# The Impact of Entrepreneurial Experience on the Internal Economics of the Firm

Rui Baptista [a,b], Francisco Lima [c], Miguel Torres Preto [a,1]

[a] Center for Innovation, Technology and Policy Research, IN+, Instituto Superior Técnico, IST, Av. Rovisco Pais, 1049-001 Lisbon, Portugal
[b] Max Planck Institute of Economics, Jena, Germany
[c] Instituto Superior Técnico, Technical University of Lisbon and CEG-IST, Av. Rovisco Pais, 1049-001 Lisbon, Portugal

**Abstract**

This study uses detailed longitudinal matched employer-employee data to examine the impact of entrepreneurial experience on job assignments, careers, and wages. The results suggest that there are significant differences in career mobility between former business owners and individuals who were always wage employees. While former business owners are, on average, paid less than other workers in the same hierarchical level, they enter firms at higher job levels and progress faster up the hierarchy, earning a labor market premium for entrepreneurial experience. The worker-firm match plays a significant role in generating this result, which contradicts previous empirical works on the subject.

*JEL classification:* J31; L26; M51

*Keywords:* Entrepreneurial Experience; Internal Labor Markets; Task-specific Human Capital; Matched Employer-employee Data.

**Acknowledgement**

We thank Mirjam van Praag, George Baker, and participants in the ACE-MPI Workshop on the Costs and Benefits of Entrepreneurship. We are indebted to the Portuguese Ministry of Labor and Social Solidarity for allowing us access to the data used in this paper. Financial support from the Portuguese Science and Technology Foundation (grant PTDC/ESC/71080/2006) is gratefully acknowledged. Miguel Torres Preto gratefully acknowledges to the Portuguese Foundation for Science and Technology for their financial support (grant SFRH/BD/22648/2005).

[1] Corresponding author: Phone: +351 218 417 379. Fax: + 351 218 496 156.

E-mail address: miguel.preto@dem.ist.utl.pt (Miguel Torres Preto).

## 1. Introduction

A considerable amount of theoretical and empirical work in economics focuses on individual choices between wage employment and entrepreneurship (or business ownership). Seminal work by Lucas (1978) and Jovanovic (1982) provide the basis for a significant stream of literature linking entrepreneurial ability to firm size dynamics, and the evolution of markets. Another literature stream examines the role played by pecuniary and non-pecuniary rewards in the occupational choice between self-employment and wage employment (see, for instance, Rees and Shah, 1986; and Taylor, 1996). Work originating mostly in the management and organizational theory literatures increasingly focuses on the individual decision to exit entrepreneurship (Gimeno et al., 1997; McGrath, 1999) and on the characteristics of former business owners who re-enter entrepreneurship (see, for instance Westhead and Wright, 1998).

Conversely, only a few recent studies examine how well individuals who forsake business ownership and return to wage employment fare in the labor market. Research comparing earnings of former business owners who have become wage employees with those of others of similar age and educational background who did not experience self-employment over their careers provides mixed results and generally fails to account systematically both for the matching between worker and firm characteristics, and the specifics of career dynamics within firms.

The present study uses longitudinal matched employer-employee data that include detailed information about individuals' backgrounds, job assignments, and career progress within firms to examine the impact of business ownership experience on job assignments, careers and wages. An explanation for the empirical evidence obtained is provided based on the extant theoretical literature, paying attention in particular to the framework proposed by Gibbons and Waldman (2006) with regard to task-specific human capital.

The following section provides the background for this study and surveys the empirical literature examining wage incomes and the labor market performance of former business owners. The third section describes the data used in the present study. Section four presents empirical evidence on the role played by business ownership experience in the internal economics of the firm with regard to careers, while section five focuses on wages. In these two sections, we largely follow the broad empirical strategy employed by Baker et al. (1994a; 1994b), asking three main questions that seek to account for the main features of the impact of business ownership experience on careers and wages:

i. Are former business owners more or less likely to be assigned to higher levels in the firms' hierarchies at the time of hiring than other workers of comparable characteristics?

ii. Do former business owners progress up the job ladder faster or slower than other workers of comparable characteristics?

iii. What is the impact of business ownership experience on wages, and how much of this impact is related with differences in job assignment?

Section five concludes by proposing an explanation for the main empirical results.

For the purpose of the present study, a broad definition of entrepreneur is used, which deliberately overlaps with that of business owner, not delving into a conceptual distinction between those terms. The same applies for the definition of entrepreneurship, which must be understood in a broad economic sense. The terms 'entrepreneur' and 'business owner', as well as 'entrepreneurship experience' and 'business ownership experience' will be used interchangeably in the present work as including those individuals who report themselves as business owners, regardless of whether they have full or partial ownership, and have started, acquired or inherited the business.

## 2. Background

*2.1 Business Ownership Experience and Theories of Job Assignment, Wage, and Promotion Dynamics*

While entrepreneurship's links with risk/uncertainty and innovation have lately taken the spotlight, entrepreneurial activities have also been connected with coordination and supervision tasks at least since the work of Say (1803/1971). In *A Treatise on Political Economy or the Production, Distribution and Consumption of Wealth*, the entrepreneur plays a central coordinating role both in production and distribution. Also within the firm, he is the coordinator and moreover, the modern leader and manager. Say is the first economist who stresses this managerial role for the entrepreneur.

For Marshall (1890/1930), within the firm, the owner/entrepreneur bears all the responsibility and exercises all control. He directs production, and he is both the manager and employer. Kaldor (1934) stresses that, in addition to uncertainty-bearing, the "entrepreneurial function" includes supervision and coordination. Supervision is necessary in the case of cooperative production in order to ensure that contracts already entered into should, in fact, be carried out. Coordination, on the other hand, is that part which determines what sort of contracts should be entered into.

It may be argued therefore that the exercise of business ownership should provide former entrepreneurs with experience in organizing, supervising and coordinating activities in firms. This experience may be valued by hiring firms as a positive signal when hiring and promoting to the higher levels of their hierarchy.

Assignment models of the distribution of earnings across firms and industries (ultimately addressing the issue of income distribution in the economy) begin with Tinbergen (1951) and Roy (1951). Comprehensive analyses of the internal organization of firms – with particular regard to employee entry and exit, wage and promotion dynamics – are found in works by Doeringer and Piore (1971); Rosenbaum (1984); and, more recently, in the crucial studies by Baker et al. (1994a; 1994b).[2]

Sattinger (1993) reviews models explaining the distribution of earnings as a result of the market economy's solution to the problem of assigning workers to jobs. Such models arise from a variety of related issues, including occupational choice; self-selection bias; human capital and skill prices; wage differentials and the organization of hierarchies. Instead of focusing specifically on assignment mechanisms of the distribution of earnings, we are concerned with discussing three main determinants leading to specific worker-job matching – human capital, imperfect information, and the scale of operations of the firm – and how these factors affect the importance of an ability that is specifically acquired by those with business ownership experience – that of organizing, coordinating and supervising activities in firms.

Human capital theory (Becker, 1962; 1964/1975) states that individuals can acquire abilities through education and on-the-job training. These positively impact individual productivity and, consequently, earnings (see also Ben Porath, 1967). While some forms of human capital are general and should impact individual productivity in a wide range of jobs, others are specialized (Topel, 1991; Becker and Murphy, 1992), and are associated with specific industries, firms, or tasks. The assignment of workers to jobs in the economy should then occur as a result of the knowledge firms and workers have of the output from each specific worker-job match. However, such knowledge is usually imperfect (Spence, 1975).

One mechanism for job assignment is learning. While workers acquire general human capital through schooling and firm- and task-specific human capital through experience and on-the-job training, firms learn about workers' true abilities and productivity through observation. Workers

[2] Other examples of studies on the internal labor markets include Lazear and Oyer (2004) using multi-firm data and Dohmen et al. (2004) and Lin (2005) using single firm data. Waldman (2008) presents an extensive discussion survey of the related literature.

may be sorted into jobs through mechanisms of screening and signaling (Stiglitz, 1975; Spence, 1973), or a matching process of workers to jobs occurs over time (Jovanovic, 1979; 1984).

Both learning/matching and screening/signaling models may be viewed as extensions of human capital theory. While learning models concentrate on the effect of general and specific human capital on expected productivity in a job and, therefore, on its effect on job assignment, promotion and wage dynamics, screening and signaling models focus in particular on the ways in which human capital acquisition (through schooling, experience and on-the-job training) serves as either a signal or filter for productivity differences that firms cannot reward directly (Weiss, 1995).

Baker et al. (1994a) provide evidence that firms use the job assignments of workers as a signal of ability (see also Waldman, 1984; Bernhardt, 1995). It can then be argued that firms should seek those with organization and supervisory/coordination experience when filling up vacancies in managerial levels of the hierarchy which typically require these abilities. If business ownership is perceived as providing such abilities, then it is possible that entrepreneurial experience may be interpreted as a signal in the employment of supervisors/managers.

The assignment of workers to jobs across firms and industries is also influenced by the scale of operations of firms. More resources, in the form of capital, labor, and supervising and coordinating responsibility, are allocated to workers with greater supervisory/coordination abilities, since these resources will have a greater effect on output when allocated to those workers. This means that workers with greater specific human capital associated with the organization and oversight of resources will be assigned more resources to administer and, through these resources, will have a greater impact on a firm's output. For a fixed number of such workers, the larger the scale of operations of the firm, the larger will be the amount of resources allocated to them and the larger their impact on output (Mayer, 1960; Williamson, 1967; Rosen, 1981; Spurr, 1987).

The relationship between firm size and assignment of workers to jobs is also related to the issue of information asymmetries and compensation of workers within hierarchies, originally put forward by Simon (1957). If only performance, and not effort, is observed by the firm, a moral hazard problem occurs. Holmstrom (1979) shows that, when only the payoff of the agent's actions (e.g. the worker's performance) is observable, contracts will be second best. Calvo and Wellisz (1979) show that moral hazard occurs within firm hierarchies: the effect of a supervisor shirking is that workers under the supervisor also shirk, leading firms to place more able workers in supervising positions. The effect of moral hazard is therefore that, the larger the scale of operations, the larger the impact workers with supervising and coordinating ability on output; moreover, it provides a rationale for incentive mechanisms to avoid shirking that are especially significant for workers in supervisory/coordination jobs (Harris and Holmstrom, 1982).

Human capital and signaling theories hold that wages in firms reward experience acquired in the labor market due to the accumulation of skills (Mincer 1974; Becker, 1964/1975) and its signaling value (Spence, 1973). Individuals can acquire specific skills through on-the-job training, thus increasing their productivity. Under perfect information, or with efficient screening/signaling, the pecuniary value of labor market experience should translate into higher earnings (Mincer 1974) because experienced and educated workers are expected to be more productive and are consequently rewarded with higher earnings. If entrepreneurial experience provides individuals with specific skills in supervisory/coordination tasks, such experience may allow them to have a significant impact on firm productivity as wage employees.

Gibbons and Waldman (1999) provide a general framework integrating job assignment, human-capital acquisition, and learning capturing several empirical findings concerning wage and promotion dynamics inside firms. In particular, their model provides a rationale for some important features of the internal economics of the firm (Baker et al., 1994a; 1994b):

i. Job assignments (i.e. hierarchical levels) are a stronger determinant of wage levels than human capital or any other observed characteristic of workers;

ii. There is a significant overlap between wages in adjacent hierarchical levels; and

iii. Wage increases are serially correlated, and promotions are associated with large wage increases, but wage increases at promotion are small relative to the difference between average wages across levels of the job ladder.

In an extension to their model, Gibbons and Waldman (2006), show that the existence of task-specific human capital allows for the explanation of another characteristic of the internal economics of the firm: the existence of cohort effects. Studies by Beaudry and DiNardo (1991), and Baker et al. (1994b) show that a cohort's average wage upon entering the firm is an important determinant of that same cohort's average wage years later. In particular, a cohort entering in a "good" year into relatively high level jobs and earning relatively high wages, will still have those advantages years later when compared with a cohort entering in a "bad" year, taking up relatively lower level jobs and earning relatively lower wages, independent of their composition in terms of observable characteristics.

The basic explanation for the cohort effect (Gibbons and Waldman, 2004; 2006) is that human capital accumulation is task-specific and its effect on productivity diminishes the further up a worker climbs in the job ladder. Some of a worker's acquired human capital goes unused when a worker is promoted and is assigned a new set of tasks. Hence, workers entering into lower levels in the job ladder accumulate human capital that is specific to the execution of tasks performed in those lower levels – being unlikely to acquire human capital specific to the supervisory/coordination activities required at higher levels. This means that their career progress will be slower than that of individuals who possess such human capital.[3]

### *2.2 Business Ownership Experience and Wage Earnings*

Empirical work on the impact of business ownership experience on careers in firms is, to our knowledge, non-existent. Some recent work has examined the impact of such experience on individuals' wages, while other studies have compared earnings in self-employment with those in paid employment. In general these studies argue that business ownership experience should exert a negative influence on earnings, as wage employees benefit from on-the-job training while former business owners do not (Williams, 2000). Business owners may not acquire the kind of firm-specific or industry-specific human capital that represents a positive signal in wage employment. No reference is made to the role played by task-specific human capital.

In their path-breaking study, Evans and Leighton (1989) find no clear evidence that the return to experience in business ownership is different than the return to experience in wage work. When examining the possibility of a labor market 'stigma' for individuals with previous self-employment experience, Hamilton (2000) finds that a brief experience as a business owner yields a positive effect on subsequent wages as an employee, but that such effect wears away when long spells of entrepreneurial experience are considered.

Only recently empirical analyses have paid attention primarily to the effects of entrepreneurial experience on individuals' earnings after they exit business ownership and switch into wage employment. Typically, empirical works on this subject find effects of business ownership experience on future employment earnings that are of small magnitude and weakly significant.

Generally, even when positive, the effect of self-employment experience on future wages is found to be smaller than the effect of past experience as a wage employee. Sometimes it is even

[3] As Waldman (2008) stresses, this approach can also explain the economy-wide cohort effects and industry-level cohort effects found in recent papers such as Kahn (2008), Oyer (2006) and Oreopoulos et al. (2008).

negative (Williams, 2000, 2004; Bruce and Schuetze, 2004; Hyytinen and Rouvinen, 2008; Kaiser and Malchow-Møller, 2008). However, these studies fail to account for the characteristics of the companies employing the former business owners. In particular, no evidence of where in the job assignment structure of firms do former business owners end up is provided.

Ferber and Waldfogel (1998) report no significant overall return to self-employment experience. Using the same data set, Williams (2000) finds that the rate of return to previous business ownership experience is lower than the return to wage employment, but is only significant for women. In further work, Williams (2004) finds that more business ownership experience has a negative effect on the post-business ownership wage. Bruce and Schuetze (2004), also based on a sample of U.S. workers, find a small negative effect of brief spells of business ownership experience compared to continued wage work. Those spells would have a more detrimental effect on wage earnings than longer ones. These authors also find that the labor market consequences associated with unemployment are clearly more negative than for business ownership.

Williams (2003) provides evidence for Germany. While the focus of Williams' paper is on returns to schooling, it also documents that self-employment experience is rewarded a slightly lower return on the German job market than paid-employment experience. Kaiser and Malchow-Møller (2008), based on Danish data, find that time spent as a business owner reduces the post-business ownership wage. This study finds considerable differences in the returns to business ownership depending on age, occupational status prior to business ownership, and the length of the business ownership spell. Finally, Hyytinen and Rouvinen (2008), using data from the European Community Household Panel,[4] find that those re-entering paid-employment after a brief self-employment spell appear to earn considerably lower wages than those staying in the wage sector.

In general, the empirical evidence concerning the wage returns to business ownership experience is mixed and suffers from important limitations. In particular, firm-specific determinants of wages are rarely considered due to data unavailability, leading to possible bias in the results. Moreover, the studies do not address features of the internal economics of firms such as job assignments and promotions, thus providing an incomplete picture of the role played by business ownership experience on wage and career dynamics. The present study contributes to the literature by addressing these issues.

## 3. Data

The present study uses the *Quadros de Pessoal* (QP) micro-data, a Portuguese longitudinal matched employer-employee data set including extensive information on the mobility of workers and business owners for the period 1986-2003.[5] QP is gathered annually by the Portuguese Ministry of Labor and includes data from all private firms (and establishments) with at least one wage-earner. The data do not cover public administration. The survey collects detailed information on each individual employee (regular wages, subsidies, hours worked, date of admission, age, gender, schooling, qualification level, part-time status, job assignment, and type of collective agreement, among others). It also collects basic information about the establishment and the firm, such as size, ownership, sales turnover, International Standard Industrial Classification (ISIC) codes, and location.

[4] This dataset tracks flows from paid-employment either to self-employment or to unemployment, and back to paid-employment for most of the EU-15 countries.

[5] Recent studies using QP data include: Mata and Machado (1996), Blanchard and Portugal (2001), Mata and Portugal (2002), Cabral and Mata (2003), and Varejão and Portugal (2007).

The present analysis uses information concerning the period 1995 until 2003.[6] The employment and wage data refer to the month of October. The raw data used is organized in two data sets corresponding to the level of aggregation of the information: individual level and firm level.[7] There are over 250,000 firms and two million workers in each annual survey who can be tracked over time through a unique identification number. Data on business owners and employees for each firm and establishment includes income,[8] gender, age, occupation, tenure, educational attainment, and hierarchical levels. For both business owners and employees, records of wage employment and entrepreneurial experience can be collected, as well as information concerning their labor market experiences following business ownership.[9]

### *3.1 Sample*

Our initial sample comprises all young male individuals present in 1995 who appear as employees in at least one year from 1986 to 2003, including those individuals who remain ever as employees and those who experience both wage employment and business ownership occupations at different points in time. A panel was built to trace backwards the individuals' experiences in the labor market – between 1986 and 1995.

The period under study ranges from 1995 to 2003. This empirical study uses information on individuals who have entered the QP micro-data sometime between 1986 and 1995, in order to trace their backgrounds, therefore building information on the initial stock of labor market experience. As an initial condition, it is guaranteed that this variable captures not only the number of years individuals are observed as employees or business owners in the data set, but goes back to the individuals' complete work history in their current firms.[10]

The analysis is restricted to males, who account for 61 percent of all individuals present in the data set in 1995 who were aged between 16 and 25 in 1986, corresponding to 40 percent of the original sample.[11] By excluding individuals over 25 years old, the analysis focuses on young individuals who have finished their formal education and have already entered the labor market. Furthermore, it mitigates the issue of initial conditions arising from comparing individuals with very dissimilar work experiences and ages.

### *3.2 Former Business Owners and Wage Employees*

Part of the motivation of this study is based on the contention that former business owners own human capital that is distinguishable from that of wage employees. Table 1 presents the descriptive statistics for the complete sample (1995-2003), comparing former business owners with those individuals who were always wage employees. One particular issue that will be discussed in detail later is whether there is a wage 'penalty' affecting former business owners.

---

[6] However, QP does not have information for all years. Along the period in analysis there is one gap in the workers' files, namely in the year 2001.

[7] QP enables a third dimension which respects establishments, but the present empirical work focuses exclusively on the individual and the firm as units of analysis.

[8] Data on incomes for business owners is incomplete, as most business owners do not report any income, or assign themselves a small wage.

[9] The variable measuring experience as wage employee reflects the potential experience while in wage employment. Thus, potential experience as an employee is equal to age minus six, years of education, tenure, and experience as business owner.

[10] This is possible since the data set provides information on workers' admission date to the firm. Hence, we gauge individuals' complete experience even when it goes back to a time before the first year of observations of the data set (i.e. 1986).

[11] We drop a small number of observations (less than 0.5%) where individuals' professional situation is not the one of wage employment or business ownership, namely members of producers' co-operatives and unpaid family members.

At first sight, it seems clear that former business owners have higher earnings in comparison with individuals without any experience of owning a business.[12]

Table 1 *here*

Three binary variables capture the workers' education, defined as: i) individuals who have completed compulsory education, which in Portugal, over the period under analysis, corresponds to a nine-year school enrolment; ii) individuals who have completed secondary education, which corresponds to a twelve-year school enrolment; and iii) individuals who have completed tertiary education, which usually corresponds to a five-year university/college degree.

Generally, former business owners are better educated on average than individuals who were always on wage employment. Focusing exclusively on the higher level of education, only a very small percentage of individuals have this degree (3.2 percent) and the proportion of former business owners with tertiary education is twice the same proportion for individuals who were always wage employees (6.4 percent vs. 3.2 percent). Finally, average experience in wage employment of former business owners is higher than for individuals who were never business owners, but former business owners are, on average, older than wage employees.

Firm size is measured using the natural logarithm of the number of employees in the firm. As can be seen in Table 1, the majority of former business owners find employment in smaller firms when compared with wage employees. Table 2 presents the distribution of firms and workers across firm size categories. Micro and small firms (less than 50 employees) represent 92.9 percent of all firms. This group of firms hires 71 percent of former business owners, compared with only 50.2 percent of wage employees.

Table 2 *here*

## 4. Evidence on Job Assignments

Two major objectives of this study are to determine: i) whether former business owners are assigned to higher levels in the firm's hierarchy when they arrive in comparison with other workers of similar characteristics; and ii) whether former business owners progress up the job ladder faster than other workers of comparable characteristics. To do so, it is necessary to analyze the distribution of hierarchical levels within the firm structure. In particular, it is important to be aware of which tasks are demanded of workers within each specific level, as well as which skills are required.[13]

The information available in the data on employee's job assignments (i.e. hierarchies within firms) consists of eight different levels, from level #1 – apprentices – to level #8, which includes the top managers of the firm (which may or may not coincide with the business owner).[14] As we go up the job ladder, task complexity, skill requirements, and the responsibility level increase. Abilities associated with planning, organizing, supervising and coordinating

[12] Hourly wage is calculated by dividing the sum of base wage with regular payments by the number of monthly paid hours, deflated using the *Consumer Price Index*. Overtime payments are not included.

[13] QP micro-data discriminates the hierarchy in the firm as seen in Table A1 in the Annex, which provides a description of the hierarchical levels and the correspondent tasks and skills required by each level.

[14] The hierarchical level called "Apprentices, interns, and trainees" is always used in estimation regressions as the comparison group with each of the other seven levels. The choice of this level to be the omitted dummy variable is due to the fact that it constitutes the first step of the hierarchy.

activities become ever more important. This basically fits the rationale of Mintzberg (1973) in the sense that upper level jobs are usually associated with supervising and managing large groups, coordinating across business units, and strategic planning; while lower level jobs depend more on specialized functional knowledge and performing less complex tasks. The information on wage employees' and former business owners' hierarchical levels is presented in Table 3, disaggregated by firm size classes.

Table 3 *here*

The distribution of hierarchical levels is different for former business owners than wage employees. A striking feature of the data is that the allocation of ex-business owners to top hierarchical levels is exceptionally high when compared with that of individuals who were always wage employees. In particular, nearly 15 percent of former business owners fall into the top manager level, even when former business owners who have remained with the same business after selling it are excluded from the data.[15] Only three percent of individuals who were never business owners are allocated to that top level. Moreover, about 27 percent of ex-business owners in the sample are concentrated in the top three hierarchical levels. These may be considered the 'managerial' levels, i.e. the ones where organizing, supervisory and coordinating tasks are likely to represent the majority of requirements. Only ten percent of other employees are allocated to those levels. The same pattern of job assignment is present across firm size; however, the differences in the top levels between former business owners and wage employees are more obvious in micro and small firms.

Table 4 *here*

It is important to check whether a relationship between the hierarchical level and worker tenure within the firm is identifiable. Table 4 displays the cross-share of tenure across hierarchical levels comparing the former business owners with those individuals who were always wage employees. It is possible to observe that, for the higher hierarchical levels – from highly-skilled professionals to top managers – the proportions at time of entry of former business owners are higher than those of individuals who were always wage employees. As years of tenure increase, we observe the expected movement up the hierarchy for both types of workers, but former business owners are promoted more frequently than the workers who were never business owners. After five years, the share of former business owners who are top managers increases from 11 percent to 17 percent, while the share of workers who were never business owners that are top managers goes from 3 percent to 4 percent.

The relationship between tenure and hierarchical level is independent of the size of the firm given that the results are very similar for the three categories and follow the trends detected earlier on Table 4.[16] Former business owners concentrate in a larger share on the top three hierarchical levels than wage employees and, consequently, the share of wage employees in the non-managerial (i.e. supervisory/coordination) levels is higher than the correspondent share of former business owners.

*4.1 Entry*

[15] All business owners in the sample under analysis have changed firms. This way we exclude possible cases of business owners who sold their firm but stayed on as top managers.
[16] Descriptive tables are available from the authors upon request.

We begin by analyzing the job assignment at entry through the estimation of a (pooled) probit in order to determine if the differences observed between the two types of workers – with and without business ownership experience – are reflected in the estimates on past experience, controlling for the remaining individual attributes and the characteristics of the firm. Table 5 presents the estimation results for job assignment at entry. The dependent binary variable equals one if the worker is assigned to one of the top three hierarchical levels (the managerial levels, where supervisory/coordination tasks dominate) and zero otherwise, at the moment of hiring (that is, when tenure equals zero).

Table 5 *here*

The linear effect of business ownership experience on the probability of assignment to the top three hierarchical levels (13.2 percent) is considerably higher than the corresponding effect of wage employee experience (1.5 percent). The partial effect is more pronounced for medium firms. For larger firms, the magnitude of the coefficients of business ownership experience and wage employee experience is almost the same. The quadratic term does not change this relative magnitude. These results strongly suggest that business ownership experience is more valued at the moment of hiring than prior wage work experience, regardless of the hiring firm's size.[17]

*4.2 Promotions*

In the previous section it became clear that former business owners are more likely to be assigned to higher levels in the firms' hierarchies at the time of hiring than wage employees of comparable characteristics. In this context, one plausible question arises: once entering a firm, do former business owners progress faster up the hierarchy? Table 6 examines this issue by looking at the time to promotion across hierarchical level by firm size class.

Table 6 *here*

Typically, former business owners spend less time at each hierarchical level than individuals who were always wage employees, except for micro and small firms, for the intermediary manager level. It can also be said that, for former business owners, the larger the firm, the shorter the time spent in the same hierarchical level. A former business owner employed by a large firm spends, on average, five years in the supervisor hierarchical level before getting a promotion, while a wage employee in the same circumstances spends more than eight years at the same level. The same is true for lower hierarchical levels and medium-sized firms. For instance, the average time to promotion for a former business owner and for a wage employee who are both non-skilled professionals in a medium-sized firm is, respectively, 3.7 and 6 years.

While for small- and micro-firms the differences are insignificant, in large firms, former business owners take less time to move from intermediary to top manager. These pattern fits into the concept of promotion 'fast tracks' in larger firms: those individuals who are promoted

[17] To further explore these findings, a probit model which disaggregates effects of experience as business owner and experience as wage employee per binary variable equal to one across experience years was estimated. Results (not reported here) are available from the authors upon request. Coefficients associated with former business ownership experience are always significant, and these coefficients are always higher than those for experience as wage employee, regardless of firm size. This is true for all firms and across the three firm size classes under analysis. For instance, an individual with two years of experience as a business owner has a probability of assignment to one of the top three hierarchical levels larger than 40 percent, while an individual with two years of experience as a wage employee only has a probability of assignment to the top three hierarchical levels of about 4 percent, which is a very considerable difference.

sooner are more likely to be promoted sooner again (Baker et al., 1994a; Ariga et al., 1999; and Seltzer and Merrett, 2000).

It is important to check whether the pattern of promotions identified above is particularly significant for the top three hierarchical levels (where supervisory/coordination abilities are likely to be of greater importance). Table 7 presents probit estimates for the probability of being promoted to the top-three hierarchical levels (supervisors, intermediate and top managers) from non-managerial levels. The estimations provide evidence of the differences observed between the partial effect of past experience as former business owner and as wage employee. The dependent binary variable is equal to one if the worker is promoted from non-managerial/supervisory hierarchical levels to the top three levels, and zero otherwise. The estimation results show that one year of past business ownership experience holds a higher effect on the probability of being promoted to the top levels of the hierarchy than one year of past experience as wage employee. As firm size increases, the probability of a former business owner being promoted to a managerial position decreases, but is always superior to the probability of a wage employee being promoted to a managerial position.[18]

Table 7 *here*

## 5. Evidence on Earnings

Individual earnings are compared using hourly wages (while in wage employment) over the period 1995-2003 as the variable of interest.[19] We investigate whether experience as a business owner (including the necessary skills to start a business and the skills acquired during business ownership) has a significant impact on the individuals' labor market earnings while wage employees. Wage equations are defined for all the periods after the reference year, i.e. from 1995-2003, providing a total of over 2.4 billion observations. Years of experience as a business owner and as a wage employee are included as explanatory variables. The coefficients of experience are used to determine the value of the two types of human capital. Other explanatory variables include individual characteristics such as education; tenure; hiring firm characteristics, including size, industry, and administrative region; and also the hierarchical levels to which the workers are assigned.

### *5.1 Empirical Specification*

We specify a panel data model of wage determination as

$$\log(w_{ijt}) = x_{ijt}\beta + z_{ijt}\delta + v_{ijt} \qquad (1)$$

where $i$ indexes individual, $j$ indexes firm, and $t$ indexes time period; $w_{ijt}$ is the hourly wage received by individual $i$ in period $t$ when employed in firm $j$; $x_{ij}$ is a vector of individual

[18] We also examine the relative magnitude of the effects of different types of experience by disaggregating the effects of tenure, experience as business owner, as well as experience as wage employee using dummy variables which range from one year to six or more years. Results (not reported here but available from the authors upon request) show that the probability of being promoted from a non-managerial hierarchical level to a managerial one increases with tenure as well as with firm size. The effect of business ownership experience on the probability of promotion is always higher than the correspondent effect for experience as a wage employee and increases as the years of business ownership experience increase.

[19] The data provide no information with regard to individuals' earnings while in business ownership. As an example, if one individual has a brief experience as a wage employee and, after 1995, he switches into business ownership and remains so in the data set, the model will drop this observation since there is no available information on this individual's earnings after 1995.

characteristics including education (three dummy variables), tenure (and its squared term), years of accumulated experience as a business owner (and its squared term), and years of accumulated experience as a wage-worker (and its squared term); $z_{ij}$ is a vector of characteristics of the firm employing individual $i$, including size, industry, administrative region, and also hierarchical levels; and $v_{ijt}$ is the error term.

This last unobserved part of the model can be decomposed into three components: an individual effect, $\alpha_i$; a firm effect $\gamma_j$ where $j$ indexes the firm/employer; and an idiosyncratic error $u_{it}$. These components define a composite error $v_{ijt} \equiv \alpha_i + \gamma_j + u_{it}$.

The pooled ordinary least squares estimation (hereafter OLS) of equation (1) is consistent if there is no correlation between the regressors and $v_{ijt}$, which implies assuming no correlation between the regressors and each component of the composite error. This assumption is very unlikely to hold as, for example, education is probably correlated with individual unobserved heterogeneity $\alpha_i$ and firm size is probably correlated with firm unobserved heterogeneity $\gamma_j$. Nevertheless, the estimation of equation (1) by pooled OLS is reported to serve as a reference for comparing wage levels across individuals.

Assuming strict exogeneity of the regressors conditional on the unobserved effects,

$$\mathrm{E}\left(u_{ijt} \mid x_{ijt}, z_{ijt}, \alpha_i, \gamma_j\right) = 0 \qquad t = 1,\ldots, T \tag{2}$$

Equation (1) can be estimated by a fixed effects model as

$$\log(w_{ijt}) = x_{ijt}\beta + z_{ijt}\delta + \alpha_i + \gamma_j + u_{ijt} \tag{3}$$

Furthermore, define $m_{ij} \equiv \alpha_i + \gamma_j$ as a composite specific random effect that captures the unobserved part of the worker-firm match. In this way we can estimate equation (3) by a fixed effects estimation model, where the two possible sources of unobserved heterogeneity – the worker and the firm – are controlled for. The definition of $m_{ij}$ is a way of capturing unobserved heterogeneity which is only possible due to the matched employer-employee nature of the dataset.

*5.2 Earnings at Entry*

This section introduces wage equations at the moment of entry. Only workers with one year of tenure are included in the regressions. The advantage of estimating wages at entry is that the results are not affected by tenure, but only by the worker-firm match at the moment of hiring.

Table 8 displays the results for the estimation of wage equations at the hiring year. Of course, this regression only includes one year by worker-firm which is the first year in the firm of newcomers for the period 1995-2003. Results show pooled cross-section regression coefficients. Column 1 explains wages based on individual characteristics, such as education, experience as business owner, and experience as employee,[20] and firm characteristics including size and dummy variables for industrial sector and administrative region. The regression in column 2 includes dummy variables accounting for the assignment of workers to hierarchical levels.

Table 8 *here*

In general, the statistically significant variables associated with the accumulation of human capital have a positive effect on entry wages. Moreover, experience as business owner and experience as wage employee show decreasing returns, as the coefficients on the quadratic terms are generally negative. The introduction of firm characteristics decreases the coefficients

[20] Squared terms are included to control for non-linear coefficients.

associated with individual characteristics. This decrease is expected given the introduction of variables associated with the demand side of the labor market.

When both individual and firm characteristics at the moment of entry are considered, employers seem to value business ownership less than wage employment experience, thus penalizing entrepreneurial experience with a lower wage premium. Former business owners see their wage increased by about 2.3 percent for every additional year of entrepreneurial experience, while every additional year of previous experience as an employee increases wages by 4.7 percent, though the negative quadratic term is higher.[21]

When information about employees' hierarchical levels is included, the linear coefficient of experience as a business owner becomes negative, but not significant. However, we know that former business owners have a higher probability of being assigned to higher hierarchical levels at entry. That is, the evidence seems to show that individuals with business ownership experience capture higher earnings at entry not by a direct reward to that same experience, but rather by being hired to higher places in the hierarchy.

*5.3 Rewards to Business Ownership Experience*

In order to understand the effect of business ownership experience on wages, this section presents wage equations for the period 1995-2003 for all individuals (without any restriction on tenure). To do so, business ownership experience is included in the wage equation using different approaches, namely: quadratic polynomial function and dummy variables for each year of experience in business ownership.

The differences between former business owners and wage employees are a critical issue in the context of this study. It is therefore relevant to understand whether those individuals who had a first experience as business owners over the period 1995-2003 (about 3,000 observations) have some idiosyncratic characteristic which is not captured through human capital variables. One way to deal with this issue is through the introduction of a dummy variable which discriminates those individuals who will become business owners when estimating wages during the period on wage employment prior to their first business ownership experience. If this dummy variable is statistically significant, it means that these individuals *a priori* are different from the remaining individuals, i.e. they possess some unobserved characteristic which awards them higher earnings. Estimation results show that this variable is not significant, which means that future business owners are not initially different from other individuals – only after a spell in business ownership are they recognized as different.[22]

Table 9 presents wage regressions comparing the explanatory power of human capital variables and level dummy variables. Wage levels equations are estimated pooling the yearly data. With this specification we capture the average effects of the regressors. Column 1 presents a pooled OLS estimation controlling for tenure, tenure squared, education, and labor market experience variables, namely experience as business owner, experience as employee and the two correspondent squared terms, and firm characteristics variables (firm size, industry, and administrative region where the firm is located). As with a typical wage regression, the variables associated with the accumulation of human capital have a positive, statistically significant effect on wages. Moreover, tenure, experience as business owner, and experience as employee show decreasing returns, as the coefficients of the quadratic terms are negative.

Table 9 *here*

[21] The two effects only crossover after 50 years of experience.

[22] This regression has been also tested by each year of the time period. The dummy variables for the yet to be business owner were always non-significant. Results are available from the authors upon request.

The regression in column 2 includes also information about employees' hierarchical levels. In this regression, wages decrease by 2.3 percent for every additional year of previous experience as business owner. There is an increase of about 1.6 percent for every additional year of previous experience as an employee.[23] These results show that the increase in wage associated with one more year of experience as a business owner is less than would be achieved if that additional year was spent in wage employment.[24] Therefore, at first glance, evidence seems to confirm the idea that past experience as a business owner may be associated with a penalty, or a stigma of failure. This would, however, be at odds with the results concerning entry levels and promotions.

*5.4 Rewards Accounting for Worker-firm Fixed Effects*

The focus of this section is on fixed effects estimation, given the panel of individuals and firms, which allows us to account for individual and firm unobserved heterogeneity, as presented in equation (3). The unobserved value of the employer-employee match ($m_{ij} \equiv \alpha_i + \gamma_j$) is included in the regression, thus controlling both for firm unobserved heterogeneity ($\gamma_j$) and individual and firm specific effects simultaneously ($\alpha_i + \gamma_j$).

Table 10 shows results for the estimation of wage equations with the worker-firm fixed effects specification. Column 1 and column 2 correspond, respectively, to column 1 and column 2 of Table 9. In this regression, the identification of the coefficients is only possible by the variation of the individual characteristics under consideration within a spell in a specific firm.[25] Focusing on the results of column 2, there is evidence that former business owners who seek wage employment no longer suffer a labor market penalty. On the contrary, employers seem to value business ownership experience higher than wage employment experience, thus rewarding former business owners with a wage premium: individuals see their wage increased by almost 3.3 percent for every additional year of previous experience as business owners, while for every additional year of previous experience as an employee, the partial effect is close to zero. This is an important result, since previous studies of this topic in the literature (who have found generally opposite effects) have taken into account variables concerning tenure and human capital indicators, but left out firm-level variables and, therefore, the specific worker-firm match.[26]

Table 10 *here*

Table 11 shows the same regression of the previous table, but disaggregating the effect of tenure and experience as business owner as well as employee. Results are in line with the empirical evidence presented above, thus strengthening the empirical findings. Overall, results

[23] The differences do not change much if the quadratic terms are considered in the derivation of the partial effects.

[24] As the effect of experience is assumed to be quadratic in the previous estimations and the results can be driven by that assumption, a model was estimated using an indicator variable (0, 1) defined for each year of tenure and experiences – as business owner and wage employee. The results (not reported here but available from the authors upon request) are very close to the ones obtained using the quadratic function.

[25] This specification accounts for specific effects of each worker in each firm (or firms) where the individual worked. Thus, the unit of analysis is pair worker-firm, which means that if one individual, during the period in analysis, were employed in three different firms, then there will be three worker-firm pairs.

[26] Specifications of the wage equation without the firm variables, whether directly or as unobserved heterogeneity, show that the reward to previous business ownership experience increases, while the remaining coefficients generally decrease. It was expected that the coefficients associated with education would decrease when firm characteristics were included in the estimation, but the striking result is the increase in the coefficient of experience as business owner.

show that, after controlling for tenure, level of education, and firm characteristics – size, location and industry – the effect of experience as a business owner on wages is always higher than the effect of experience as employee, leading to a wage premium for entrepreneurship-specific human capital.

Table 11 *here*

The analysis can be extended to the comparison of the estimated worker-firm specific effects. The unobserved heterogeneity is defined as the sum of the worker and the firm specific effects. The way the fixed effects estimator is implemented allows us to interpret this composite unobserved term as the value of the match specific to the employment relationship defined by the pair worker-firm.

The densities of the estimated specific effects (from the second column of Table 10) for former business owners and wage employees are presented in Figure 1 and suggest that there are no remarkable differences across types of individuals. However, the densities by hierarchical levels displayed in Figure 2 present some evidence that for the two top hierarchical levels there are sizable differences between the densities.

Figure 1 and Figure 2 *here*

The distribution of the specific effects of the former business owners shifts to the left compared with that for wage employees. This fact indicates that, at least for the top hierarchical levels, work experience as a business owner is not a substitute for experience as an employee, as it seems to be for the other levels. At the top, the unobserved part of the worker-firm match is partially captured by the specific abilities (human capital) acquired while being a business owner, which means that these abilities signal the worker as suitable to have responsibilities that are specific to those top levels of the hierarchy, which may be associated with organization, supervision, coordination, and planning.

*5.5 Rewards within Hierarchical Levels*

The results achieved so far suggest two main findings:

i. Former business owners enter firms at higher job levels than other employees, and progress faster up the job ladder; and

ii. While the direct effect of business ownership experience on wages does not seem to be higher than the effect of wage employment experience, former business owners capture a wage premium through better career prospects, as they are more concentrated at the top of the hierarchy and hold lower tenure in between promotions.

This suggests that even if former business owners may receive lower wages than individuals occupying the same hierarchical position who have no entrepreneurial experience, the labor market rewards former business owners with higher hierarchical positions, leading to an overall earnings premium.

In order to reconcile the results, we investigate the rewards within hierarchical levels for former business owners and wage employees by analyzing a typical promotion across wage deciles. Baker et al. (1994a) find that, in general, promoted workers move from the top of the wage distribution in the hierarchical level prior to promotion and arrive at the bottom of the wage distribution in the hierarchical level after promotion. However, their results also show that, although the probability of promotion is higher for individuals close to the top of the wage

distribution within their hierarchical level, there are also individuals promoted from the bottom of the wage distribution within a hierarchical level. If the same pattern is observed in the present analysis, it is possible that those individuals who are promoted from the bottom of the within-level wage distribution could be former business owners. These individuals could be promoted faster and from the bottom of the within-level wage distribution because they have task-specific (supervisory/coordination) human capital acquired while in business ownership that is valuable for higher positions in the hierarchy.

We calculate the distribution of pay for workers promoted between job levels in wage deciles before and after promotion. Following Lima and Pereira (2003), in the case of the multi-firm data analyzed in this research, the calculations are carried out by firm, year, hierarchical level, and career event. Table 12 and Figure 1 provide the results for the transition from hierarchical level 4 (the highest non-managerial level) to hierarchical level 5 (the lowest managerial level) as an example.[27]

Table 12 *here*

If more workers are promoted from the top deciles, then the cumulative distribution should have more weight near 100 percent. If workers are promoted to the bottom deciles, then the cumulative distribution should have more weight near zero. The resulting figure would have the plot of the cumulative distribution before promotion under the plot of the cumulative distribution after promotion.

Figure 3 *here*

Figure 3 shows that workers are more concentrated at the top deciles within the hierarchical level before promotion and more concentrated at the bottom deciles within the hierarchical level after promotion, as expected. This can be observed by looking at the relative position of each pair of lines dashed and full for former business owners and employees, respectively. However, comparing the lines across types of workers – with and without entrepreneurial experience – there are clear differences. Firstly, the promoted ex-business owners are more evenly distributed across wage deciles in the level before promotion, as the respective dashed line is above the same line for wage employees who were never business owners. Secondly, in the level after promotion, ex-business owners are more concentrated at the bottom deciles than the other promoted co-workers, as the dashed line (for ex-business owners) is above the full line (for wage employees). Basically, this descriptive evidence shows that former business owners progress faster than the remaining employees – they not need to wait so long in the same hierarchical level in order to be promoted to the next level, but move to lower wage levels in their new position. This is in line with the findings above.

## 6. Concluding Remarks

This study examines the effect of business ownership experience on careers and earnings in firms, compared with wage employment experience. We look at the moment of entry and at career and wage progression within firms for individuals who were business owners for at least one year and for individuals who are never business owners. The results suggest that there are significant differences in career mobility between former business owners and individuals who

[27] Similar results hold for other transitions such as from level 4 to level 6 or level 7 to level 8.

were always wage employees. Former business owners have a greater probability of entering a firm at a high job level than other individuals and progress faster up the job ladder.

We assess whether time spent as a business owner is worth less, earnings-wise, than time spent as a wage employee. The results suggest that, while former business owners are, on average, paid less than other workers in the same hierarchical level, they enter firms at higher job levels and progress faster up the hierarchy, leading to a labor market premium for entrepreneurial experience. The worker-firm match plays a significant role in generating this result, which contradicts previous empirical works on the subject who did not account for firm specific factors. Hence, the labor market seems to reward former entrepreneurs with better career prospects, and not through a direct valuation of their past experience in wage levels.

Results confirm that wage earnings are, to a large extent, determined by job assignment, or hierarchical position (Baker et al., 1994; Gibbons and Waldman, 1999). There is a considerable gain in wage when an employee progresses from one hierarchical level to the one above it, regardless of individual or firm-level characteristics. A particularly interesting result is that, while former business owners progress faster than the remaining employees, they typically move to lower wage levels in their new job level, being also more likely to move up from a wage in the bottom half of the distribution of their previous level. Former business owners then benefit from the features of internal labor markets to earn a premium for their entrepreneurial experience, even though they may not earn more than other workers in the same level of the hierarchy.

A possible explanation for these results is that former business owners may possess a kind of task-specific human capital (Gibbons and Waldman, 2004; 2006). In particular, entrepreneurial experience may allow individuals to accumulate greater experience in organizing, supervising, coordinating and planning activities. Firms may use business ownership experience as an outside signal about the workers' ability (Waldman, 1984; Bernhardt, 1995) to perform in higher hierarchical levels, and thus hire former business owners to higher level jobs. The higher the job level a worker is assigned to, the more likely he is to acquire more supervisory/coordination ability. If this ability is an important requirement for career progress, then former business owners, being more likely to have initially been assigned to a higher job level, should also progress faster up the job ladder. This effect is akin to the cohort effect highlighted by Gibbons and Waldman (2006).

In our background section, we discussed three main determinants leading to specific worker-job matching – human capital, imperfect information, and the scale of operations of the firm – and how these factors affect the importance of an ability that is specifically acquired by those with business ownership experience – that of organizing, coordinating and supervising activities in firms. Results suggest that the first two play the main role in generating a labor market premium for entrepreneurial experience. The fact that former business owners possess an observable characteristic that leads them to be hired to higher job levels (regardless of firm size, although the effect is stronger in small firms) provides them with an important advantage which is amplified by the fact that such assignment increases the amount of task-specific human capital required to progress up the job ladder. Even though wages increase with firm size (a common result in the literature), most former business owners are hired by micro and small firms (about 71 percent, compared with 50.2 percent of wage employees), suggesting that scale of operations is not a central determinant of the labor market premium awarded to former business owners.

Further work is necessary to address some unanswered questions. One issue regards success in business ownership. The present study does not distinguish between former business owners who closed their business due to lack of financial viability, and those who sold or closed successful businesses. Results suggest that the acquisition of the kind of task-specific human capital (or other observable characteristic) required by firms does not seem to depend on entrepreneurial success. However, performance in wage employment may differ between successful and unsuccessful former business owners. Also, we have seen that micro and small

firms hire the majority of former business owners. This suggests that large and medium firms may value entrepreneurial experience less when compared with, for instance, general human capital acquired in formal education. An obvious development would be to examine which industrial and service sectors hire the majority of former business owners, and whether former business owners are hired by firms in the same sectors where they developed their entrepreneurial activity. Such work would shed light on the interaction between business ownership experience and industry-specific experience as sources of human capital.

**References**


Ariga, K., Ohkusa, Y., Brunello, G., 1999. Fast track: is it in the genes? The promotion policy of a large Japanese firm. Journal of Economic Behavior & Organization 38(4), 385–402.

Baker, G., Gibbs, M., Holmstrom, B. 1994a. The internal economics of the firm: evidence from personnel data. Quarterly Journal of Economics 109 (4), 881–919.

Baker, G., Gibbs, M., Holmstrom, B. 1994b. The wage policy of a firm. Quarterly Journal of Economics 109 (4), 921–955.

Beaudry, P., DiNardo, J., 1991. The effects of implicit contracts on the movement of wages over the business cycle: Evidence from microdata. Journal of Political Economy 99(4), 665–688.

Becker, G.S., 1962. Investment in human capital: A theoretical analysis. Journal of Political Economy 70(5), 9–49.

Becker, G.S., 1975. Human capital. 2nd edition. New York, National Bureau of Economic Research (first edition 1964).

Becker, G.S., Murphy, K.M. 1992. The division of labor, coordination costs, and knowledge. Quarterly Journal of Economics 57(4), 1137–1160.

Ben-Porath, Y. 1967. The production of human capital and the life cycle of earnings. Journal of Political Economy 75(4), 352–365.

Bernhardt, D. 1995. Strategic promotion and compensation. Review of Economic Studies 62(2), 315–339.

Blanchard, O., Portugal, P. 2001. What hides behind an unemployment rate: Comparing Portuguese and U.S. labor markets. American Economic Review 91(1), 187–207.

Bruce, D., Schuetze, H.J. 2004. The labor market consequences of experience in self-employment. Labour Economics 11(5), 575–598.

Cabral, L., Mata, J. 2003. On the evolution of the firm size distribution: Facts and theory. American Economic Review 93(4), 1075–1090.

Calvo, G.A., Wellisz, S. 1979. Hierarchy, ability, and income distribution. Journal of Political Economy 87(5), 991–1010.

Doeringer, P.B., Piore, M.J. 1971. Internal labor markets and manpower analysis. Lexington, Heath Lexington Books.

Dohmen, T.J., Kriechel, B., Pfann, G.A. 2004. Monkey Bars and Ladders: The Importance of Lateral and Vertical Job Mobility in Internal Labor Market Careers. Journal of Population Economics 17(2), 193–228.

Evans, D.S., Leighton, L.S. 1989. Some empirical aspects of entrepreneurship. American Economic Review 79(3), 519–535.

Ferber, M.A., Waldfogel, J. 1998. The long-term consequences of nontraditional employment. Monthly Labor Review 121(5), 3–12.

Gibbons, R., Waldman, M. 1999. A theory of wage and promotion dynamics inside firms. Quarterly Journal of Economics 114(4), 1321–1358.

Gibbons, R., Waldman, M. 2004. Task-specific human capital. American Economic Review 94(2), 203–207.

Gibbons, R., Waldman, M. 2006. Enriching a theory of wage and promotion dynamics inside firms. Journal of Labor Economics 24(1), 59–107.

Gimeno, J., Folta, T.B., Cooper, A.C., Woo, C.Y. 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. Administrative Science Quarterly 42(4), 750–783.
Hamilton, B.H. 2000. Does entrepreneurship pay? An empirical analysis of the returns to self-employment. Journal of Political Economy 18(3), 604–631.
Harris, M., Holmstrom, B. 1982. A theory of wage dynamics. Review of Economic Studies 49(3), 315–333.
Holmstrom, B. 1979. Moral hazard and observability. Bell Journal of Economics 9(1), 74–91.
Hyytinen, A., Rouvinen, P. 2008. The labour market consequences of self-employment spells: European evidence. Labour Economics 15(2), 246–271.
Jovanovic, B. 1979. Job matching and the theory of turnover. Journal of Political Economy 87(5), 972–990.
Jovanovic, B. 1982. Selection and the evolution of industry. Econometrica 50(3), 649–670.
Jovanovic, B. 1984. Matching, turnover, and unemployment. Journal of Political Economy 92(1), 108–122.
Kahn, L.B. 2008. The long-term labor market consequences of graduating from college in a bad economy. Unpublished manuscript, Yale University.
Kaiser, U., Malchow-Møller, N. 2008. Is self-employment really a bad experience? The effects of previous self-employment on subsequent wage employment. Unpublished manuscript, Department of Economics, University of Copenhagen.
Kaldor, N. 1934. The equilibrium of the firm. Economic Journal, 44, 60–76.
Lazear, E.P., Oyer, P. 2004. Internal and External Labor Markets: A Personnel Economics Approach. Labour Economics 11, 527–544.
Lin, M.-J. 2005. Opening the Black Box: The Internal Labor Markets of Company X. Industrial Relations 44(4), 659–706.
Lucas, R.E. 1978. On the size distribution of business firms. Bell Journal of Economics 9(2), 508–523.
Marshall, A. 1930. Principles of Economics. London, Macmillan and Co. (first edition 1890).
Mata, J., Machado, J.A.F. 1996. Firm Start-Up Size: A Conditional Quantile Approach, European Economic Review, 40(6), 1305–1323.
Mata, J., Portugal, P. 2002. The survival of new domestic and foreign-owned firms. Strategic Management Journal 23(4), 323–343.
Mayer, T. 1960. The distribution of ability and earnings. Review of Economics and Statistics 2(2), 189–195.
McGrath, R.G. 1999. Falling forward: Real options reasoning and entrepreneurial failure. The Academy of Management Review 24(1), 13–30.
Mincer, J. 1974. Schooling, experience, and earnings. New York, Columbia University Press.
Mintzberg, H. 1973. The nature of managerial work. New York, Harper & Row.
Oreopoulos, P., Wachter, T. von, Heisz, A. 2008. The short- and long-term career effects of graduating in a recession: Hysteresis and heterogeneity in the market for college graduates. IZA Discussion Paper No. 3578.
Oyer, Paul. 2006. Initial labor market conditions and long-term outcomes for economists. Journal of Economic Perspectives 20(3), 143–160.
Rees, H., Shah, A. 1986. An empirical analysis of self-employment in the U.K. Journal of Applied Econometrics 1(1), 101–108.
Rosen, S. 1981. The economics of superstars. American Economic Review 71(5), 845–858.
Rosenbaum, J.E. 1984. Career mobility in a corporate hierarchy. London, Academic Press.
Roy, A.D. 1951. Some thoughts on the distribution of earnings. Oxford Economic Papers 3(2), 235–246.
Sattinger, M. 1993. Assignment models of the distribution of earnings. Journal of Economic Literature 31(2), 831–880.
Say, J.-B. 1971. A treatise on political economy or the production, distribution and consumption of wealth. New York, A.M. Kelley Publishers (first edition 1803).
Seltzer, A., Merrett, D. 2000. Personnel policies at the Union Bank of Australia: Evidence from the 1888-1900 entry cohorts. Journal of Labor Economics 18(4), 573–613.

Simon, H.A. 1957. The compensation of executives. Sociometry 20, 32–35.
Spence, A.M. 1973. Job market signaling. Quarterly Journal of Economics 87(3), 355–374.
Spence, A.M. 1975. The economics of internal organization: An introduction, Bell Journal of Economics 6(1), 163–172.
Spurr, S.J. 1987. How the market solves an assignment problem: The matching of lawyers with legal claims. Journal of Labor Economics 5(4), 502–532.
Stiglitz, J. 1975. The theory of screening education and the distribution of income. American Economic Review 65(3), 283–300.
Taylor, M.P. 1996. Earnings, independence or unemployment: Why become self-employed? Oxford Bulletin of Economics and Statistics 58(2), 253–266.
Tinbergen, J. 1951. Some remarks on the distribution of labour incomes. International Economic Papers 1, 195–207.
Topel, R.H. 1991. Specific capital, mobility, and wages: Wages rise with job seniority. Journal of Political Economy 99, 145–176.
Varejão, J., Portugal, P. 2007. Employment dynamics and the structure of labor adjustment costs. Journal of Labor Economics 25, 137–165.
Waldman, M. 1984. Job assignments, signaling, and efficiency. Rand Journal of Economics 15(2), 255–267.
Waldman, M. 2008. Theory and evidence in internal labor markets. In: Gibbons, R., Roberts, J. (Eds.), Handbook of Organizational Economics, Princeton, Princeton University Press (forthcoming 2008).
Weiss, A. 1995. Human capital vs. signalling explanations of wages. Journal of Economic Perspectives 9(4), 133–154.
Westhead, P., Wright, M. 1998. Novice, portfolio and serial founders: Are they different? Journal of Business Venturing 13(3): 173–204.
Williams, D.R. 2000. Consequences of self-employment for women and men in the United States. Labour Economics 7(5), 665–687.
Williams, D.R. 2003. Returns to education and experience in self-employment: Evidence from Germany, Journal of Applied Social Science Studies 123, 139–150.
Williams, D.R. 2004. Youth self employment: Its nature and consequences. Small Business Economics 23(4), 323–336.
Williamson, O.E. 1967. Hierarchical control and optimum firm size. Journal of Political Economy 75(2), 123–138.

## Annex

*Table 1 Descriptive statistics, 1995-2003*

| Variables | All workers | Former business owners | Wage employees |
|---|---|---|---|
| Wage per hour (logarithm) | 1.389 | 1.439 | 1.388 |
| | [0.546] | [0.606] | [0.545] |
| Age | 30.176 | 33.073 | 30.138 |
| | [5.336] | [4.459] | [5.336] |
| Tenure | 7.021 | 5.913 | 7.035 |
| | [5.108] | [5.750] | [5.111] |
| 9-years education | 0.166 | 0.187 | 0.166 |
| | [0.372] | [0.390] | [0.372] |
| Secondary education | 0.167 | 0.191 | 0.166 |
| | [0.373] | [0.393] | [0.372] |
| College education | 0.032 | 0.064 | 0.032 |
| | [0.177] | [0.244] | [0.176] |
| Experience as business owner | 1.032 | 3.495 | -- |
| | [0.380] | [2.269] | -- |
| Experience as employee | 12.134 | 13.074 | 12.122 |
| | [6.318] | [6.488] | [6.315] |
| Firm size (logarithm) | 4.205 | 3.164 | 4.218 |
| | [2.226] | [1.871] | [2.227] |
| N | 2,414,623 | 30,904 | 2,383,719 |

*Notes*: Standard deviation between brackets underneath the mean. Hourly wage is calculated by dividing the sum of base wage with regular payments by the number of monthly paid hours, deflated using the *Consumer Price Index*. Tenure, experience as business owner, and potential experience as employee are measured in years. 9-years of education, secondary education, and college education are defined as dummy variables.

*Table 2 Firms and workers, 1995-2003*

| Firm size class | Firms | | Workers | | Former business owners | | Wage employees | |
|---|---|---|---|---|---|---|---|---|
| Micro & small firms | 157,203 | 92.9% | 1,201,906 | 50.8% | 21,947 | 71.0% | 1,195,986 | 50.2% |
| Medium firms | 11,434 | 6.8% | 728,104 | 30.8% | 6,651 | 21.5% | 736,647 | 30.9% |
| Large firms | 552 | 0.3% | 436,181 | 18.4% | 2,306 | 7.5% | 451,086 | 18.9% |
| Total | 169,189 | 100% | 2,366,191 | 100% | 30,904 | 100% | 2,383,719 | 100% |

*Notes:* Firm size is divided into three classes: micro and small firms, medium firms, and large firms. Micro and small firms are those firms with less than 50 employees. Medium firms are those firms between 50 and 499 employees. Large firms are those firms with more than or equal to 500 employees.

*Table 3 Hierarchical levels and firm size, 1995-2003*

| Hierarchical level | Firm size (number of employees) | | | |
|---|---|---|---|---|
| | All | < 50 | [50-500[ | ≥ 500 |
| Former business owners | | | | |
| 1: apprentices, interns, trainees | 0.02 | 0.03 | 0.02 | 0.01 |
| 2: non-skilled professionals | 0.06 | 0.05 | 0.07 | 0.15 |
| 3: semi-skilled professionals | 0.08 | 0.08 | 0.10 | 0.10 |
| 4: skilled professionals | 0.50 | 0.52 | 0.44 | 0.43 |
| 5: higher-skilled professionals | 0.07 | 0.06 | 0.08 | 0.08 |
| 6: supervisors and team leaders | 0.06 | 0.05 | 0.07 | 0.07 |
| 7: intermediary managers | 0.06 | 0.06 | 0.06 | 0.06 |
| 8: top managers | 0.15 | 0.15 | 0.16 | 0.10 |
| Wage employees | | | | |
| 1: apprentices, interns, trainees | 0.06 | 0.09 | 0.04 | 0.01 |
| 2: non-skilled professionals | 0.09 | 0.09 | 0.09 | 0.10 |
| 3: semi-skilled professionals | 0.14 | 0.11 | 0.17 | 0.15 |
| 4: skilled professionals | 0.54 | 0.59 | 0.50 | 0.47 |
| 5: higher-skilled professionals | 0.07 | 0.05 | 0.06 | 0.11 |
| 6: supervisors and team leaders | 0.04 | 0.03 | 0.06 | 0.06 |
| 7: intermediary managers | 0.03 | 0.02 | 0.04 | 0.05 |
| 8: top managers | 0.03 | 0.02 | 0.04 | 0.05 |

*Notes*: Each column presents the distribution of workers across hierarchical levels for former business owners and the remaining employees (the 'wage employees') calculated at different firm sizes.

*Table 4 Hierarchical level and tenure, 1995-2003*

| Hierarchical level | Tenure | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 |
| Former business owners | | | | | | |
| 1: apprentices, interns and trainees | 0.04 | 0.03 | 0.03 | 0.02 | 0.02 | 0.03 |
| 2: non-skilled professionals | 0.09 | 0.07 | 0.05 | 0.05 | 0.05 | 0.04 |
| 3: semi-skilled professionals | 0.08 | 0.09 | 0.08 | 0.08 | 0.07 | 0.08 |
| 4: skilled professionals | 0.51 | 0.52 | 0.50 | 0.50 | 0.49 | 0.48 |
| 5: higher-skilled professionals | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.07 |
| 6: supervisors and team leaders | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| 7: intermediary managers | 0.05 | 0.05 | 0.06 | 0.07 | 0.08 | 0.08 |
| 8: top managers | 0.11 | 0.12 | 0.14 | 0.15 | 0.16 | 0.17 |
| Wage employees | | | | | | |
| 1: apprentices, interns and trainees | 0.10 | 0.11 | 0.10 | 0.09 | 0.07 | 0.06 |
| 2: non-skilled professionals | 0.16 | 0.13 | 0.11 | 0.10 | 0.09 | 0.08 |
| 3: semi-skilled professionals | 0.12 | 0.12 | 0.13 | 0.14 | 0.14 | 0.15 |
| 4: skilled professionals | 0.50 | 0.50 | 0.51 | 0.52 | 0.53 | 0.54 |
| 5: higher-skilled professionals | 0.04 | 0.05 | 0.05 | 0.06 | 0.06 | 0.06 |
| 6: supervisors and team leaders | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 |
| 7: intermediary managers | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 8: top managers | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 |

*Notes*: Each column presents the distribution of workers across hierarchical levels for former business owners and the remaining employees (the 'wage employees') calculated at tenure between zero years (the employee's entry year) and five years.

*Table 5 Probit for job assignment at entry (marginal effects)*

| Variables | All firms | Micro and small firms | Medium firms | Large firms |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| 9-years education | 0.0643*** | 0.0701*** | 0.0639*** | 0.0278*** |
| | [0.0022] | [0.0029] | [0.0042] | [0.0053] |
| Secondary education | 0.1963*** | 0.1968*** | 0.2151*** | 0.1383*** |
| | [0.0033] | [0.0044] | [0.0063] | [0.0073] |
| College education | 0.7956*** | 0.7707*** | 0.8311*** | 0.7724*** |
| | [0.0038] | [0.0061] | [0.0055] | [0.0114] |
| Experience as business owner | 0.1315*** | 0.1497*** | 0.0285*** | 0.0146** |
| | [0.0031] | [0.0037] | [0.0043] | [0.0065] |
| Experience as business owner$^2$ x $10^{-2}$ | -0.7982*** | -0.9139*** | -0.1057** | -0.0379 |
| | [0.0416] | [0.0486] | [0.0516] | [0.0678] |
| Experience as employee | 0.0148*** | 0.0138*** | 0.0150*** | 0.0146*** |
| | [0.0004] | [0.0005] | [0.0007] | [0.0010] |
| Experience as employee$^2$ x $10^{-2}$ | -0.0184*** | -0.0193*** | -0.0132*** | -0.0128*** |
| | [0.0011] | [0.0015] | [0.0020] | [0.0028] |
| Firm size (log) | -0.0077*** | -0.0206*** | 0.0026* | -0.0143*** |
| | [0.0003] | [0.0008] | [0.0016] | [0.0020] |
| Year dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| Region dummies | Yes | Yes | Yes | Yes |
| Observations | 322,132 | 198,585 | 86,128 | 37,416 |
| Wald $\chi$-squared | 31408.50 | 18851.10 | 10457.21 | 4629.46 |
| Pseudo R-squared | 0.244 | 0.282 | 0.231 | 0.213 |

*Notes*: Dependent binary variable equals one if the worker is assigned to one of the top three hierarchical levels, and zero otherwise, at the moment of hiring. *Experience as business owner*, and *experience as employee* are measured in years. *9-years of education*, *secondary education*, and *college education* are defined as dummy variables. Industry dummies are defined for in two-letter ISIC classification. Firm size is divided into three classes: micro and small firms (less than 50 employees); medium firms (between 50 and 499 employees); large firms (more than or equal to 500 employees). Standard errors are in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%.

*Table 6 Average time to promotion by hierarchical level*

| Hierarchical level before promotion | All workers | Former business owners | Wage employees |
|---|---|---|---|
| All firms | | | |
| 1: apprentices, interns, and trainees | 4.87 | 5.04 | 4.87 |
| 2: non-skilled professionals | 5.89 | 5.04 | 5.89 |
| 3: semi-skilled professionals | 6.99 | 6.32 | 7.00 |
| 4: skilled professionals | 7.70 | 6.38 | 7.72 |
| 5: higher-skilled professionals | 7.21 | 6.09 | 7.24 |
| 6: supervisors and team leaders | 7.96 | 6.18 | 7.99 |
| 7: intermediary managers | 6.04 | 6.41 | 6.02 |
| Micro and small firms | | | |
| 1: apprentices, interns, and trainees | 5.19 | 5.63 | 5.19 |
| 2: non-skilled professionals | 5.77 | 5.71 | 5.77 |
| 3: semi-skilled professionals | 6.58 | 6.64 | 6.58 |
| 4: skilled professionals | 7.02 | 6.26 | 7.04 |
| 5: higher-skilled professionals | 6.18 | 6.25 | 6.18 |
| 6: supervisors and team leaders | 7.57 | 6.35 | 7.63 |
| 7: intermediary managers | 5.50 | 6.48 | 5.37 |
| Medium firms | | | |
| 1: apprentices, interns, and trainees | 4.41 | 3.08 | 4.41 |
| 2: non-skilled professionals | 5.99 | 3.69 | 6.01 |
| 3: semi-skilled professionals | 7.53 | 5.86 | 7.54 |
| 4: skilled professionals | 8.13 | 7.24 | 8.14 |
| 5: higher-skilled professionals | 7.08 | 5.29 | 7.10 |
| 6: supervisors and team leaders | 8.19 | 5.85 | 8.21 |
| 7: intermediary managers | 5.92 | 6.51 | 5.90 |
| Large firms | | | |
| 1: apprentices, interns, and trainees | 3.51 | 1.88 | 3.52 |
| 2: non-skilled professionals | 6.03 | 4.18 | 6.04 |
| 3: semi-skilled professionals | 7.05 | 4.89 | 7.05 |
| 4: skilled professionals | 8.21 | 5.41 | 8.23 |
| 5: higher-skilled professionals | 8.46 | 6.77 | 8.47 |
| 6: supervisors and team leaders | 8.12 | 5.00 | 8.12 |
| 7: intermediary managers | 7.11 | 4.27 | 7.14 |

*Notes*: Firm size is divided into three classes: micro and small firms (less than 50 employees); medium firms (between 50 and 499 employees); large firms (more than or equal to 500 employees).

*Table 7 Probit for promotion (marginal effects)*

| Variables | All firms | Micro and small firms | Medium firms | Large firms |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Tenure | 0.0012*** | 0.0007*** | 0.0013*** | 0.0024*** |
| | [0.0001] | [0.0001] | [0.0001] | [0.0002] |
| Tenure$^2$ x $10^{-2}$ | -0.0017*** | -0.0003 | -0.0020*** | -0.0064*** |
| | [0.0004] | [0.0004] | [0.0007] | [0.0010] |
| 9-years education | 0.0168*** | 0.0152*** | 0.0177*** | 0.0165*** |
| | [0.0005] | [0.0007] | [0.0010] | [0.0011] |
| Secondary education | 0.0428*** | 0.0365*** | 0.0459*** | 0.0417*** |
| | [0.0008] | [0.0011] | [0.0015] | [0.0017] |
| College education | 0.2352*** | 0.2449*** | 0.2956*** | 0.1798*** |
| | [0.0055] | [0.0101] | [0.0103] | [0.0093] |
| Experience as business owner | 0.0185*** | 0.0179*** | 0.0056*** | 0.0070** |
| | [0.0006] | [0.0006] | [0.0016] | [0.0028] |
| Experience as business owner$^2$ x $10^{-2}$ | -0.1070*** | -0.1063*** | -0.0461* | -0.0674 |
| | [0.0082] | [0.0082] | [0.0250] | [0.0471] |
| Experience as employee | 0.0009*** | 0.0009*** | 0.0008*** | 0.0003* |
| | [0.0001] | [0.0001] | [0.0001] | [0.0002] |
| Experience as employee$^2$ x $10^{-2}$ | 0.0000 | -0.0011*** | 0.0009* | 0.0048*** |
| | [0.0002] | [0.0003] | [0.0005] | [0.0007] |
| Firm size (log) | 0.0001 | 0.0018*** | -0.0012*** | -0.0017*** |
| | [0.0001] | [0.0002] | [0.0003] | [0.0003] |
| Year dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| Region dummies | Yes | Yes | Yes | Yes |
| Observations | 1,418,933 | 729,745 | 426,565 | 262,549 |
| Wald $\chi$-squared | 22819.08 | 12885.67 | 7877.73 | 4167.22 |
| Pseudo R-squared | 0.085 | 0.113 | 0.084 | 0.068 |

*Notes*: Dependent binary variable is equal to one if the worker is promoted from non-supervision hierarchical level to supervision hierarchical level, and zero otherwise. *Tenure, experience as business owner*, and *experience as employee* are measured in years. *9-years of education*, *secondary education*, and *college education* are defined as dummy variables. Industry dummies are defined for in two-letter ISIC classification. Firm size is divided into three classes: micro and small firms (less than 50 employees); medium firms (between 50 and 499 employees); large firms (more than or equal to 500 employees). Standard errors are in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%.

*Table 8 Wage equations at entry – pooled OLS*

| Variables | (1) | (2) |
|---|---|---|
| 9-years education | 0.1286*** | 0.0752*** |
| | [0.0022] | [0.0020] |
| Secondary education | 0.3565*** | 0.1948*** |
| | [0.0031] | [0.0028] |
| College education | 1.1500*** | 0.5197*** |
| | [0.0071] | [0.0076] |
| Experience as business owner | 0.0225*** | -0.0042 |
| | [0.0040] | [0.0034] |
| Experience as business owner$^2$ x $10^{-2}$ | -0.0587 | 0.0091 |
| | [0.0486] | [0.0393] |
| Experience as employee | 0.0467*** | 0.0269*** |
| | [0.0006] | [0.0005] |
| Experience as employee$^2$ x $10^{-2}$ | -0.0872*** | -0.0531*** |
| | [0.0017] | [0.0015] |
| Firm size (log) | 0.0436*** | 0.0497*** |
| | [0.0005] | [0.0004] |
| Hierarchical level | | |
| 2: non-skilled professionals | | 0.0134*** |
| | | [0.0025] |
| 3: semi-skilled professionals | | 0.1042*** |
| | | [0.0026] |
| 4: skilled professionals | | 0.2215*** |
| | | [0.0022] |
| 5: higher-skilled professionals | | 0.5016*** |
| | | [0.0049] |
| 6: supervisors and team leaders | | 0.5101*** |
| | | [0.0060] |
| 7: intermediary managers | | 0.7548*** |
| | | [0.0073] |
| 8: top managers | | 0.9877*** |
| | | [0.0084] |
| Intercept | | 0.3495*** |
| | | [0.0071] |
| Year dummies | Yes | Yes |
| Industry dummies | Yes | Yes |
| Region dummies | Yes | Yes |
| Observations | 295,408 | 287,772 |
| F test | 2404.73 | 3418.18 |
| R-squared | 0.375 | 0.490 |

*Notes*: Dependent variable is the logarithm of hourly wage in the year of hiring. *Experience as business owner*, and *experience as employee* are measured in years. *9-years of education*, *secondary education*, and *college education* are defined as dummy variables. Industry dummies are defined for in two-letter ISIC classification. Apprentices (level 1) are the comparison group in the hierarchical level dummies. Robust standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.

*Table 9 Wage equations – pooled OLS, 1995-2003*

| Variables | (1) | (2) |
|---|---|---|
| Tenure | 0.0319*** | 0.0186*** |
| | [0.0002] | [0.0002] |
| Tenure$^2$ x $10^{-2}$ | -0.0475*** | -0.0274*** |
| | [0.0012] | [0.0011] |
| 9-years education | 0.1754*** | 0.1137*** |
| | [0.0014] | [0.0012] |
| Secondary education | 0.4059*** | 0.2435*** |
| | [0.0019] | [0.0016] |
| College education | 1.1403*** | 0.5421*** |
| | [0.0037] | [0.0035] |
| Experience as business owner | 0.0311*** | -0.0226*** |
| | [0.0029] | [0.0026] |
| Experience as business owner$^2$ x $10^{-2}$ | -0.0888** | 0.1925*** |
| | [0.0367] | [0.0315] |
| Experience as employee | 0.0254*** | 0.0162*** |
| | [0.0003] | [0.0002] |
| Experience as employee$^2$ x $10^{-2}$ | -0.0205*** | -0.0194*** |
| | [0.0010] | [0.0008] |
| Firm size (log) | 0.0589*** | 0.0572*** |
| | [0.0003] | [0.0002] |
| Hierarchical level | | |
| 2: non-skilled professionals | | 0.0028* |
| | | [0.0015] |
| 3: semi-skilled professionals | | 0.1055*** |
| | | [0.0014] |
| 4: skilled professionals | | 0.2088*** |
| | | [0.0013] |
| 5: higher-skilled professionals | | 0.4643*** |
| | | [0.0023] |
| 6: supervisors and team leaders | | 0.4733*** |
| | | [0.0025] |
| 7: intermediary managers | | 0.7282*** |
| | | [0.0033] |
| 8: top managers | | 0.9741*** |
| | | [0.0038] |
| Intercept | 0.2933*** | 0.3739*** |
| | [0.0045] | [0.0039] |
| Year dummies | Yes | Yes |
| Industry dummies | Yes | Yes |
| Region dummies | Yes | Yes |
| Observations | 2,414,602 | 2,366,191 |
| F test | 14158.56 | 19659.73 |
| R-squared | 0.514 | 0.613 |

*Notes*: Dependent variable is the logarithm of hourly wage. *Experience as business owner*, and *experience as employee* are measured in years. *9-years of education*, *secondary education*, and *college education* are defined as dummy variables. Industry dummies are defined for in two-letter ISIC classification. Apprentices (level 1) are the comparison group in the hierarchical level dummies. Robust standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.

*Table 10 Wage equations – worker-firm fixed effects, 1995-2003*

| Variables | (1) | (2) |
|---|---|---|
| Tenure | 0.0155*** | 0.0117*** |
| | [0.0028] | [0.0027] |
| Tenure$^2$ x $10^{-2}$ | -0.0473*** | -0.0409*** |
| | [0.0010] | [0.0010] |
| 9-years education | -0.0011 | -0.0016 |
| | [0.0019] | [0.0019] |
| Secondary education | 0.0017 | 0.0017 |
| | [0.0029] | [0.0029] |
| College education | 0.0394*** | 0.0350*** |
| | [0.0049] | [0.0049] |
| Experience as business owner | 0.0405*** | 0.0325*** |
| | [0.0116] | [0.0123] |
| Experience as business owner$^2$ x $10^{-2}$ | -0.0648 | 0.0986 |
| | [0.2608] | [0.3044] |
| Experience as employee | -0.0046*** | -0.0043*** |
| | [0.0005] | [0.0005] |
| Experience as employee$^2$ x $10^{-2}$ | 0.0164*** | 0.0145*** |
| | [0.0013] | [0.0014] |
| Firm size (log) | 0.0359*** | 0.0336*** |
| | [0.0009] | [0.0009] |
| Hierarchical level | | |
| 2: non-skilled professionals | | 0.0432*** |
| | | [0.0018] |
| 3: semi-skilled professionals | | 0.0696*** |
| | | [0.0015] |
| 4: skilled professionals | | 0.0957*** |
| | | [0.0014] |
| 5: higher-skilled professionals | | 0.1336*** |
| | | [0.0019] |
| 6: supervisors and team leaders | | 0.1718*** |
| | | [0.0022] |
| 7: intermediary managers | | 0.1756*** |
| | | [0.0024] |
| 8: top managers | | 0.2198*** |
| | | [0.0030] |
| Intercept | 1.0824*** | 1.0173*** |
| | [0.0129] | [0.0122] |
| Year dummies | Yes | Yes |
| Industry dummies | Yes | Yes |
| Region dummies | Yes | Yes |
| Observations | 2,414,602 | 2,366,191 |
| (number of worker-firm) | (757,081) | (748,257) |
| F test | 4141.88 | 3790.7 |
| R-squared | 0.210 | 0.219 |

*Notes*: See notes of previous table.

*Table 11 Wage equations – worker-firm fixed effects, 1995-2003 'disaggregated'*

| Variables (dummies) | 1 year | 2 years | 3 years | 4 years | 5 years | ≥6 years |
|---|---|---|---|---|---|---|
| (1) | | | | | | |
| Tenure | 0.0081*** | 0.0205*** | 0.0329*** | 0.0429*** | 0.0502*** | 0.0611*** |
| | [0.0008] | [0.0009] | [0.0010] | [0.0011] | [0.0012] | [0.0014] |
| Experience as business | 0.0407*** | 0.1054*** | 0.1847*** | 0.1628*** | 0.2217*** | 0.3789*** |
| owner | [0.0132] | [0.0240] | [0.0411] | [0.0523] | [0.0637] | [0.0819] |
| Experience as employee | -0.0062 | -0.0071 | -0.0126*** | -0.0175*** | -0.0173*** | -0.0179*** |
| | [0.0055] | [0.0049] | [0.0043] | [0.0048] | [0.0045] | [0.0044] |
| Observations | 2,442,084 | | | | | |
| (number of worker-firm) | (761,672) | | | | | |
| F test | 3427.66 | | | | | |
| R-squared | 0.211 | | | | | |
| (2) | | | | | | |
| Tenure | 0.0077*** | 0.0181*** | 0.0289*** | 0.0376*** | 0.0437*** | 0.0535*** |
| | [0.0008] | [0.0009] | [0.0010] | [0.0011] | [0.0012] | [0.0014] |
| Experience as business | 0.0363*** | 0.0782*** | 0.1893*** | 0.1534*** | 0.2291*** | 0.3763*** |
| owner | [0.0127] | [0.0232] | [0.0413] | [0.0517] | [0.0636] | [0.0879] |
| Experience as employee | -0.0061 | -0.0059 | -0.0107** | -0.0160*** | -0.0147*** | -0.0164*** |
| | [0.0054] | [0.0048] | [0.0042] | [0.0047] | [0.0045] | [0.0043] |
| Observations | 2,393,030 | | | | | |
| (number of worker-firm) | (752,845) | | | | | |
| F test | 3210.21 | | | | | |
| R-squared | 0.221 | | | | | |

*Notes*: Dependent variable is the logarithm of hourly wage. *Tenure*, *experience as business owner,* and *experience as employee* are defined as dummy variables ranging from one year to six or more years. All other variables used on the previous estimations are omitted (see previous table). Robust standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.

*Table 12 Distribution of pay for workers promoted between job levels in wage deciles before and after promotion – from level 4 to level 5*

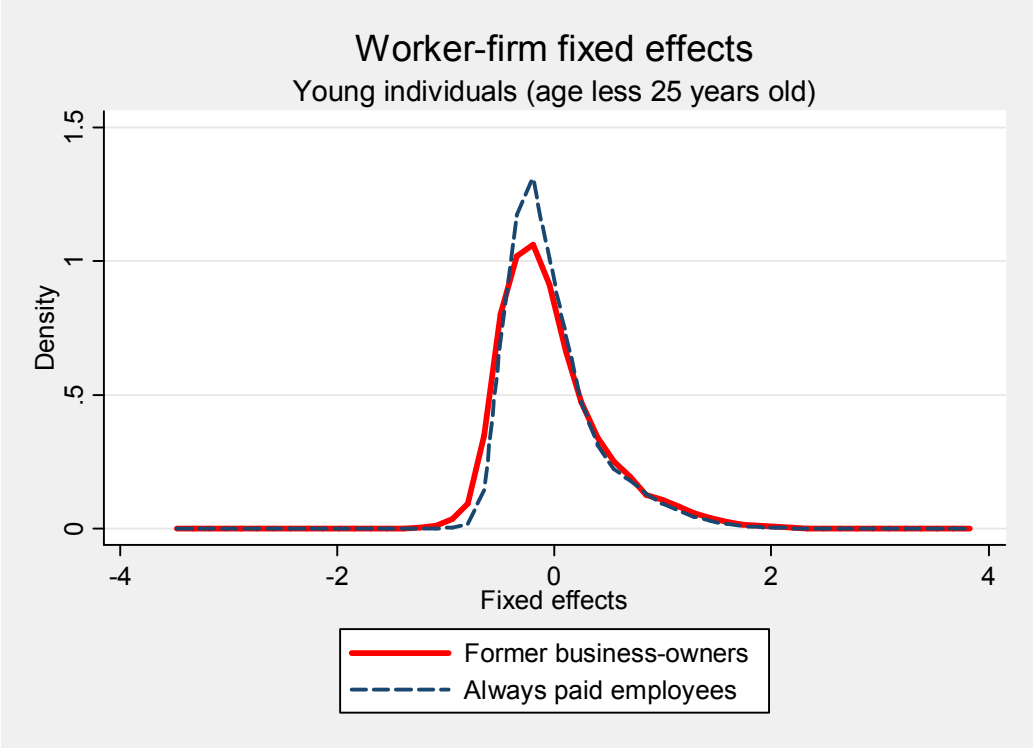
| | Percentage of workers in each wage decile | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N | Bottom | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Top | Total |
| Former business owners | | | | | | | | | | | |
| Promotion from Level 4 – decile before promotion | | | | | | | | | | | |
| 445 | 12.4 | 7.6 | 7.9 | 9.0 | 8.5 | 9.7 | 8.3 | 10.6 | 12.1 | 13.9 | 100 |
| Promotion to Level 5 – decile after promotion | | | | | | | | | | | |
| 378 | 31.2 | 16.4 | 8.5 | 7.1 | 9.3 | 7.1 | 8.2 | 5.0 | 3.4 | 3.7 | 100 |
| Wage employees | | | | | | | | | | | |
| Promotion from Level 4 – decile before promotion | | | | | | | | | | | |
| 28,761 | 6.6 | 5.8 | 5.8 | 6.5 | 7.1 | 8.6 | 9.7 | 12.3 | 16.4 | 21.2 | 100 |
| Promotion to Level 5 – decile after promotion | | | | | | | | | | | |
| 28,619 | 16.0 | 12.7 | 11.2 | 11.5 | 11.4 | 9.9 | 8.6 | 7.4 | 6.6 | 4.6 | 100 |

*Notes*: The cells present the percentage of individuals in each wage decile before and after promotion from Level 4 to Level 5. The deciles are calculated for the wage distribution within each hierarchical level.

*Table A1 Hierarchical levels*

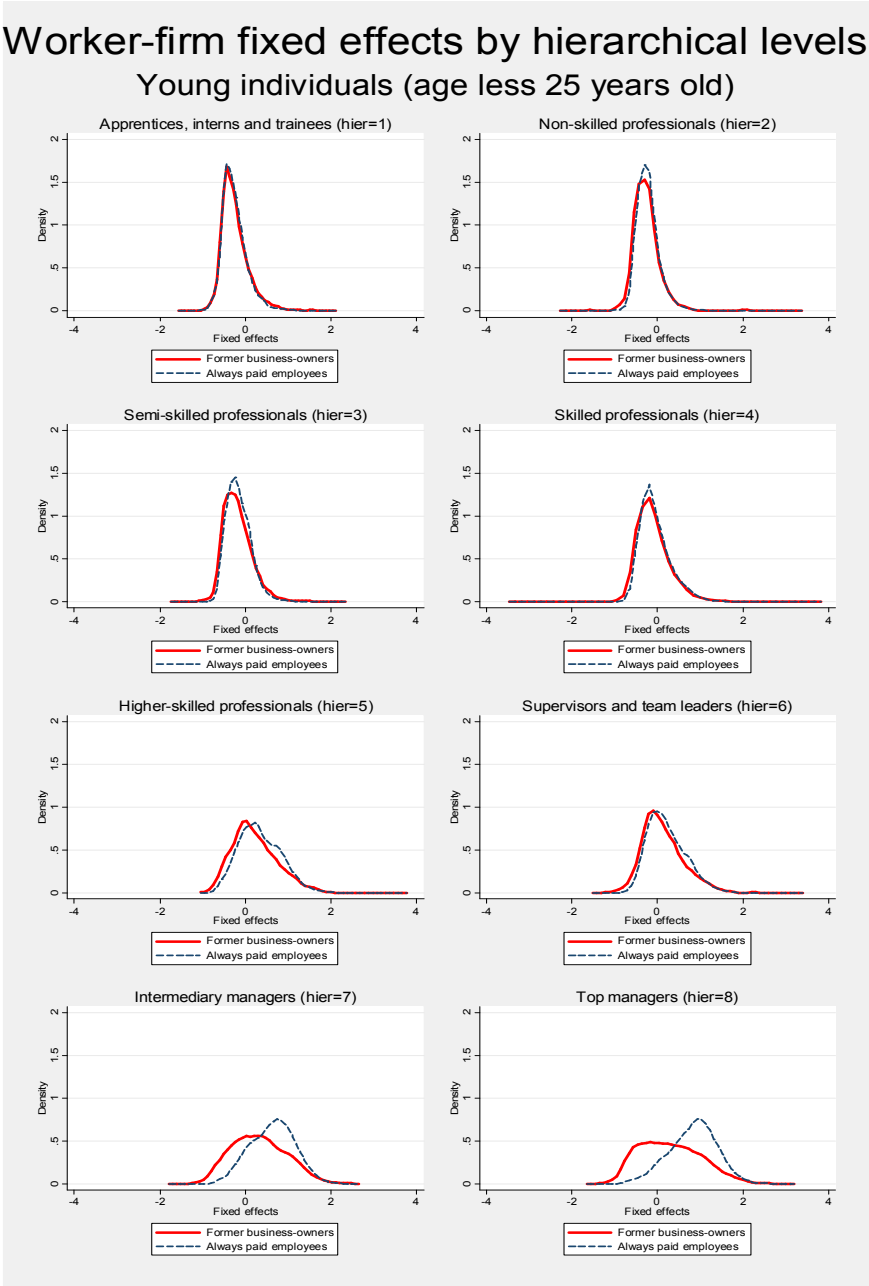
| Level | Tasks | Skills |
|---|---|---|
| 8 – Top managers | Definition of the firm general policy or consulting on the organization of the firm. Strategic planning. Creation or adaptation of technical, scientific and administrative methods or processes. | Knowledge of management and coordination of 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, foremen | Orientation and supervision of teams, as directed by superiors, but requiring the knowledge of tasks. | Complete professional qualification with a specialization. |
| 5 – Higher-qualified professionals | Tasks requiring a high technical value and defined in general terms by superiors. | Complete professional qualification with a specialization adding to theoretical and applied knowledge. |
| 4 – Qualified professionals | Complex or delicate tasks, usually not repetitive and defined by superiors. | Complete professional qualification implying theoretical and applied knowledge. |
| 3 – Semi-qualified professionals | Well defined tasks, mainly manual or mechanical with low complexity, usually routine and sometimes repetitive. | Professional qualification in a limited field or practical and elementary professional knowledge. |
| 2 – Non-qualified professionals | Simple tasks, diverse and usually not specified, totally determined. | Practical knowledge and easily acquired in a short time. |
| 1 – Apprentices, interns, trainees | Training for a specific task | Identical, but without practice, to the professional of the qualification level they will be assigned |

*Notes*: Grade levels as defined by law – Decreto Lei 121/78 of July 2.




*Notes*: The densities are obtained by kernel density estimation with Epanechnikov kernel function. Individuals aged 25 years or less in 1986. Estimations for 1995-2003.

*Figure 1 Fixed effects, density comparing the former business owners with the employees*




*Notes*: The densities are obtained by kernel density estimation with Epanechnikov kernel function. Individuals aged 25 years or less in 1986. Estimations for 1995-2003.

*Figure 2 Fixed effects, density comparing the former business owners with the employees by hierarchical levels*

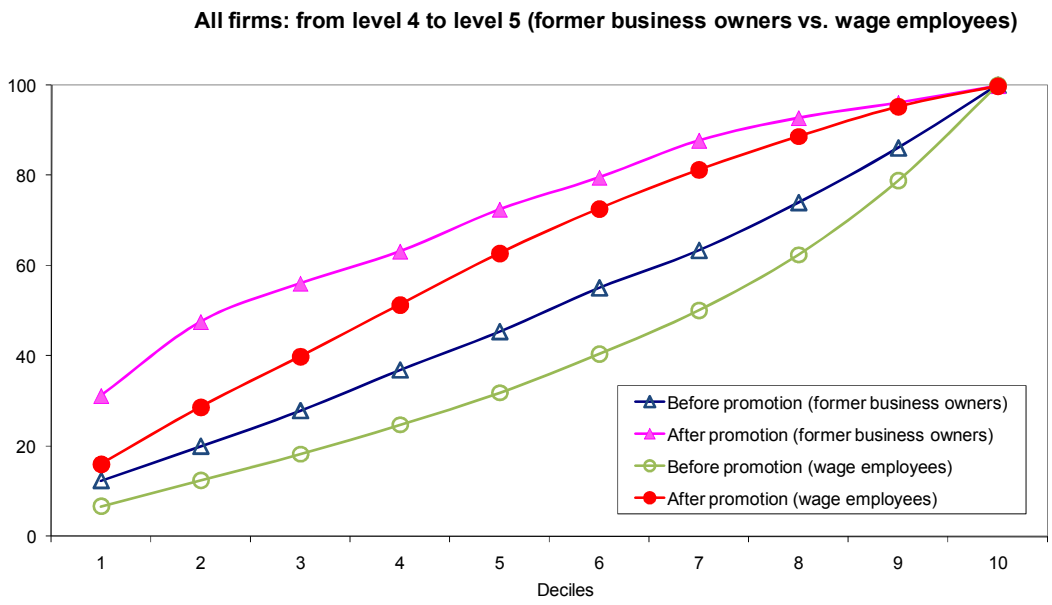



*Figure 3 Cumulative distribution of pay for former business owners and wage employees promoted between job levels - from level 4 to level 5 - in wage deciles*