Does inertia pay off? Empirical assessment of an evolutionary-ecological model of human capital decisions at firm level

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1. Introduction
The existing theoretical and empirical literature relating to the human capital theory approach involves resorting to the belief that employers must be ill-informed or irrational to explain why there remain distinctly low limits on the demands they place on the education and training system. None of the authors following this theoretical approach have focused attention upon the determinants of demands for human skills and how those demands change. As the ‘demand’ side in rate of returns studies is already incorporated recursively in the formulation of the incentives for accumulation given the existence of labour market equilibrium, by studying supply one is studying demand as well. If there were an insufficiency of demand for higher levels of human capital, the incentives for its accumulation would be lower and the supply would automatically adjust to the demand. In this vein, most theory and research within human capital issues treat firms as rational, flexible, and rapid adapters to changing environmental circumstances. According to this view, Portuguese textile firms, facing increasing availability of top educated and skilled individuals, considered as the most productive, should ‘adapt’ by becoming relatively more education/skill intensive. The flexibility of price mechanisms and the substitutability between different labour inputs would guarantee that human capital supply and demand match. The apparent paradox observed in the Portuguese textile industry and the concomitant failure of human capital demand to match the corresponding supply seemed to challenge the orthodox theory of human capital. The structural inertia observed in Portuguese textile firms demand for high levels of human capital called, therefore, for alternative theoretical approaches. An alternative explanation is presented in this study, which combines heterodox economics contributions, namely the organisational ecology and the evolutionary approaches. Within this heterodox framework, and highlighting the economic rationality of the low skills path that Portuguese textiles firms have found themselves in, the present paper introduces a new concept, ‘fission’. Here, the hiring process of high levels of human capital is viewed from a probabilistic or fitness perspective. Fitness is related not only to the actual productivity contribution of a highly skilled or highly educated person to the plant, but also to the probability that this same person will leave the plant to create or join a new (rival) unit. The fission argument intends therefore to answer the following questions: why
are employers so reluctant to hire additional numbers of top educated people if these are accepted as being the most productive and are abundant in the labour market? Does inertia pay off?

2. The evolution of earnings and the human capital paradox in Portugal

The analysis of human capital demand and supply seems to reveal a quite paradoxical situation. On the one side, top skilled and top educated people are not in short supply in the labour market and seem to be accepted to be the most productive. On the other side, employers, and in particular, new firms, reveal a poor hiring record at this level.

In fact, as documented before, in the last twenty years or so, there was an ‘explosion’ in the Portuguese education and training system, with the number of post-secondary (university and polytechnic) graduates showing an enormous increase. Between 1980/1981 and 1992/1993 the number of enrolments in tertiary education almost trebled (from approximately 87,000 to 248,000 students) and completion rates rose from a mere 11,000 in 1981/1982 to 27,000 in 1992/1993 (a global growth of 150%). Also, in more recent years, unemployment rates for post-secondary graduates rose quite sharply. The number of unemployed post-secondary graduates grew 57% (69% for licentiates) between 1992 and 1993 against a global unemployment growth rate of 33%. Moreover, corresponding employment stagnated. This seems to ignore the issue of shortage (at least quantitative) of top educated people.

Notwithstanding this fact, which presumably would lead to a decrease in respective earnings, the earnings distribution registered significant improvements in the premium accruing to workers with higher education and skill levels, namely those classified as top skilled and top educated relative to those with correspondingly lower levels. Indeed, as Figure 1 (Appendix) shows, those workers with a university degree and those with secondary education in the technical or professional route recorded the strongest increase in relative earnings.

In terms of skills (Figure 2 - Appendix), managers, technicians, highly skilled workers and foremen experienced similar improvements, contrasting with the deterioration of unskilled and semi-skilled relative earnings.

Considering that earnings indicate to an extent the ‘value’ or productivity of workers (Mincer, 1969), the evidence collected seems to indicate that the best educated and most highly skilled employees are ‘more valuable’, i.e., more productive, than the rest of the workers.

The poor hiring record displayed by Portuguese employers relative to the best educated and highly skilled individuals referred to in Batista (1993) and Coopers and Lybrand (1994), and documented in the last section, does not square with the above mentioned supply availability and relative productivity of those same individuals. In particular, in the light of orthodox economic theory, namely human capital theory, the behaviour of Portuguese employers does not seem ‘rational’.
According to the argument introduced in the present study, this apparently ill-conceived irrationality on the part of Portuguese employers derives, at least to some extent, from the neglect of an important factor in the hiring decisions of employers, that is, the risk of fission. The next section presents the particular of the fission model. It starts providing evidence on the reproduction pattern of firms and the associated human capital patterns in the Portuguese textile industry. This evidence constitutes the starting point of the fission hypothesis that aims to explain the ‘rationality’ of the low skill path that Portuguese firms seem stuck in.

3. Reproduction of firms and skills in Portuguese textile industry

Information gathered from several studies indicates that, in general, new firms were not a vehicle for structural change in the Portuguese economy. In fact, Demess/Cisep’s (1994) study emphasises that the kind of employment created by new firms (which are responsible for the increased employment creation) does not change the structural features of the Portuguese economy in terms of education and skills. New jobs tend to be even less skilled than existing ones, bringing lower than average wages. It also underlines that in spite of the apparent need for top skilled and top educated workers the hiring in this direction is worryingly weak.

This conclusion is reached with regard to the textile industry either through database analysis or case-study evidence. Indeed, information collected during Teixeira’s (2002a) fieldwork, which encompassed personal visits to and formal interviews with seventeen Portuguese textile firms, corroborates the above facts in relation to textile plant reproduction processes and, in addition, provided important clues about this process. Within the selected sample of fieldwork firms there was some similarity in the process by which they emerged. Often, the entrepreneurs who were interviewed had formerly been top skilled employees in neighbouring firms. Evolution processes, at least in terms of skill patterns, were very similar; firm skill patterns tended to ‘imitate’ existing firm human capital traits, characterised by a limited core of top skilled and top educated workers and a large ‘reserve army’ of low paid, undifferentiated workers.

Additionally, the process of new firm creation implied, in general, the exit of some (or, in certain cases all) top skilled or top educated workers from the existing firm. Usually, for the incumbent firm, vital knowledge and experience is lost when people leave (especially those with high levels of human capital). Departures are often accompanied by a spin-off of a new venture by former employees who set up a firm which is complementary to, or in competition with, their former employer.

A mail survey carried out by Teixeira (2002a) in October-December 2000 targeting all Portuguese textile firms created between 1991 and 1997 which were still in business, provides additional

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1 The emergence of new establishments, which are often founded by former top skilled employees of existing establishments, is accompanied by a decline in the average sales per worker of the original plants (see Teixeira, 2002a, Appendix 7). This evidence seems to corroborate the negative impact of exits on existing establishment economic performance.
information about textile firm reproduction processes.\(^2\) In terms of the reproduction system for recently created firms, the responses show a heavy path dependency in the sense that the current entrepreneur’s origins (in terms of characteristics of their last employer) seem to matter substantially and significantly influence the choice of activity, location, and most importantly, the ‘new’ firm’s labour organisation. In fact, almost three quarters of ‘new’ entrepreneurs are operating in the same (textile) activity as their previous firm, and are located in the same area.\(^3\) As in existing firms generally, in the ‘new’ firm the top educated and top skilled core is very limited and often non-existent. At the outset, around 91% of ‘new’ firms operated with no top educated workers and 71% operated with no top skilled employees. In 2000 those percentages decreased but are still very high (82% and 62%, respectively), though closer to those of existing firms.

In short, taking firm employment distributions as a whole, it is clear that both ‘new’ and existing firms present a bifurcated employment structure, with a limited core of top educated and top skilled workers and a large number of undifferentiated, low educated and low skilled employees. Recently created firms, as mentioned above, seem to imitate the employment structures of existing firms, especially regarding top educated and top skilled human capital types.\(^4\)

The starting point of the fission hypothesis is derived from the empirical observation that in the Portuguese textile sector the pattern of human capital accumulation at establishment level increases the risk of fission and contributes to the perseverance of education and skill employment structures at industry level. In other words, the hiring of one top skilled or top educated individual increases the establishment’s probability of fission, regardless of the return from such a hiring.

In fact, evidence provided in last section does seem to suggest that the process of plant creation in the Portuguese textile industry occurs in a similar way to atomic nuclear fission.\(^5\) At a given moment, the nucleus of a plant (its core of top educated and skilled workers) may split, producing a new plant of a different size to the previous plant but with a similar skill and education structure. It is assumed here (similar to the nuclear atom case) that when an additional top worker enters the firm, the risk of fission increases.\(^6\) Moreover, and unlike the case of the atom, there is a real possibility that the nucleus of the incumbent firm ends up with no elements, that is, all the top workers will leave the firm (radical

\(^2\) The response rate to this inquiry was very low, only 34 out of 897 firms responded. However, the sample was considered as ‘dynamically’ representative of the whole population (see Teixeira, 2002a, section 7.2.2 for further details).

\(^3\) Around half of the respondents stated that their current firm was located in the ‘localidade’ of their previous firm or employer and another 40% in the same ‘concelho’ (that is, municipality).

\(^4\) A study coordinated by Lança (2000), based on information gathered from an inquiry to the Portuguese manufacturing industry, involving 880 firms with more than 10 workers, which (according to “Quadros de Pessoal”) were in business in 1986, sketches the profile of the Portuguese industry entrepreneur. Results relative to these ‘existing’ firms corroborate the thesis of a path-dependent reproduction process within Portuguese industry, namely in terms of human capital. In fact, according to that study, the vast majority of existing manufacturing firms were run without top educated workers.

\(^5\) In physics, when a nucleus splits (fission), two (or more) daughter nuclei are formed with uneven masses, which do not add together to form the mass of the original nucleus. The process of fission is not ordered or regular, and it is uncertain (http://www.users.bigpond.com/Sinclair/fission).

\(^6\) By adding an extra neutron to the nucleus, mass is increased, and binding energy is consequently reduced to conserve energy. When the binding energy is reduced, the electrostatic repulsion within the nucleus is greater than the binding energy, and the nucleus splits (http://wwwusers.bigpond.com/Sinclair/fission).
fission) instead of the firm diminishing but continuing with a positive number (partial fission). It is argued here that the ultimate reason why the industry’s skill and education patterns remain relatively inert is the risk of fission, in particular the risk of radical fission. The “fission argument” implicitly assumes that there is a ‘threshold’ number of top skilled or top educated workers needed to run a plant. Below and above this level, the establishment’s fitness decreases. Figure 3 (Appendix) illustrates this relationship.

Note that attempts on the behalf of employers to secure valuable existing top educated workers (and thus diminish the risk of radical fission) through increasing their already high wages, or offering them non-monetary compensations (which renders their jobs even more attractive) may act to amplify employment structural inertia. In fact, it reduces the hiring propensity as higher wages lead to less monetary resources being available for new hiring. Moreover, given the higher wage or job incentive of more education, it contributes to an ever-expanding supply of top educated labour and, therefore, an aggravation of top educated unemployment.

In practice, one should distinguish between the two ‘fission’ processes, ‘partial fission’ and ‘radical fission’. Partial fission occurs when the plant has a relative excess of top skilled or top educated workers, whereas radical fission happens when the plant has its ‘desired’ level of these types of workers. In the first case the fission may be beneficial for plant performance or fitness, whereas in the second case fission is expected, in general, to be detrimental to plant survival.

In the event of fission occurring, in particular radical fission, the plant will incur costs, namely in the form of loss of a qualified worker with associated training costs, potential loss of market share (in favour of the new competitor’s) and, ultimately, threat to the plant’s fitness or survival prospects. In this way, the likelihood of fission influences the skill and education structures being maintained at a certain level in existing units. In addition, and given the existence of a sufficiently large pool of appropriate personnel, new organisations will tend to reproduce existing plants’ employment structures as they have been revealed to be those that are likely to lead to a ‘satisficing’ fitness level. In the end, industry employment structures in terms of human capital will remain fairly constant; that is, they will be characterised by substantial inertia.

What follows attempts to formulate an empirical economic behavioural model of the hiring pattern for top skilled and top educated workers. It is a realistic model, which recognises that, the existence of a “fission risk” must certainly affect the prospective employer’s probability of hiring in new top skilled or top educated workers. Accordingly, when analysing the determinants of hiring at top level, one should look not at the prevailing effective productivity differentials as such, but instead at the expected productivity differential (that is, the productivity differential adjusted for the probability of fission). This probabilistic approach is then incorporated into an empirical model of the determinants of establishment performance (that is, fitness or likelihood of survival), which is then used to explain or
justify employment structure dynamics (or often inertia) in terms of education and skills at the
industry level.

This empirical model, in particular, is likely to provide a convenient framework for analysing and
explaining the apparent paradox within the Portuguese economy and more specifically the textile
industry of a structural inertia in industry employment distribution in terms of both education and
skills, in a context of increasing availability of educated and skilled individuals in the labour market.

4. The empirical assessment of the fission model

Statistical information used in this section is based on unpublished data from a Portuguese survey,
“Quadros de Pessoal”. The statistical department of the Portuguese Ministry for Qualification and
Employment (DE_MQE) has collected these data on a yearly basis since 1982.7 “Quadros de Pessoal”
is a survey that is compulsory for every Portuguese firm with at least one wage-earner. It thus covers
almost the whole population of Portuguese firms with paid employees.

The database employed to compute measures presented in this work includes a file for each year of the
study (1984, 1988 and 1992).8 This file includes all establishments classified in the textile industry.
For each establishment, for the reference period of March of each year, information was gathered
relative to a set of variables that characterise the establishment, the corresponding firm, and each of its
workers. Specifically, this information encompasses the following variables: 1) relative to the
establishment and firm - identification number; district and village; industry; firm total turnover (sales
plus service rendered);9 legal nature;10 2) relative to employees - gender; birth date; date of joining the
firm; schooling level achieved;11 skill level;12 normal and extra remuneration earned in March; normal
and extra hours worked in March. In the database, information relating to each worker was aggregated
at the level of the establishment.

The database provides rich and comprehensive information about Portuguese textile establishments.
However, it also presents some problems that must be minimised (through feasible correction) to
permit a more consistent and meaningful analysis. These problems (e.g., intermitting establishments,

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7 The former designation of DE_MQE was DEMESS. Data can be obtained through a protocol with the Department of
8 The reason for not choosing an earlier period was because of the survey’s initially poor coverage. Substantial changes in
data collection methodology after 1992 influenced the choice of the last period. Despite the small number of periods
considered, the eight-year period seems to be sufficiently wide to permit statistical inferences to be drawn on the topic
pursued here.
9 For multi-establishment firms, their turnover figure was assumed to be proportional to their employment share in firm’s
total employment.
10 The firm’s juridical nature was aggregated into five categories: 1) Limited liability company (LDA,); 2) Public company
(S.A.); 3) Sole ownership; 4) Other; 5) Unknown.
11 Three schooling levels were considered: ED01 – post-secondary education (‘Top educated’); ED02 – second cycle of basic
(exclusive) up to secondary education; ED03 – six or less years of schooling.
12 Skills are divided into five groups: SK01 – top professionals and intermediate technicians (‘Top skilled’); SK02 – foremen
and team chiefs; SK03 – highly and skilled workers; SK04 – low and non-skilled workers; SK05 – apprentices.
missing values, and adjustments of firm sales, including services rendered, in order to find establishment sales) and how they are overcome are discussed in Teixeira (2002a).

The aim here is to collect evidence on the relation between human capital accumulation patterns and the corresponding survival probability of establishments. In particular, the work undertaken is intended to evaluate the empirical relevance of fission processes (in terms of education and skills) for the fitness of textile establishments.

The nature of data observed relative to the dependent variable [Establishment survived? (1) Yes; (0) No] dictates the choice of the estimation model. The approach used, therefore, will be to analyse each situation in the general framework of probabilistic models.

In the model of establishment survival, during a given period, the establishment either survived \((Y=1)\) or did not \((Y=0)\). Moreover, it is believed (cf. literature reviewed in Teixeira, 2002b) that a set of factors, such as human capital accumulation patterns, size, industry, and workforce composition, among other variables, gathered in a vector \(X\), explain the outcome.

In order to capture the dynamics of the human capital accumulation patterns of establishments, in relation to top educated and top skilled workers, a categorical variable was constructed indicating the particular pattern of human capital accumulation for each given establishment presented in the database.

In effect, the variable constructed encompasses five distinct categories or groups of establishments:

- ‘Radical fission’ [RF] – establishments that between 1984 and 1988 lost all their top educated (skilled) workers;
- ‘Partial fission’ [PF] – establishments that between 1984 and 1988 lost some of their top educated (skilled) workers, i.e., the number of top educated (skilled) workers in 1988 is less than that for 1984 but still positive;
- ‘Inert zero’ [INZ] – establishments that in neither period (1984 and 1988) had any top educated (skilled) workers;
- ‘Inert positive’ [INP] – establishments that maintained the same number of top educated (skilled) workers in 1984 and 1988;
- ‘Expanding’ [EXP] – establishments that increased the number of their top educated (skilled) workers between 1984 and 1988 [default category].

This categorical variable was constructed for both top educated and top skilled employees.\(^\text{13}\)

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\(^\text{13}\) Due to the importance of missing cases for top educated and top skilled employment categories, three alternative hypotheses regarding to the missing cases were considered [see Teixeira (2002a, chapter 6) for further details]. Given the highly likelihood that missing cases are in fact zeros, the estimates presented in this study are restricted to this scenario - DE_MQE technicians, who were responsible for treating the data from the “Quadros de Pessoal” inquiry, emphasised that missing values in the education and skills categories are in the majority of cases zeros; additionally, several studies (e.g., Godinho and Sousa, 2000) that are based on the same data source take for granted that the missing values are zeros, thus corroborating this assumption.
The empirical assessment of the fission argument is based on the estimation of a logistic regression. Writing the logistic model in terms of the odds, one obtains the logit model

\[
\log \left( \frac{\text{Pr}(\text{SURV})}{\text{Pr}(\text{NOSURV})} \right) = \beta_0 + \beta_1 \text{RF} + \beta_2 \text{PF} + \beta_3 \text{IN0} + \beta_4 \text{INP} + \beta_5 S2 + \ldots + \beta_9 S9 + \beta_{10} \text{PREP} + \ldots + \beta_{12} \text{OTHER} \\
+ \beta_{13} \text{E8488} + \beta_{14} \text{LNWAGE} + \beta_{15} \text{WAGE8488} + \beta_{16} \text{MULTES} + \beta_{17} \text{PAGE25} + \beta_{18} F_{-W} + \epsilon
\]

The logistic coefficient can be interpreted as the change in the log odds associated with a one-unit change in the independent variable.

Then \( e \) raised to the power \( \beta_i \) is the factor by which the odds change when the \( i^{th} \) independent variable increases by one unit. If \( \beta_i \) is positive, this factor will be greater than 1, which means that the odds are increased; if \( \beta_i \) is negative, the factor will be less than one, which means that the odds are decreased. When \( \beta_i \) is 0, the factor equals 1, which leaves the odds unchanged.

Estimation results show that even when one controls for establishments, industry, employment and wage dynamics, length in business and employment gender and youth composition, for both top educated and top skilled cases, the odds of survival are significantly lower for establishments that suffered radical fission processes when compared with establishments that expanded the number of such workers or those that maintained an inert zero behaviour, that is, did not have any top educated or top skilled workers in the period under study (1984-1988).

In fact, establishments that present inert behaviour in terms of human capital accumulation perform better than establishments that in the initial period had some positive number for top workers but four years later ended up with none. Therefore, in the top educated case, the odds of survival for radical fission establishments are estimated at 0.534 times those for establishments that expanded; whereas in case of inert zero establishments the corresponding odds of survival are estimated to be 0.695 (in the case of top skilled, the respective figures are similar at 0.552 and 0.607) (see Tabel 1 in Appendix).

In this vein, although in the short run expanding seems to be the most profitable alternative (in terms of fitness, at least), in the medium run, given the highly detrimental impact of radical fission on fitness, establishments may improve their survival prospects by instead maintaining an inert (zero) behaviour. Moreover, in the particular case of top educated employment, the evidence seems to indicate that inert positive behaviour is, in fact, even more profitable than expanding. Notwithstanding this, as already referred to above, this conclusion lacks statistical significance. For top skilled cases,
and taking into account the same limitation, inert positive behaviour presents odds of survival substantially higher than radical fission, though lower than the expanding alternative.\textsuperscript{14}

5. Conclusion

This paper aimed to seek an economic ‘rational’ explanation for the relative inertia of human capital demand side in the Portuguese economy and more specifically in the textile industry. In this vein, a new concept, fission, was introduced.

The fission argument stated that Portuguese textile establishments’ reproduction process occurs in a similar way to atomic nuclear fission. At a given moment, the ‘nucleus’ of the establishment, constituted by its core of top educated and top skilled workers, may split, originating a new plant with a similar education and skill structure.

It is argued then that due to this fission risk, establishments would tend to maintain a bifurcated employment structure characterised by a limited core of top educated and top skilled workers and a large ‘reserve army’ of undifferentiated and low educated individuals. Implicitly it was assumed that the existence of a limited number of top educated and top skilled workers would yield ‘satisficing’ levels of fitness. Also that the risk of fission would produce new establishments, which, in turn, would profit (in terms of fitness) by imitating existing plants’ employment structures. In this vein, the mechanism of establishment reproduction would explain the observed inertia at the industry level on the human capital demand side, and thus the human capital paradox.

The pertinence of the fission argument, concerning the ‘profitability’ of maintaining inert behaviour in terms of the hiring of individuals with high levels of human capital (i.e., top educated and top skilled workers) was assessed empirically through the estimation of a probabilistic model of establishment survival which took into account the accumulation pattern of human capital, in particular the fission risk.

The estimated logistic model, based on the whole population of the Portuguese textile establishments that were in business in the period 1984-1988 (whether or not they survived until 1992), provided statistical evidence that corroborates the fission argument. In fact, taking a dynamic perspective, there was enough evidence that it is more profitable for an establishment, in terms of fitness or survival capacity, to maintain inertia (characterised by employment of no top educated or top skilled workers) than to hire an individual with high levels of human capital which would run the risk of eventually suffering a fission process. This evidence, however, was stronger in the case of top educated than top skilled workers.

\textsuperscript{14} Note that although the ‘reverse causality’ argument could provide an alternative explanation for the empirical evidence gathered here, it is discarded based on further evidence gathered from the survey to recently created textile firms (\textit{cf. Teixeira, 2002a}). According to this later, the “prospective closure” or “economic difficulties” of the former employer of the respondents (owners of newly created textile firms) is consider important or very important motive for creating their present firm in only 22\% of cases; the vast majority (78\%) of the new owners claimed that the most important reasons for starting the new business (in competition with their former employer) were the existence of a business opportunities, desire for independence or expectation of higher incomes. This isolated piece of evidence tends thus to support the argument of fission.
References


Table 1: Human capital and establishment fitness in the Portuguese textile industry - logistic estimates of the odds of establishment survival

<table>
<thead>
<tr>
<th>Indep. Variable</th>
<th>Definition</th>
<th>Coef. estimates and significance</th>
<th>Top Educated</th>
<th>Top Skilled</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RF</strong></td>
<td>‘Radical fission’ – establishments that between 1984 and 1988 lost all their top educated (skilled) workers;</td>
<td>Exp((\beta)) 0.534</td>
<td>0.552</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.047</td>
<td></td>
<td>0.037</td>
</tr>
<tr>
<td><strong>PF</strong></td>
<td>‘Partial fission’ – establishments that between 1984 and 1988 lost some of their top educated (skilled) workers, i.e., the number of top educated (skilled) workers in 1988 is less than that for 1984 but still positive;</td>
<td>Exp((\beta)) 1.390</td>
<td>1.198</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.444</td>
<td></td>
<td>0.536</td>
</tr>
<tr>
<td><strong>INZ</strong></td>
<td>‘Inert zero’ – establishments that in neither period (1984 and 1988) had any top educated (skilled) workers;</td>
<td>Exp((\beta)) 0.695</td>
<td>0.607</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.067</td>
<td></td>
<td>0.008</td>
</tr>
<tr>
<td><strong>INP</strong></td>
<td>‘Inert positive’ – establishments that maintained the same number of top educated (skilled) workers in 1984 and 1988;</td>
<td>Exp((\beta)) 1.030</td>
<td>0.729</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.917</td>
<td></td>
<td>0.171</td>
</tr>
<tr>
<td><strong>E8488</strong></td>
<td>Equals 1 if the establishment maintained or expanded its total employment between 1984 and 1988 and 0 otherwise</td>
<td>Exp((\beta)) 1.923</td>
<td>1.694</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.000</td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td><strong>LNWAGE84</strong></td>
<td>The natural logarithm of the average monthly base remuneration in real terms in 1984</td>
<td>Exp((\beta)) 0.974</td>
<td>1.232</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.954</td>
<td></td>
<td>0.593</td>
</tr>
<tr>
<td><strong>WAGE8488</strong></td>
<td>The growth rate of the average monthly base remuneration in real terms between 1984 and 1988</td>
<td>Exp((\beta)) 1.008</td>
<td>1.004</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.089</td>
<td></td>
<td>0.391</td>
</tr>
<tr>
<td><strong>LNAGE</strong></td>
<td>The natural log of the highest length of tenure of workers within the establishment in the reference period</td>
<td>Exp((\beta)) 1.305</td>
<td>0.391</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.001</td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td><strong>MULTES84</strong></td>
<td>Assuming the value 1 in the case of an establishment belonging to a single-establishment firm and 2 if it belongs to a multi-establishment firm in the reference period</td>
<td>Exp((\beta)) 0.788</td>
<td>0.380</td>
<td></td>
</tr>
<tr>
<td><strong>PAGE2584</strong></td>
<td>The ratio of the number of employees aged 25 or under in establishments’ total employment in 1984</td>
<td>Exp((\beta)) 0.999</td>
<td>0.751</td>
<td></td>
</tr>
<tr>
<td><strong>F_W84</strong></td>
<td>The ratio of the number of women working in the establishment to total employees in 1984</td>
<td>Exp((\beta)) 0.996</td>
<td>0.128</td>
<td></td>
</tr>
<tr>
<td><strong>CONST.</strong></td>
<td></td>
<td>Exp((\beta)) 1.763</td>
<td>1.415</td>
<td>0.790</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Significance</strong> 0.701</td>
<td></td>
<td>0.790</td>
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Dummy variables

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>1395</td>
<td>1417</td>
</tr>
<tr>
<td>Survived</td>
<td>1039</td>
<td>1055</td>
</tr>
<tr>
<td>Died</td>
<td>356</td>
<td>362</td>
</tr>
<tr>
<td>-2Log Likelihood</td>
<td>1517.7</td>
<td>1563.7</td>
</tr>
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</table>

Hosmer and Lemeshow test

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Note: Computations made by the author based on unpublished data from “Quadros de Pessoal”.


Figure 1: Average monthly earnings relative to earnings of workers with less than the first cycle of basic education (less than first cycle = 100)

Notes: Data based on “Quadros de Pessoal” inquiry from the Portuguese Ministry of Employment.


Figure 2: Average monthly earnings, relative to earnings of non-skilled workers, 1985-1989 and 1989-1993 (global growth rates)

Notes: Data based on “Quadros de Pessoal” inquiry from the Portuguese Ministry of Employment.

Insufficient hiring of top educated/skilled workers or large amount of leavers among these workers and, at the extreme, ‘radical’ fission processes (ending up with no top educated or skilled workers) are likely to lead to a decline in the performance of firms. This is derived from the loss of a valuable stock of the firm’s specific human capital and thus decline in productivity and potential losses in market share due to the increasing competition provoked by the creation of new firms by former top educated/skilled workers.

Increases in the number of top skilled/educated workers lead to losses in the firm’s total value function. These losses are related to the risks of overstaffing and the associated potential conflicts within organisations. In this vein, ‘partial’ fission (loss of part, but not all, of top educated/skilled workers) is likely to improve the firm’s performance.

**Figure 3:** The fission risk and its impact on establishment fitness