 1981).

The main objective of this section is to study the promotion decision, namely to what extent this decision is influenced by the firm's ILM features. We are

[4] All the workers employed in a firm are used in the estimation of the wage regression specific to that firm. The restriction imposed in the number of workers is justified by the number of coefficients to be estimated.

not characterising the potential trade-off that the employer faces when filling in a slot: to hire from outside or to promote from inside; but rather the fact that there are different degrees of ILM and how it relates to the use of promotions as an element of the firm's personnel policies.

3.1 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 an 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

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

If we additionally assume that the ε_{it} are normally distributed, the promotion event can be studied by applying a probit model as defined in equations (1) and (2). This empirical specification is similar to what usually appears in related literature (e.g., Ariga, Ohkusa and Brunello, 1999; Pergamit and Veum 1999; and Winter-Ebmer and Zweimüller, 1997). The main advantage of our approach is the fact that the dataset used in the present study comprises

longitudinal information on multiple firms, with complete work force records.

The set of explanatory variables X_{it} includes both individual and firm/match characteristics. The individual characteristics considered were the following: tenure (with a third order polynomial); time since last promotion (with a third order polynomial); an interaction term of these two variables; education (defined as the highest level attained – primary, secondary, and tertiary); age and age squared; two dummies for the top manager's ranks. In addition, several variables capture firm characteristics: dimension, measured by the (log) number of employees and the (log) number of top managers; industry (at two digits code); and the above mentioned indicators of firm "openness" – ports of entry and wage tenure elasticity.

3.2 Results

The promotion event is studied using this empirical model and the two samples described in Section 2. The Probit model results presented in Table 2 are for the sample of all managers, regardless of the number of years the companies they work for are observed during the 1991-98 period. Table 3 presents the results obtained with the smaller sample, in which we include only those managers observed during the whole 8-year period.

Insert Tables 2 and 3 here

We are especially interested in the coefficients of the variables that measure the degree of firm openness, tenure, and time since last promotion. The inclusion of the last variable makes it possible to interpret the results as a promotion

hazard. [5] Each of the models presented in Tables 2 and 3 consider a different variable of the firm ILM degree. All the specifications include a set of industry and year dummies. Overall, the different specifications deliver the same main results.

The variable that captures the elapsed time since last promotion allows us to analyse 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 time dependence of the promotion event is shown to be quite important. The underlying impact on the promotion probabilities for a newly hired manager is shown in Figure 1, that presents the individual's promotion probability as a function of elapsed time since last promotion. The upper curve represents a firm with ports of entry, and the lower curve a firm without ports of entry. [6]

The promotion probability is decreasing with time since last promotion, while during the first few 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 negative sign on the top manager's future promotion prospects, pointing to the existence of a learning process on individual abilities.

Insert Figure 1 here

[5] In fact, not only the formulation of a duration model has a similar interpretation since it is a binary model, but also the estimation of a proportional hazard model of the promotion event yields similar qualitative results (see Bover, Arellano and Bentolila, 2002).

[6] The curves presented in Figures 1, 2 and 3 are based on the estimation results of model (1) in Table 2.

In Figure 2 we present the pattern of promotion probabilities for two possible career paths: top managers who are always promoted (with time since last promotion equal to zero); and top managers who were not promoted in the previous year (with time since last promotion equal to one 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 managers are less frequently promoted.

Insert Figure 2 here

A similar pattern can be observed from Figure 3. We compare the differences in promotion probabilities between a manager promoted every year (solid line in Figure 2) with the promotion probabilities of a manager never promoted (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 Gibbons and Waldman (1999a), the results point to the serial correlation of the promotion event: Figure 3 shows that a top manager that has been promoted every year (star) has a much higher probability of being promoted in the following year than the one that was never promoted (loser). However, Figure 3 also shows that the difference in the promotion probability increases until 10 years of tenure at the firm and then slightly decreases. In an environment of imperfect information, promotion identifies the higher-ability managers, but as the employer learns about their abilities, this type of fast-track effect tends to slow down. [7]

Insert Figure 3 here

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

The key results from Tables 2 and 3 are the estimated coefficients on different ILM indicators. The main finding is that firms with stronger ILM features are more likely to promote insiders. This result is robust in both specifications of the model, which correspond to different ILM indicators. The first column uses the ports of entry indicator. Firms identified has having practices consistent with ILM are significantly more likely to promote insiders. Model 2 uses the steepness of the firm tenure-wage profile as ILM indicator. Firms with larger returns to tenure show a higher probability of promotion, a result that is consistent with the incentives theories of wage formation.

Overall, these results point to the importance of including variables that capture the degree of ILMs when investigating learning effects in career patterns, and to the importance of firm openness in analysing fast track or early starter effects.

We can take another look at these results using Figure 1. This figure shows that firms having ports of entry are more likely to promote top managers, but that this difference fades away with the accumulation of tenure and time since last promotion. Thus, it appears that our measures of firm openness are 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 top level workers from within the firm.

4 Promotion dynamics

What is the relationship between subsequent career events? What are the determinants of promotions overtime, namely how do previous promotion events

help in predicting future promotions? The objective of this section is to study the influence of past career events on future promotion probabilities.

The top managers can be promoted or not in period one. In the second, the same decision faces the employer: to promote the worker (again) or not. Thus, in every period the employer has to decide the future career of his employees. How do these decisions depend on the individual attributes – human capital and ability – and, above all, the firm ILM practices? In a dynamic perspective, when looking at a worker's promotion prospects, one must consider her past career outcomes, namely, the timing of past promotions.

Consider two workers who are assigned to the same hierarchical level in period one. In this period, one is promoted and the other is not. In period two, if the worker previously promoted is not promoted she is identified as an early starter, and the previously unpromoted worker is promoted, being identified as a late beginner (see Figure 4). In the framework of Chiappori et al. (1999) late beginners have better promotion prospects in the future.

Insert Figure 4 here

We aim at studying the nested structure of the firm's decision process. 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. We model the promotion decision with a random utility model (RUM), which can be estimated by the conditional logit technique introduced by McFadden (1973). RUMs have been used, for example, in studies of choices among a discrete set of alternatives such as school choice (Montgomery, 2002) and migration decisions (Knapp et al., 2001). The random utility approach assumes that the individual (in this case

the firm) chooses one option (to promote or not to promote) from among all of the options in the "choice set" she faces. Comparing characteristics of the chosen options with those of rejected ones indicates which characteristics contribute to the likelihood of being chosen.

The choice of a RUM model in the present context is dictated by the assumption that our firm level data are generated by a random selection from a population with heterogeneous tastes as in McFadden (1981). [8] The assumption of firms having heterogenous tastes is compatible with the postulate of profit maximization since we observe a wide variety of internal firms organization leading to the same ultimate goal. The stochastic property of RUM into the choice problem is, in this sense, a way to allow unobserved firm heterogeneity into the model.

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 follow Chiappori el al. (1999) and consider three periods. [9] 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 first three years. In the second period of three years, the promotion probability

[8] We thank a referee for pointing out this interpretation of the RUM model for the promotion decision problem.

[9] The late-beginner property involves three subperiods, so we need to split the data accordingly. This is an important task of the empirical exercise, since there is a lot of leeway to break the 8 years of data available into three periods. There is an obvious trade-off in terms of the dimension of each period. The theory tell us that the period should be long enough so that promotions occur and the effect of no demotions (which is the case in our data set) has time to appear as a downward rigidity phenomenon. However, if the period is long enough most workers will end up being promoted, and promotion will lose its information content. We tried with some partitions of the 8 periods in three periods and the one presented was the one that allowed to identify the four career paths considered here: champions, early-starters, late-beginners and losers.

is conditional on the first period promotion outcome, this can be defined as $Prob(prom2|prom1)$. In the same way, the conditional promotion probability in the third period (two years) is $Prob(prom3|prom1, prom2)$. Finally, the unconditional probability of the observed choice at the bottom level (corresponding to the last period) is

$$\begin{aligned} Prob(prom3, prom2, prom1) = & \, Prob(prom3|prom1, prom2) \times \\ & Prob(prom2|prom1) \times \\ & Prob(prom1) \end{aligned}$$

Figure 4 presents the decision tree faced by the employer who decides to promote or not to promote an employee in order to maximize the firm objective function. Up until period three, we can identify four career types: the loser – a top manager who is not promoted in the first two periods; the early starter – promoted in 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.

Formally, the three level nested logit model 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 X_{ijk}, Y_{ij} and Z_i 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:

$$P_{ijk} = P_{k|ij} P_{j|i} P_i$$

Note that the conditional probability $P_{k|ij}$ will involve only the parameters β

associated with the variables in X, and can be written as:

$$P_{k|ij} = \frac{e^{\beta' X_{ijk}}}{\sum e^{\beta' X_{ijn}}} \tag{3}$$

When one moves up to higher 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. These inclusive values can be defined as:

$$I_{ij} = \ln \left\{ \sum_n e^{\beta' X_{ijn}} \right\}$$

and

$$J_i = \ln \left\{ \sum_n e^{(\alpha' Y_{im} + \tau_{im} I_{im})} \right\}$$

Using these expressions for the inclusive values we can obtain the choice probabilities of each nest in the second and first levels as follows:

$$P_{j|i} = \frac{e^{(\alpha' Y_{ij} + \tau_{ij} I_{ij})}}{\sum_m e^{(\alpha' Y_{im} + \tau_{im} I_{im})}} \tag{4}$$

and

$$P_i = \frac{e^{(Z_i \gamma + \delta_i J_i)}}{\sum_l e^{(Z_l \gamma + \delta_l J_l)}} \tag{5}$$

Note the conditional characteristic of probabilities in (3), (4) and (5), which is the main distinctive feature of the model.

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 worker's promotion path. The inclusive value represents the utility of having all the future promotion decisions available at each node. If the coefficient of the inclusive value is one there is no nesting of the decisions and the probability of being promoted in period three is just the unconditional probability of being promoted in each period, which is simply the product of the promotion probabilities in each period.

The results from the estimation of the nested logit model are presented in Table 4. In the first level we include individual specific variables − age, education and time since last promotion − and firm specific variables − ports of entry indicator, log number of workers and log number of top managers. The second and third levels include the education, ports of entry and log number of top managers variables. The variables age and time since last promotion were excluded from levels two and three since the sequential structure of the empirical model accounts for their evolution.

Insert Table 4 here

In the specification of the model presented in Table 4 the inclusive value's parameters are different from one, confirming the validity of the proposed econometric model. [10] Additionally, the estimated inclusive value parameters are all within the unit interval, a necessary condition for consistency between the nested logit model and RUM, as shown in McFadden (1978). The LR test

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

reported at the bottom of the table is a test for the nesting (heteroskedasticity) against the null hypothesis of homoskedasticity. It computes the difference between the likelihood of a non-nested conditional logit model against the nested logit model likelihood. The statistic has a value of 1,888.1 that clearly supports the use of the nested logit model with these data.

The impact of firm openness in the promotion probability is clearly different for different career paths inside the firm. The most interesting results are those related to the promotion probabilities of late beginners versus early starters. The top managers who were promoted in the first period but not in the second (early starters) are more likely to not be promoted in the third period in firms that have explicit ports of entry. The reverse is true for those classified as late beginners; these are more likely to be promoted in the third period in firms having ILMs. In firms having ports of entry the probability of a late beginner being promoted is not statistically different from the probability of an early starter not being promoted – the test of equality of the two coefficients cannot be rejected. Moreover, if we compare the probability of promotion of individuals classified as late beginners and early starters we cannot accept the null hypotheses of equality. These results show that the career of a worker inside an organization is a function of the firm's ILM characteristics. In particular, firms with ILM features show higher incidence of a late beginner effect.

5 Discussion and conclusions

We study the promotion policies of top managers from a large sample of Portuguese companies. We have found that (i) a promotion event is negatively influenced by tenure in the firm but at decreasing rates; (ii) the longer a top

manager remains without a promotion, the less likely she is to be promoted, but this probability starts to pick up after some time in the top rank of the firm without a promotion; (iii) more open firms − those that have weaker internal labour markets − are less likely to promote insiders. Also, larger companies with larger manager ranks have higher promotion rates, thus a mix of learning model effects and efficiency arguments might be needed to fully explain the observed promotion patterns: on one hand there is the process of employer's learning about the employees' abilities; on the other hand, there are the internal procedures that aim at providing incentives to the employees'.

Concerning the top managers' career dynamics, the results allow us to identify four types of career progression: the losers, the early starters, the late beginners, and the champions. According to a model of learning inside the firm, we expect the existence of a late beginner effect: managers not promoted in the first period but promoted in the second period have more chances to be promoted in the future than managers promoted earlier in the firm. The nested logit results show that this depends on the degree of internal labour market in the firm. In firms that use ports of entry the late beginner effect is clearer. This is an interesting result given that it shows the importance of openness in the learning effect on promotions.

Future research should extend this analysis to the consideration of wage dynamics associated with promotion events. This is an important topic since the insulation of workers from the external labour market can be the result of a wage policy that, along with specific promotion policies, increases wages above those of the outside market.

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Table 1. Summary Statistics

	All workers		Workers present in all periods (1991-1998)	
	Mean	Std. Dev.	Mean	Std. Dev.
Promotion rate	0.137	0.343	0.105	0.306
Ports of entry indicator	0.775	0.417	0.733	0.442
Returns to tenure indicator	0.075	0.091	0.067	0.074
Primary education	0.039	0.194	0.029	0.169
Secondary education	0.330	0.470	0.378	0.485
Tertiary education	0.608	0.488	0.562	0.496
Age	43.133	9.513	45.355	8.339
Tenure	13.824	10.469	17.217	9.375
Time since last promotion	5.365	5.653	6.832	6.154
Rank 2	0.388	0.487	0.406	0.491
Rank 3	0.011	0.106	0.011	0.106
Log number of top managers	4.820	1.753	4.548	1.349
Log number of workers	6.941	1.800	6.816	1.517
Observations		279,404		98,999

Notes:
1. Data from *Quadros de Pessoal*, MSST, 1991-1998.
2. The first two columns present the summary statistics for all workers regardless of the number of years in the sample, columns three and four include only those workers that are in the sample during the whole 8-year period.
3. *Promotion rate* is the fraction of promoted workers in all worker/year observations in the sample.
4. *Ports of entry indicator* is equal to one if the entry rate to a hierarchical level is higher than 50% (defined for the seven bottom hierarchical levels).
5. *Returns to tenure indicator* is the coefficient on log tenure in a (log)wage regression specific to each firm in the sample.
6. *Tenure*, *Time since last promotion* and *Age* are measured in years.
7. The dummy *Rank 2* is for those classified as top managers by both ranking systems, and *Rank 3* is for those in *Rank 2* who are classified at the highest level.

Table 2. The determinants of top managers' promotion: marginal effects of the Probit model defined by equations (1) and (2), full sample

	Model 1	Model 2
Ports of entry indicator	0.0121***	
	(0.0015)	
Returns to tenure indicator		0.0740***
		(0.0072)
Secondary	-0.0076***	-0.0066**
	(0.0028)	(0.0029)
Tertiary	-0.0155***	-0.0152***
	(0.0029)	(0.0030)
Age	-0.0040***	-0.0040***
	(0.0006)	(0.0007)
$Age^2 \times 10^{-2}$	0.0016**	0.0015*
	(0.0007)	(0.0008)
Tenure	-0.0032***	-0.0035***
	(0.0005)	(0.0005)
$Tenure^2 \times 10^{-2}$	0.0092***	0.0108***
	(0.0031)	(0.0032)
$Tenure^3 \times 10^{-3}$	-0.0019***	-0.0020***
	(0.0005)	(0.0005)
Time since last promotion	-0.0277***	-0.0264***
	(0.0007)	(0.0007)
Time since last $promotion^2 \times 10^{-2}$	0.1018***	0.0951***
	(0.0069)	(0.0067)
Time since last $promot^3 \times 10^{-3}$	-0.0191***	-0.0176***
	(0.0015)	(0.0014)
Tenure *Time prom $\times 10^{-2}$	0.0375***	0.0360***
	(0.0024)	(0.0024)
Rank 2	0.0257***	0.0265***
	(0.0014)	(0.0014)
Rank 3	0.0142**	0.0179***
	(0.0060)	(0.0064)
Log number of top managers	0.0175***	0.0210***
	(0.0009)	(0.0010)
Log number of workers	-0.0011	-0.0053***
	(0.0009)	(0.0010)
Observations	279,404	266,263
Wald chi2	22,857.26	22,064.88
Log Likelihood	-96,836.78	-92,305.14
Pseudo R-squared	0.1304	0.1316

Notes:

1. Robust standard errors in parentheses.
1. * significant at 10%; ** significant at 5%; *** significant at 1%.
2. Year and industry dummies included.
3. Marginal effects computed at mean sample values.
4. Ports of entry indicator is equal to one if the entry rate to a hierarchical level is higher than 50% (defined for the seven bottom hierarchical levels).
5. Returns to tenure indicator is the coefficient on log tenure in a (log)wage regression specific to each firm in the sample

Table 3. The determinants of top managers' promotion: marginal effects of the Probit model defined by equations (1) and (2), workers present in all period (1991-1998)

	Model 1	Model 2
Ports of entry indicator	0.0097***	
	(0.0022)	
Returns to tenure indicator		0.0283**
		(0.0133)
Secondary	-0.0036	-0.0027
	(0.0044)	(0.0045)
Tertiary	-0.0070	-0.0074
	(0.0045)	(0.0046)
Age	-0.0053***	-0.0055***
	(0.0011)	(0.0011)
Age^2 $x10^{-2}$	0.0034***	0.0035***
	(0.0012)	(0.0013)
Tenure	-0.0001	-0.0002
	(0.0009)	(0.0009)
$Tenure^2$ x 10^{-2}	-0.0036	-0.0034
	(0.0044)	(0.0045)
$Tenure^3$ x 10^{-3}	0.0001	0.0001
	(0.0007)	(0.0007)
Time since last promotion	-0.0241***	-0.0234***
	(0.0010)	(0.0010)
Time since last $promotion^2$ x 10^{-2}	0.0896***	0.0864***
	(0.0072)	(0.0073)
Time since last $promot^3$ x 10^{-3}	-0.0143***	-0.0137***
	(0.0014)	(0.0014)
Tenure x Time prom x 10^{-2}	0.0002***	0.0002***
	(0.0000)	(0.0000)
Rank 2	0.0117***	0.0125***
	(0.0021)	(0.0021)
Rank 3	0.0178**	0.0199**
	(0.0083)	(0.0086)
Log number of top managers	0.0117***	0.0120***
	(0.0015)	(0.0015)
Log number of workers	-0.0037***	-0.0041***
	(0.0013)	(0.0014)
Observations	98,967	96,296
Wald chi2	5,093.28	4,927.44
Log Likelihood	-29,831.9	-29,136.5
Pseudo R-squared	0.1008	0.1000

Notes:

1. Robust standard errors in parentheses.
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. Year and industry dummies included.
4. Marginal effects computed at mean sample values.
5. Ports of entry indicator is equal to one if the entry rate to a hierarchical level is higher than 50% (defined for the seven bottom hierarchical levels).
6. Returns to tenure indicator is the coefficient on log tenure in a (log)wage regression specific to each firm in the sample

Table 4. Careers – Random Utility Models of Promotion Decision
Structural Estimates of the Nested Logit Model

			Coefficient	Std. Error
3rd level promotion (2 years)				
Tertiary education	Loser	– not promoted	0.192	0.070
	Late beginner	– not promoted	0.218	0.047
		– promoted	-0.271	0.073
	Early starter	– not promoted	0.192	0.164
		– promoted	-0.195	0.182
	Champion	– not promoted	-0.358	0.262
		– promoted	-0.407	0.263
Ports of entry indicator	Loser	– promoted	-0.385	0.066
	Late beginner	– not promoted	-0.412	0.153
		– promoted	0.308	0.164
	Early starter	– not promoted	0.252	0.299
		– promoted	-1.438	0.308
	Champion	– not promoted	-0.386	0.220
		– promoted	-0.296	0.121
Log number of top managers	Loser	– promoted	0.059	0.015
	Late beginner	– not promoted	0.068	0.019
		– promoted	0.239	0.019
	Early starter	– not promoted	0.443	0.152
		– promoted	0.426	0.154
	Champion	– not promoted	0.183	0.897
		– promoted	0.189	0.089
2nd level promotion (3 years)				
Tertiary education	Late beginner		-0.043	0.190
	Early starter		-0.229	0.391
	Champion		0.034	0.401
Ports of entry indicator	Late beginner		0.072	0.016
	Early starter		0.023	0.016
	Champion		0.050	0.015
Log number of top managers	Late beginner		0.470	0.097
	Early starter		-0.200	0.212
	Champion		0.529	0.232
1st level promotion (3 years)				
Tertiary education			-0.059	0.120
Ports of entry indicator			0.307	0.068
Time since last promotion			-0.747	0.022
Age			-0.001	0.003
Log number of workers			0.040	0.039
Log number of top managers			-0.147	0.074
Inclusive values				
2nd level	Loser		0.912	0.308
	Late beginner		0.015	0.007
	Early starter		0.392	0.146
	Champion		0.536	0.056
1st level	Promotion		0.482	0.072
	No promotion		0.305	0.043
Observations			83,312	
LR chi squared (df)[1]			12777,4 (42)	
LR test of homoskedasticity (chi squared (df))[2]			1888.1 (6)	

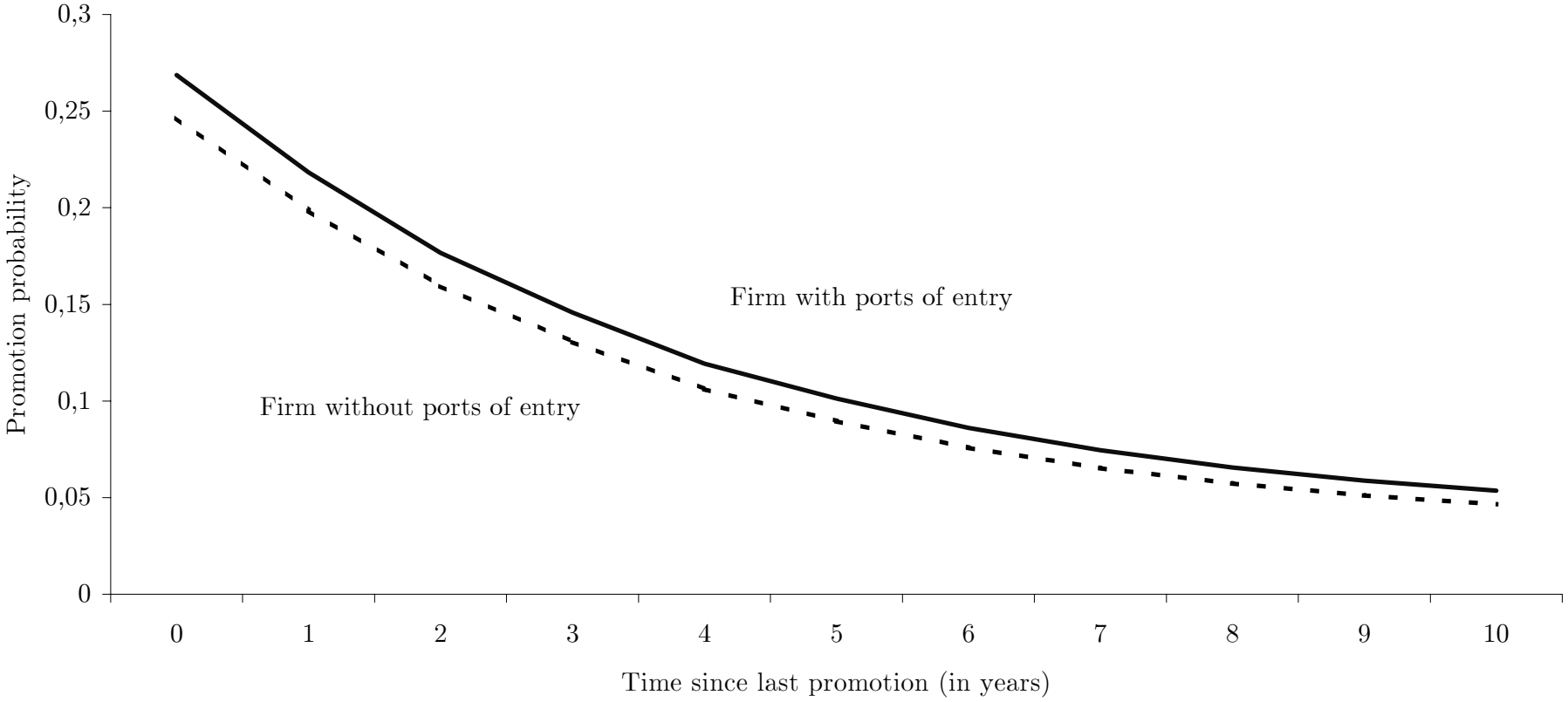
Notes:

1. The LR test against the constant-only model
2. The LR test of homoskedasticity is a test for the nesting against the null hypothesis of homoskedascticity.

Table A1. Hierarchical levels (Grade Levels as defined by law)

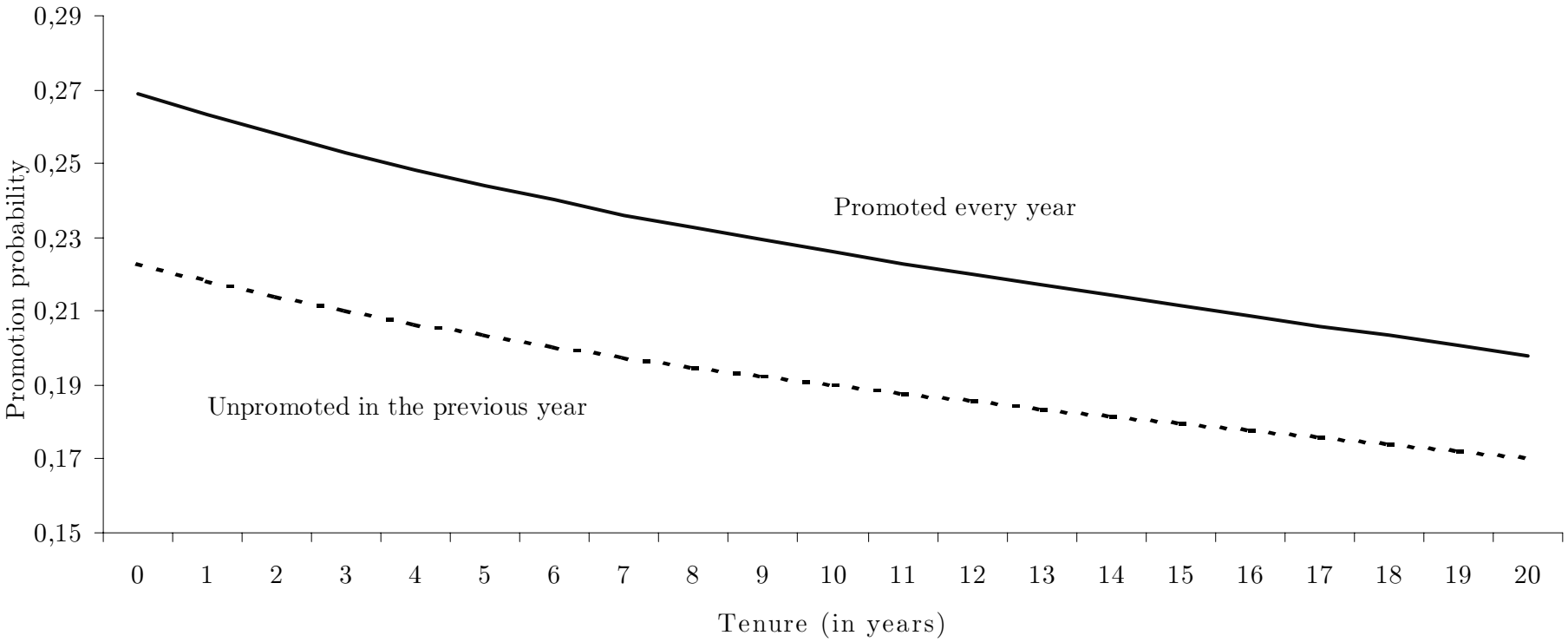
Level	Tasks	Skills
8 – Top managers	Definition of the firm's general policy or consulting on the organization of the firm. Strategic planning. Creation or adaptation of technical, scientific and administrative methods or processes.	Knowledge of management and coordination of firm's fundamental activities. Knowledge of management and coordination of the fundamental activities in the field to which the individual is assigned and that requires the study and research of high responsibility and technical level problems.
7 – Intermediary managers	Organization and adaptation of the guidelines established by the superiors and directly linked with the executive work.	Technical and professional qualifications directed to executive, research, and management work.
6 – Supervisors, team leaders	Orientation of teams, as directed by the superiors, but requiring the knowledge of action processes.	Complete professional qualification with a specialization.
5 – Higher-skilled professionals	Tasks requiring a high technical value and defined in general terms by the superiors.	Complete professional qualification with a specialisation adding to theoretical and applied knowledge.
4 – Skilled professionals	Complex or delicate tasks, usually not repetitive, and defined by the superiors.	Complete professional qualification implying theoretical and applied knowledge.
3 – Semi-skilled professionals	Well defined tasks, mainly manual or mechanical (no intellectual work) with low complexity, usually routine and sometimes repetitive.	Professional qualification in a limited field or practical and elementary professional knowledge.
2 – Non-skilled professionals	Simple tasks and totally determined.	Practical knowledge and easily acquired in a short time.
1 – Apprentices, interns, trainees	Apprenticeship	

FIGURE 1
Promotion probability as a function of the firm openness



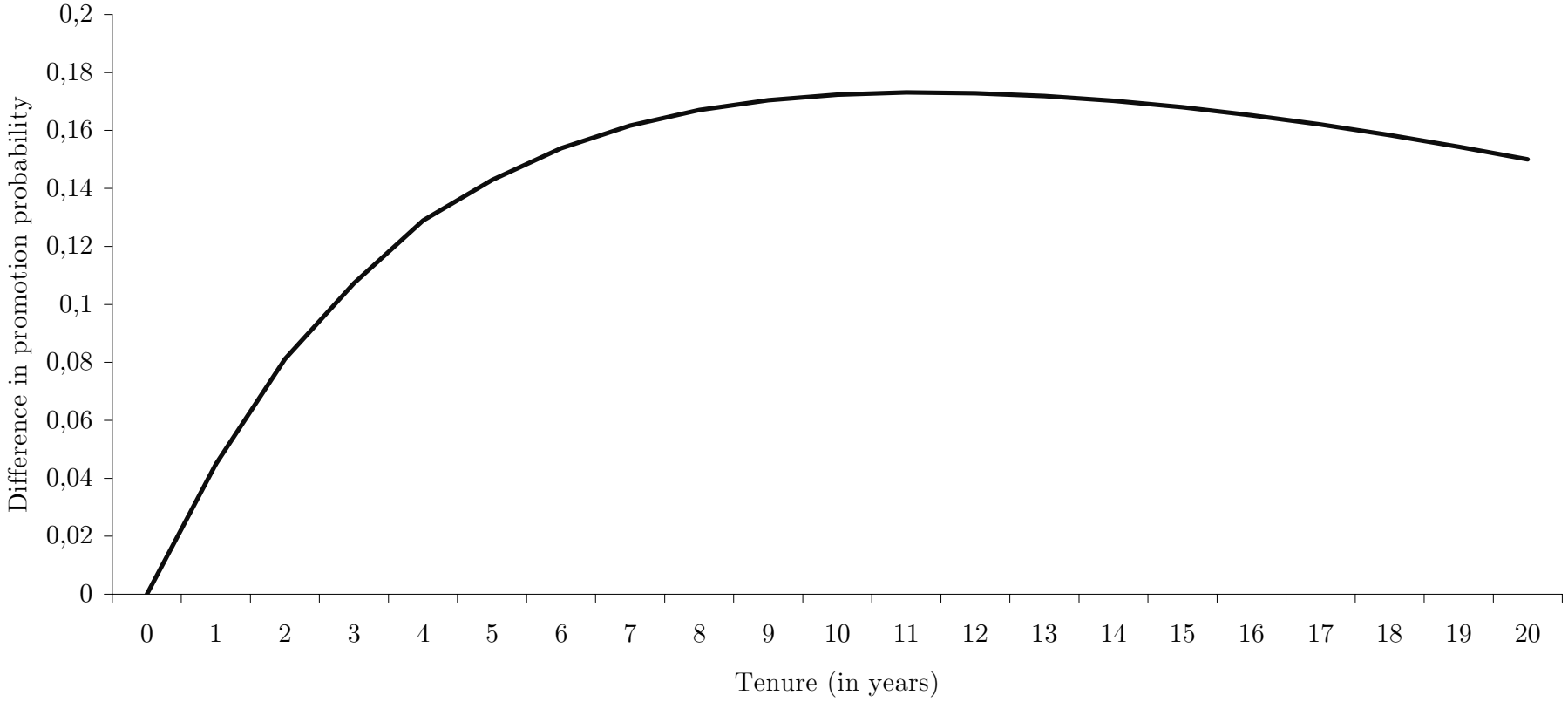
Note: Probabilities calculated for individuals with tertiary education, with a starting age of 30, assigned to rank 1, in 1991, working in the most predominant sector. The remaining variables are at their sample means. A firm is considered to have ports of entry if the entry rate to a hierarchical level is higher than 50% (defined for the seven bottom hierarchical levels).

FIGURE 2
Promotion probability as a function of recent promotion events



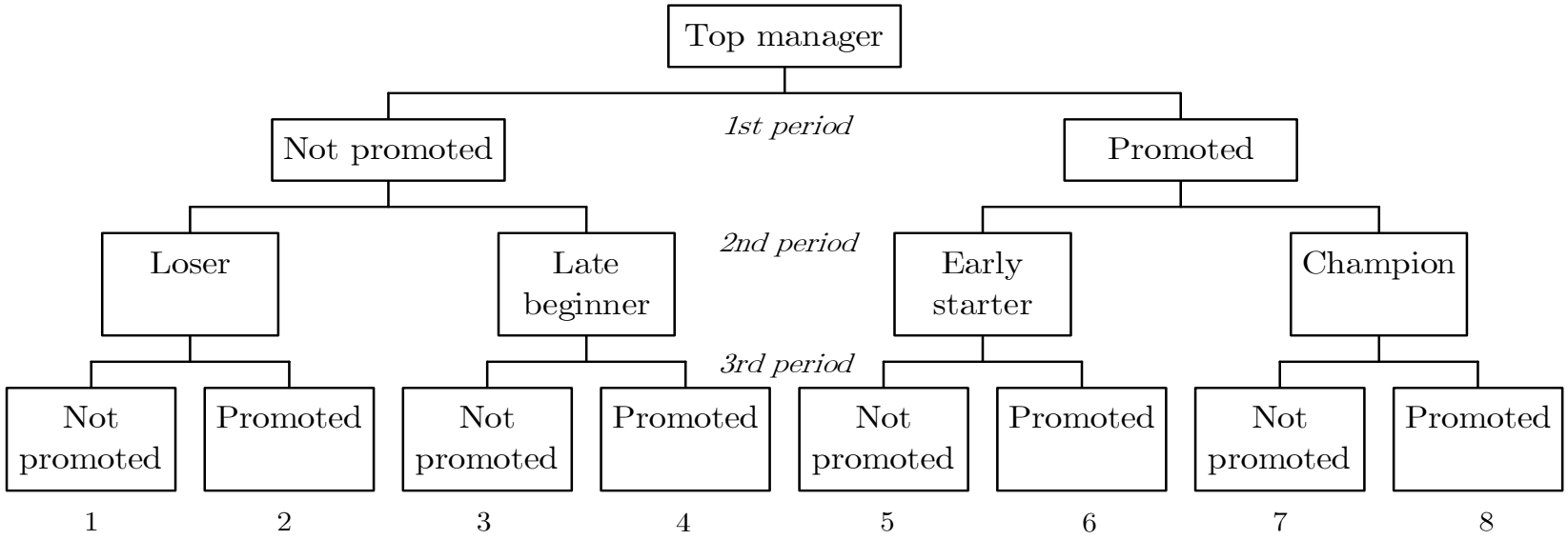
Note: Probabilities calculated for individuals with tertiary education, with a starting age of 30, assigned to rank 1, in 1991, working in the most predominant sector and within a firm with ports of entry. The remaining variables are at their sample means. The individual promoted every year has time since last promotion equal to zero and the individual unpromoted in the previous year has time since last promotion equal to one.

FIGURE 3
Stars versus losers: comparison of promotion probabilities



Note: Probabilities calculated for individuals with tertiary education, with a starting age of 30, assigned to rank 1, in 1991, working in the most predominant sector and within a firm with ports of entry. The remaining variables are at their sample means. The Loser is the individual never promoted represented by the solid line in Figure 1. The Star is the individual promoted every year represented by the solid line in Figure 2.

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



Note: The first period of the promotion/no promotion decision corresponds to the first three years in the data set; the second to the 4th-6th years; and the third period to the 7th-8th years. The Loser – a top manager not promoted in the first two periods; the Late beginner – not promoted in the first period, but promoted in the second period; the Early starter – promoted in the first period, but not promoted in the second period; the Champion – promoted in the first two periods.

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