

SKILL-ASSESSMENT, PRODUCTIVITY AND EARNINGS

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Abstract

In this paper we examine which sort of skills are most rewarded and whether these skills are related to productivity. Using data from a particular survey, our purpose was to analyse if the debate about competence model has been effectively implemented inside the companies. This question was empirically tested in the banking sector. Following the pioneer research of Medoff and Abraham (1980), performance ratings are used as productivity indicators. To this measure, we include competence ratings as other productivity indicator. Both indicators suggest that earnings grow more speedily than performance or skills. The cognitive skills carry the highest return, followed by strategic skills.

1. Introduction

The relevance of productive skills is widely recognized, but there is considerable lack of evidence on whether companies reward the skills required by economic activities. The effectiveness of investment in skills depends fundamentally on the extent to which employers are willing to pay for these skills. Thus, a clear understanding of the skill dynamics is crucial to develop education and training policies.

Therefore, this paper aims at comparing the respective impact of the traditional human capital variables, of performance and of the assessed skills¹ on earnings. In discussing the reward of skills, we argue that the most rewarded skills are those most required in the labour market. We use the ratings of performance and of sorts of skills, assessed by supervisor, as indicators of individual productivity.

In several papers, personnel files of large companies are used to check if wages rose more rapidly than performance. Performance ratings are used as an indicator of individual productivity. In this paper, we provide a new measure of productivity – skill assessment made by supervisors, as a complementary measure of performance ratings.

In a traditional seniority-based contract, wage growth is the return to tenure at an employer. For human capital theory, tenure represents a way to acquire valuable skills that improve workers productivity inside the company. Nevertheless, in none of the researches at our disposal, is discussed which sort of skills may lead to higher performance. Thus, the original feature of this research is that it allows checking which

¹ In this paper, we use assessed skills or competences to refer the skills, knowledge, behaviours and attitudes which were assessed by supervisors. It is not our purpose to discuss here the large debate concerning these and other related concepts.

sort of skills are most rewarded and whether these skills are those most related to productivity or to other reasons.

The data come from an original survey in five large banking companies in Portugal. The main contribution of this study is a direct look at the relationship between performance and assessed skills on earnings, alongside with the discussion on the relationship between experience and performance for employees charged with commercial activities. The paper is organised as follows. Section 2 presents a theoretical background concerning the most prominent papers that used personnel files to check whether the positive correlation between experience and earnings reflects a potential association between experience and performance. Section 3 describes the research and the data. In section 4 we give some descriptive analysis. In section 5 the determinants of earnings are analysed. Section 6 presents multinomial logit estimates to discuss the relation between seniority and performance. Section 6 concludes.

2. Wage and experience-performance growth

Since the pioneer study of Medoff and Abraham (1980), economic theory has considered quantitative productivity measures from personnel files of companies to check if wages rose more speedily than performance. Several studies provide insights on the relationship between experience and performance to explain whether the positive correlation between experience and earnings reflect a potential association between experience and performance. In the human capital model earnings growth reflects productivity growth. Nevertheless, there is no empirical evidence that experience-earnings profiles and experience-performance profiles follow the same pattern.

According to Medoff and Abraham, this is not an aberration. The main point is that this relevant proposition has not been treated empirically given that individual productivity is not easy to measure. For this reason, Medoff and Abraham built their research on the assumption that supervisor' job performance ratings are valid indicators of the workers relative productivity.

In Table 1, we present some of the main papers that used personnel files from large companies to check whether experience-earnings differentials can be explained by experience-performance differentials. Virtually all researches that seek to test this hypothesis appeal Medoff and Abraham (1980) assumptions and empirical findings. The goal of these papers is to determine if earnings profiles are steeper than productivity profiles. In other words, the authors have examined whether the upward sloping wage profile reflect higher productivity of more senior workers.

Table 1
Comparison of the literature on trends in performance and earnings relation

	Medoff & Abraham (1980)	Lazear (1998)	Flabbi & Ichino (2001)	Dohmen (2004)
Data source	Personnel files of 2 corporations in manufacturing sector: N _A = 4.788 N _B = 2.841	Personnel file of largest autoglass installer company Safelite N = 29.412	Personnel files of large Italian bank Data for each worker between 1974 and 1995 N = 10.809	Personnel files from Dutch national aircraft manufacturer Fokker N BC = 71.012 N WC = 24.524
Occupation in analysis	Managerial and professional employees	Autoglass installer	Non-managerial employees in different level of a typical career (8 levels)	Blue collars White collars
Assumptions	Performance ratings are valid indicators of relative productivity	Piece-rate compensation is an alternative to careers motivations schemes	Alongside with performance ratings, other indicators of productivity are included: recorded absenteeism and misconduct episodes	Performance scores do not only depend on the job level but also on the salary scale within a job; Rigid nominal wage lead to an asymmetry in the relation between productivity changes and wage changes.
Dependent variables	Annual salary	Pay per day Daily output	Month and annual wage Promotion	Real annual full-time equivalent salary
Regressors	Educational attainment Pre-company experience (years) Company service (years) Performance rating (scale = 6)	Tenure Dummy of pay scheme: piece-rate	Level of education Pre-company experience Seniority Performance ratings Absenteeism and misconduct episodes Regional dummies	Level of education Tenure Experience Performance ratings Job level dummies Salary scale dummies
Empirical findings	Pre-company and company service experience have positive effect on earnings: older and senior employees have higher than average salaries; 40% of earnings differentials related to pre or company experience occur within grade levels; Within grade level differentials are not explained by within grade level performance differentials. Education, previous experience and seniority increase the probability of assignment to the 2 higher wage categories but reduce or leave unchanged the probability of assignment to the 2 higher evaluation categories.	Tenure has greater effect in the wage regression than in the output regression.	Controlling for individual characteristics and hierarchical levels, employees revealing less absenteeism or misconduct episodes are more likely to be promoted and receive larger wage increases; 47% of the return from 1 additional year of seniority occurs within grade level; Education and seniority have different effects on the employees' position in the classification of performance and wages: higher education increases the probability to the higher wage categories but reduces or leaves unchanged the probability of higher performance; Only at lowest level, wage differentials can be explained by the performance of more senior workers.	The impact of supervisors' evaluations on earnings is weak because the positive relation between performance and wages is dissociated by nominal rigidity; Performance improvements trigger wage raises, but deteriorated performance ratings do not lead wages to fall.

With exception of Dohmen (2004), in all researches presented in table 1, the conclusion is the same: Medoff and Abraham results are robust, even controlling for other indicators of productivity. Flabby and Ichino (2001) conclude that only at the lowest level there is some evidence that workers' performance can explain the effect of seniority on wages. Lazear found that tenure has greater effect in earning regression than in the output regression.

For Dohmen (2004), the above-mentioned results are not surprising. Since the wage variation is generated by contractual tenure profile and not by variation in performance, it is not surprising that the positive relation between experience and earnings is independent of performance. This dissociation may be attributable to wage rigidity that leads to an asymmetric relationship between performance variation and wage variation.

These arguments ignore the dynamics of skills related to productivity. In none of researches at our disposal, the authors integrate the issue concerning the skills that may lead to higher productivity. This kind of subject is typically recurrent in economics of education. In several studies the question at stake is how much moderate is the return to schooling when controlling for cognitive ability (Cawley and al, 2000).

The study taken here may be regarded as an approach that incorporates both economic of education and personnel economics contributions. In focusing on education alongside with the returns of sorts of skills, we claim that there are better indicators of individual characteristics than the years of schooling. On the other hand, skill-related pay schemes offer insights about incentives devices inside the firms. In this context, we think that the most relevant question is why some skills are rewarded (or better rewarded) and others are not.

3. The data

An original survey was conducted to gather information on skills and performance ratings. Instead of using personnel files, our purpose was to analyse if the debate about the competence model has been effectively implemented inside the banking sector. In fact, four reasons can explain our option to study the banking sector:

- the concept of skill or competence finds widespread use in human resources management;
- following the restructuring process in the sector, there is a need for new skills to carry out commercial activities;
- the organisational structure of banks is based on small, medium or large branches with small teams and direct supervision;

- the geographical distribution of agencies throughout the Portuguese territory.

The evidence from the studies of banking sector supports the view that human resource management is increasingly moving toward a competence-based model. Our purpose was to check the consistency of this evidence by analysing the relationship between assessed skills and earnings. We should then have data from different banks.

But on the other side, traditionally labour contracts in the banking sector are seniority-based. This means that the wages must grow with specific experience. Thus, an interesting debate may emerge from this context: can firms replace easily a seniority-based contracts with and competence-based contract?

The survey gathered information on employees charged with commercial activities in non-manager position: employees' characteristics – age, gender, level and domain of education, tenure; job characteristics – job position, job name; the supervisors' rating of the employees' skills and performance; and compensation schemes – salary grade, base pay, other fixed compensation schemes, bonuses, profit sharing and stock-options.

Concerning the skill assessment, our intention was to gather information from a unique list of skills. For this purpose, a list of thirty skills was designed, which included technical knowledge and skills: economics, management, IT skills; cognitive skills: problem solving, learning skills; occupational, which are strategic skills: negotiation, persuasion; behaviours and attitudes toward organization: cooperation, proactive attitudes toward learning; behaviours and attitudes toward others: team working, communication (for a complete list see table 3).

This list, alongside with questions on the above-mentioned variables, was answered by the supervisors of bank agencies (86 branches/supervisors), for each employee in the non-managerial position (600 clerks) from a sample of Portuguese banks (5 banks). For the sake of clarity, in this research the supervisors' assessment represents a measure of individual skill. This is questionable, but to understand the valuation of skills inside the companies, this seems to be an appropriate method.

4. Descriptive analysis

Our final sample contains data on 600 employees of five Portuguese banks. Nevertheless, there is considerable proportion of missing values, particularly related to skill-assessment. In the empirical analysis, we choose to integrate all observations for each set of variables instead of eliminating missing values. This option explains the different number of observations in the set of models of determinants of earnings.

a. Schooling, tenure and earnings

The recruitment rules in the banking sector are defined in the collective agreement. At 2001, the entry-level was the low secondary school (11 years of schooling). Nevertheless, the banks of our sample were recruiting at high school level or, motivated by lack of attractiveness, at upper secondary (12 years of schooling),.

In Table 2 we present descriptive analysis of the sample of employees concerning the earnings and some of individual characteristics.

Table 2
Descriptive statistics of the sample used in the analysis

	Means (standard deviations)
Annual wage (Portuguese escudos/euros)	2,984,299 (14,885,62)
Less than secondary school (< 12 years)	0.180
Secondary school (12 years)	0.259
Bachelor degree	0.238
High school	0.307
Schooling (means)	12.85 (3.0)
Tenure (means)	11.49 (8.9)
Age (means)	36.43 (9.5)

From Table 2 it should be underlined that the dispersion of earnings is highest for employees having high school than for others. This may be attributable to the activities assigned to more educated employees.

b. Productivity measures

We distinguish two sorts of productivity measures: performance rating and competence rating. The first measure concerns an overall performance rating by five-level scale on his or her contribution to the banking agency. This contribution was in addition discriminated through a list of indicators related to front-office and back-office tasks. It should be underlined that the banking sector is moving toward a multitasking design, thus the distinction between front-office and back-office is becoming increasingly irrelevant.

The data gathered contained 30 variables concerning different sort of skills, knowledge, behaviours and attitudes. The same five-level scale was used to assess each of 30 skills. Principal component analysis (PCA) was applied to the original variables to ascertain that all variables obtained reflect different skills. PCA has clearly brought out the relevance of one component: cognitive skills, for structuring the stock of skills of banking employees of the sample. The results of PCA reveal that cognitive

skills explain 56.5% of the variance in competence ratings, embracing skills like: ability to learn, problem solving, ability to organize, ability to select and process information, and others.

The other components obtained explain small variance differentials, that is to say that banking employees differ predominately by the cognitive skills used during their labour contracts. Thus, PCA has brought out the relevance of 5 components for structuring the stock of skills of the banking employees (table 3):

Table 3: The five components of competences built with PCA

Cognitive skills	Specific technical knowledge Autonomy Responsibility Adaptability Innovation Planning and organising Ability to analyse Ability to select and process information Ability to solve problems Ability to learn Ability to transfer knowledge and experience Capacity to understand the specificities of the banking activity
Strategic skills	Negotiation Persuasion Perseverance and orientation towards the results Orientation towards the client Understanding of the strategy of the bank
Behaviour towards the organization	Readiness to learn Effort to learn Following rules and procedures Cooperation (with organizational goals) Adaptation to the working time Punctuality
General knowledge	General technical knowledge Knowledge of foreign languages Ability to use computing systems
Behaviour toward others ²	Relationship with colleagues Capacity to work in team Communication Willingness to help others

Are these components relevant when it comes to structuring earnings distribution? This is what we will check in the next section. At this stage it is useful to have a look at the dispersion of the productivity measures used in this research.

² In this component eigenvalue is < 1.

Table 4
Productivity measures used in the analysis

	Means (standard deviations)
Performance ratings	
1 – Very low	0.174
2 – Low	0.310
3 – Medium	0.238
4 – Good	0.251
5 – Very good	0.299
Competence ratings (PCA)	
Cognitive skills	0.011 (1.011)
Specific/strategic skills	-0.014 (1.000)
Behaviours towards organization	-0.015 (0.997)
Behaviours towards others	-0.0106 (1.001)
General knowledge	0.003 (1.004)

As above-mentioned, our focus is on the relationship between skills and performance, as well as between skills and tenure. For this purpose, in the table 5, we distinguish the sorts of skills for each level of performance.

Table 5
Skill ratings components at each level of performance rating

Performance ratings	Cognitive skills	Specific Strategic skills	Behaviours towards organization	General knowledge	Behaviours towards others
Very low	-1.24 (0.983)	-0.758 (0.737)	-1.370 (1.188)	-0.831 (0.780)	-1.289 (0.962)
Low	-0.915 (1.038)	-0.648 (0.777)	-0.749 (1.331)	-0.340 (0.995)	-0.484 (1.229)
Medium	-0.331 (0.927)	-0.372 (0.872)	-0.092 (1.065)	-0.136 (1.024)	-0.129 (1.063)
Good	0.298 (0.847)	0.165 (0.971)	0.092 (0.786)	0.098 (0.972)	0.159 (0.845)
Very good	0.720 (0.864)	0.838 (0.860)	0.454 (0.672)	0.204 (0.898)	0.288 (0.880)

Table 5 provides the level of sorts of skills at each level of performance. A comparison of the two polar ratings reveals the close relationship between high-performance/high skills; low-performance/low skills. For the best performer's employees, we may underline the high-level of specific/strategic skills, as well as of cognitive skills. In addition, the results obtained exhibits great dispersion of all sorts of skills at each level of performance.

5. The determinants of earnings

According to the human resources managers of the banks of the sample, the banking sector is clearly moving toward a competence-based management. Three of the banks of the sample have already designed tools for a competence model, such as skill list to hire, to assess and/or to train employees. The others were designing their model following the same pattern inside the sector. Let then check for the relationship between performance and competence ratings on annual earnings.

Following the above-mentioned researches, first we will check whether the upward sloping wage profile reflects performance/productivity gains or not? Nevertheless, we focus particularly on the potential relationship between the return to skills and individual performance. Several questions should be answered:

- Are the skills rewarded in the banking sector?
- What can explain the return to some sort of skills?
- Are the rewarded skills most related to productivity?

For the purpose of this paper, we will estimate a conventional earning regression to evaluate if better performance and competence ratings lead to wage increases. First, human capital specification allows to check for the return to education and potential and specific experience. Since OLS estimates suffer from bias when a variable is omitted, in the second stage of our analysis, we will test for endogeneity using instrumental variables methods (Wooldridge, 2006; Greene, 2003).

a. Earnings functions

We examine a total of 8 specifications, all of which can be estimated using data from our sample. Specification (1) measures the raw relationship of schooling and human capital (general and specific) and earnings, i.e., with no controls, to evaluate the upward sloping profile. The same relationship is tested for performance ratings (2) and dummies for each performance level (3). Specification (4) relates assessed skills to earnings. In specification (3 and 5) we condition for performance ratings and for competence ratings (6). Specification (7) contains the full range of human capital variables, performance and competence ratings. Finally, specification (8) adds gender to all supply-side variables that we have at our disposal.

The preferred specification depends on the question at stake. If we are interested in the effect of human capital variables, allowing for performance and

competence differences, then the specification (5 or 6) is preferred. This specification may be useful to evaluate whether the more seniors employees are more productive or not.

If we are interested in the relationship between sorts of skills and performance, then specification (7), which controls for human capital variables and for performance variables, is more appropriate. At least, if we want to assess gender differentials, then the last specification is preferred.

The variables of the model are:

Dependent variable:

- logarithm of annual earnings

Earnings represents the total pay receive by each employee. It integrates base pay and several contingent pay schemes, namely, pay for flexible working time, components related to occupied function, tenure premium. The annual pay is currently 14 times the monthly pay.

Independent variables:

- years of schooling
- labour market experience (Mincer)
- tenure: years of specific experience
- education: years of schooling
- performance rating: in 5 scale: 1 = too bad; 5 = high performance
- skills rating: in 5 scale = 1 = very week; 5 = excellent
- gender: 0 = women; 1 = men

Instrumental variables

- supervisors' characteristics: tenure, gender and schooling.

Table 6
The determinants of earnings: OLS regressions

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schooling	0.032***	0.030***			0.029***	0.030***	0.029***	0.029***
Experience	0.037***	0.039***			0.039***	0.038***	0.038***	0.038***
Experience ²	-0.001***	-0.001***			-0.001***	0.000***	0.000***	0.000***
Tenure	0.004*	0.003			0.004*	0.001	0.002	0.002
Performance rating (1 to 5)		0.064***						
Performance rating 1 (dummy)			0.065		-0.029		-0.039	-0.040
Performance rating 2 (dummy)			-0.040		-0.078***		-0.080**	-0.081**
Performance rating 3 (dummy)								
Performance rating 4 (dummy)			0.016		0.062***		0.034	0.034
Performance rating 5 (dummy)			0.100***		0.150***		0.099***	0.098***
Cognitive skills				0.055***		0.049***	0.029***	0.029***
Specific/strategic skills				0.024***		0.039***	0.020**	0.021**
Behaviours towards organization				-0.033***		-0.002	-0.017*	-0.017*
General knowledge				-0.070***		0.017	0.009	0.008
Behaviours towards others				-0.014		0.005	-0.006	-0.005
Gender								0.010
Constant	14.003***	13.787***	14.860***	14872***	13.985***	14.013***	14.014***	14.014***
Adj. R ²	0.476	0.527	0.015	0.151	0.531	0.524	0.533	0.531
N	520	512	557	479	520	446	446	442

The dependent variable is the log of annual earnings.

b. Human capital variables

The examination of Table 6 reveals the great stability of the return to human capital variables even in the presence of controls. All estimates indicate that educational attainment and potential experience are quite unaffected by productivity indicators. Potential experience has stronger effect on annual earnings than tenure in the banking sector. Probably because of essential feature of this sector, where, as suggested by Flabbi and Ichino (2001) for Italian bank, employees are recruited after graduation and careers take place within the bank, as in the internal labour market. In fact, seniority represents about 90% of potential experience. We believe that, because of close correlation between experience and tenure, the return to tenure is captured by the effect of potential experience on earnings.

What can explain higher wages of more educated, and more experienced or more senior employees?

In a traditional seniority-based contract, wage growth is the return to tenure at an employer. According to the human capital theory, workers acquire valuable skills at school and receive on-the-job training that improves their productivity within the firm. Thus, firm tenure corresponds to a way to acquire specific productive skills and consequently, workers receive higher wages over time within the firm. In fact, to validate this explanation one should expect that the addition of performance ratings or competence ratings into the earning function would change the estimated coefficients of human capital variables toward zero (Medoff and Abraham, 1980). Nevertheless, specification (3), (5), (6) and (7) reveals that, although high performance and high skills lead to higher earnings, the inclusion of these variables has effectively no effect on the education and experience coefficients. Recapturing Medoff and Abraham (1980) and Flabbi and Ichino (2001) conclusions, we do underline that despite the positive relationship between education, experience and earnings, it is not possible to argue that it exists a positive correlation between human capital and performance.

Furthermore, in none of the researches it was discussed which sort of skills may lead to high performance.

c. The effect of performance and competence ratings

The second step of the empirical analysis is to examine whether some sorts of skills are related to productivity. In the survey, we have distinguished questions on performance and on knowledge, skills, behaviours and attitudes of employees. Column 7 allows to check whether performance coefficients change, when controlling for sorts

of skills. In other words, more skilled employees are observed to earn higher earnings. The question is whether this effect is attributable to productivity or to other reasons. Moreover, we should ask whether the return to skill has exclusively to be attributed to productivity. Are skills rewarded merely due to their influence on performance?

Specifications 2, 3 and 5 show the influence of performance ratings (continuous and dummies) on annual earnings of banking employees charged with commercial activities. By itself, performance dummies do not explain any earnings differentials. In specification 3 and 5, the productivity measures are highly significant, but they leave schooling and experience coefficients virtually unchanged. Examination of column 5 reveals possible relationship between high tenure and level of performance.

This result requires further econometric analysis, namely multinomial logit to check, as tested by Medoff and Abraham (1980), and replicated by Flabbi and Ichino (2001), whether seniority raises the employees' ranking in the distribution of performance evaluations. We will turn to this point in next section.

A look up of estimates indicates that higher performance appears to have greater positive effect on earnings and low performance leads to negative effect. Holding everything constant, one better level of performance leads to an increase of 16.2% of earnings, and, one worse level lead to a decrease of only 2.8%. One can then suggest weak penalization of worst performance.

Two aspects of the specifications containing competence variables merit discussion. First, by itself, almost all sorts of skills are valuable in the banking sector (4). Competence ratings explain 15.1% of annual earnings differentials. The cognitive skills are the most rewarded.

Second, we do underline the changes in skills' coefficients when controlling for human capital variables. The change in the cognitive skills estimates may be explained by the contribution of education to the development of such skills. Thus, the change of cognitive skills coefficients with human capital controls is partially due to the effect of cognitive skills that is captured by schooling.

Coming to the strategic skills, we should notice the increase of this coefficient, i.e. strategic skills appears more rewarded, when one controls for human capital variables. From these high estimates one might be tempted to infer that a substantial part of the reward of strategic skills was captured by other skills, namely, behaviours toward organization. Note that in specification (6), the estimate for these skills becomes not significant. The essential question, to which we do not have answer, is where these skills are acquired or developed. Certainly, schooling does not seem to have any effect on these skills.

The joint specification (7) may shed light to this result. The estimates presented in column 8 suggest that a large part of the return to cognitive and strategic skills is due to their effect on highest performance. Comparing the estimates of specification (6), we do underline that 41% of the return to cognitive skills is explained by its effect on performance. In the same way, almost half of the return of strategic skills is related to its influence on performance. Thus, we can argue that the banks of our sample are using competence-related pay to provide incentive for increased productivity.

However, these estimates reveal that all return to cognitive and strategic skills is not attributable directly to productivity increase. Several reasons can explain competence-related pay schemes (Armstrong, 1999). One of the most remarkable reasons is that cognitive and strategic skills match better to main skills required by new economic challenges and by technological innovation. Cognitive skills allow the flexibility of the workforce, which may improve the ability of banking employees to move across different and changing activities.

As shown in column 7 of Table 6, the results suggest that earnings grow more with experience than with performance for less productive employees. By contrast, both standardized (and unstandardized) coefficients indicate that high level of performance contributes to increase earnings of employees. This result enforces our previous conclusion concerning the benefit of better performers and the light “punishment” of worst ones.

Specification (8) reveals the effect of gender on earning differentials. From the table, one can argue that the traditional wage differentials due to gender do not exist in the sample of banking employees. This is not true. Descriptive analysis shows earnings differentials. Nevertheless, these differentials are not statistically significant in our model. Different earning models for men and women reveal that being more educated, and being better rated, women’s characteristics are worst rewarded (for details see, Suleman, 2004).

d. Endogeneity test

Medoff and Abraham have underlined several issues of supervisors’ assessment. In this research, we suspect that performance and competence ratings may be influenced by supervisors’ beliefs, although knowing that this is an academic research. Wooldridge (2006) and Greene (2003) suggest instrumental variables (IV) approach to assess the validity of existence of endogenous variables in OLS earning functions.

Using some of the supervisors' characteristics as instrumental variables, we estimated the reduced form for performance ratings and for each sort of skills (cognitive, specific/strategic, behaviours toward organization, general knowledge and behaviours toward others):

$$perf = \pi_0 + \pi_1 sch + \pi_2 exp + \pi_3 exp^2 + \pi_4 ten + \pi_5 st + \pi_6 ss + \pi_7 sg + v_2$$

The additional instrumental variables are supervisors' characteristics: tenure (*st*), schooling (*ss*) and gender (*sg*).

To test if performance rating is an endogenous variable, we included \hat{v} as an additional regressor in our specification (3):

$$\lg earnings = \beta_0 + \beta_1 sch + \beta_2 exp + \beta_3 exp^2 + \beta_4 ten + \beta_5 perf + \delta_1 \hat{v}_2 + ei$$

Using OLS regression, the coefficient on \hat{v}_2 is not statistically different from zero, thus we conclude that performance variable is not endogenous.

We check for the endogeneity for all other variables that we suspect as endogenous variables: the assessed skills obtained through PCA. For this analysis, we test for the joint significance of the residuals by adding to our specification (6) the residuals of the reduced form for each sort of skills, using an *F* test.

$$skills = \pi_0 + \pi_1 sch + \pi_2 exp + \pi_3 exp^2 + \pi_4 ten + \pi_5 st + \pi_6 ss + \pi_7 sg + v_2$$

Our test reveals that we have endogenous explanatory variables. In other words, as expected, competence ratings are influenced by supervisors' characteristics, like, tenure, schooling and gender.

Since our OLS estimation suffers from an endogeneity problem, our results are partially inconsistent. If skill-level is influenced by supervisors, the estimates of return to skills are obviously biased. Nevertheless, for the present research, estimation of such deeply consistent parameters is not necessary since we want to reveal the changes of human resource management models. Furthermore, the influence of supervisors on the measure of individual skill-level is unavoidable. The firms use this sort of management tools to decide wage movements, promotions, training, and recruitment. Skill-assessment made by supervisors is largely discussed in organizational psychology, but is widely spread inside the firms.

6. Performance and tenure: multinomial logit analysis

In this step of our analysis is aimed at finding whether seniority raises the employee's ranking in the distribution of wages as well as in the distribution of performance evaluations. Following Medoff and Abraham (1980) and Flabbi and Ichino (2001) procedure, multinomial logit analysis was used to determine the strength of influence of schooling, experience and tenure upon performance or wage classes. First, performance levels were grouped in three categories respectively low, medium and high, which represents respectively 11%, 35% and 54%.

Second, trivariate categorization of wages was then created, using same quantiles of performance distribution. Thus, we classified in low wage category those employees in the level 1 who were in the bottom 11% of wage distribution; in medium wage category who were in the intermediate 35% group; and high wage category who were in the top 54%.

The data give no evidence of correlation between wage distribution and performance distribution. As suggested by Flabbi and Ichino, we do underline that these two distributions do not match, since the correlation between them is 0.013. Now, it is relevant to check if more senior employees are more productive. It is to say, "if more senior workers were also more productive, higher seniority should increase not only the probability of an assignment to a higher wage category but also the probability of an assignment to a higher evaluation category" (Flabbi and Ichino, 2001: 372).

Table 7 reports multinomial logit estimates of the probability of assignment to evaluation and wage categories.

Table 7
Assignment to performance and wages categories: multinomial logit estimates

Dependent variable	Performance				Wage			
	Medium	High	Medium	High	Medium	High	Medium	High
Schooling	0,01 (0,90)	0,095 (0,23)	0,09 (0,38)	0,07 (0,56)	0,14 (0,16)	0,441 (0,00)	0,087 (0,472)	0,360 (0,007)
Experience	-0,063 (0,33)	-0,115 (0,06)	-0,002 (0,97)	-0,048 (0,62)	0,088 (0,35)	0,387 (0,00)	0,048 (0,67)	0,378 (0,003)
Experience ²	0,000 (0,79)	0,001 (0,40)	0,001 (0,59)	0,003 (0,19)	0,001 (0,85)	-0,004 (0,32)	0,003 (0,48)	-0,001 (0,745)
Tenure	0,018 (0,60)	0,047 (0,18)	-0,006 (0,881)	0,035 (0,54)	0,353 (0,00)	0,456 (0,00)	0,255 (0,015)	0,338 (0,003)
Cognitive skills			1,481 (0,00)	3,354 (0,00)			0,712 (0,002)	1,026 (0,00)
Specific skills			1,223 (0,00)	2,88 (0,00)			0,742 (0,003)	0,933 (0,001)
Behaviours toward organisation			1,311 (0,00)	2,38 (0,00)			-0,286 (0,224)	-0,128 (0,614)
General knowledge			0,464 (0,07)	1,553 (0,00)			-0,092 (0,75)	0,206 (0,614)
Behaviours toward others			0,788 (0,00)	1,742 (0,00)			0,349 (0,113)	0,206 (0,517)
Number of observations		545		470		521		447
Constant	1,937 (0,192)	1,525 (0,291)	2,210 (0,254)	2,618 (0,25)	-2,91 (0,099)	-10,987	-1,442 (0,485)	-9,442 (0,00)
Pseudo R ² (Nagelkerke)		0,067		0,675		0,549		0,597

Dependent variable: trivariate performance and wage classification. Omitted category: lowest one

It must be emphasized from multinomial logit estimates that human capital variables do not affect performance levels of banking employees of our sample. By contrast, the results are entirely in line with human capital earning models suggesting that schooling, experience and tenure are important determinants of earnings.

The multinomial logit regression in column 4 and 5 of Table 7 is a regression of the impact of skills level on performance ratings. The estimates indicate significantly positive relationship, suggesting that all sort of skills are relevant to performance increase.

The remaining specifications in Table 7 correspond to the relationship between skills and earnings. Again an interesting pattern emerges. Whilst skills levels seem to explain performance distribution, there is not important evidence of such effect on earning distribution. Only cognitive and specific skills do provide some support for the importance of skills on earning distribution.

7. Concluding remarks

The point of this paper was to illustrate that it is useful to ascertain which sort of skills are most rewarded and whether they are related to productivity. The main conclusion is that cognitive skills carry the highest reward, followed by strategic skills. There is evidence that these skills are most related to productivity and less related to earnings. Nevertheless, they have their own value in the banking sector.

The remaining return of cognitive and specific skills may be seen as a way to avoid prearranged rules, particularly the increase of earnings with tenure. On the other hand, cognitive and strategic skills correspond to main skills required by new economic challenges and by technological innovation. Cognitive skills allow the flexibility of the workforce, which may improve the ability of banking employees to move across different and changing activities.

The analysis suggests other general conclusions. First, the earnings grow more speedily than performance. Experience has greater effect on earnings than performance (or competence) ratings, as concluded by almost all authors analysed in this paper. Nevertheless, high performance has greater effect on earnings.

Second, the return to human capital variables reveals great stability even in the presence of performance controls. Educational attainment and potential experience are quite unaffected by productivity indicators.

Third, the benefit of high performance is not proportionally similar to penalization for low performance. This may indicate wage rigidity, as suggested by

Dohmen (2004) that deteriorated performance ratings do not lead wages to fall. Knowing that wage policies inside the banking sector are partially regulated by collective agreements, this should not be a surprising result. Nevertheless, in the same agreement is defined the merit pay schemes. Thus, we can argue that earnings differentials are most influence by contractual tenure profile than by variation in performance.

Fourth, the researches built on performance or competence ratings should tackle with endogeneity problems. In fact, the level of competence is clearly influenced by supervisors' characteristics and this effect may contribute to bias the estimates of the return to skills.

Accordingly, this sort of dataset exhibits potential limitations. For the purpose of this paper, we should retain four main limitations. First limitation is that the skill measure suffers from a bias since individual's skill and performance levels are an output of supervisors' assessment. This is particularly tricky, but this skill measure is widely spread inside the firms.

Combined with this, the next potential limitation is the number of observations. Skill-assessment involves a quite large survey, with a list of well-defined skills, and it is time consuming for supervisors. This limitation can explain the scarcity of this sort of data with exception of personnel files inside the firms. These data from personnel files do not allow a comparative study between companies or inside an economic activity. For economic predictions is useful to know what are the workings inside the "black box" and the studies presented contributed largely to increase our knowledge. Nevertheless, those researches are limited to one company and provided only limited measure of productivity.

Third, to ensure homogenous skill requirements, skill-assessment must be limited to an occupation. This is to say, the departure point of this approach is an occupation demanding for similar skills. The study is then oriented to capture how different employees use their skills and are evaluated by their supervisors.

Finally, we have cross-sectional data, for one period of time, whereas data over a long period may be ideal to examine whether the deterioration of performance leads to a large decrease of earnings. Rather, it should be relevant to identify if employers are moving toward other human resource management model, namely by changing the determinants of earnings. The results indicate that the banks of our sample are not merely replacing seniority-based contracts with competence-based contracts. Our analysis considers institutional arrangements to understand why firms do not change labour contracts abruptly.

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