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Returns to firm-provided training: evidence from French worker–firm matched data [1]

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Abstract

Using worker–firm matched data, we study the incidence and the effects of firm-provided training in France. When we use the same kinds of data and models as the existing ones, the estimated impact of training on wages is as high in France as in other countries. When we build on the uniqueness of our French data and control for the selectivity of firms' training practices, the estimated impact of training falls close to zero. The wage differentials observed across trained and untrained workers reflect that individuals who are the most likely to be placed in training programs are also those with the highest unmeasured abilities.

JEL classification: J24; J31

Keywords: Firm-provided training; Returns to training

1. Introduction

The idea that post-school training may be a remedy to labour market diseases is often found in the press and political debate. From the viewpoint of policy-makers, post-school training could be an instrument for increasing the flexibility of labour

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markets by providing workers with channels that would enable them to adapt to technical changes.

Even though most countries seem to agree on the necessity of post-school training, the approach varies greatly from country to country as to how to upgrade the skills of their adult work force. Each country tries to use its specific institutional and cultural advantages. In Germany, the system is characterized by a high level of cooperation between firms, workers and unions. Skills that are attained through this system are nationally recognized and certified. Unlike Germany, US training system is highly decentralized. No national system validates skills that are acquired outside the school system. On the other hand, Japanese institutions are more informal than the American or German ones with training being conducted mostly by seniors. In Japan, employers implicitly impose high costs on employees who quit their firms.

An increasing number of studies have been carried out on the German, Japanese and American systems (Lynch, 1994). On the contrary, very little has been done on the French system, which is rather unique in itself. In France, firms either have to train their workers or pay a tax. More specifically, each firm with more than ten employees has to devote a percentage of its total wage bill to training its employees. If the firm is unable to document its training expenses as being equal or greater to the minimum percentage imposed, it must pay the difference between its actual training expenditures and the minimum imposed training expenditures to public benefit training organizations. This system has been in place since 1971. The initial train-or-pay tax rate was 0.8% of the total wage bill; it rose to 1.2% in 1988 and is currently at 1.5%.

Why such a system? First, in France, the relationships between employers and unions are not as strong as they are in Germany. Second, the links between employees and their firms are much weaker in France than in Japan. Third, the French government traditionally plays an important role in regulating employment relationships. It compensates for the strained relationships between employers, workers and unions by intervening by way of its central administration. This administration has the power to make firms respect a pay-or-train system.

In our view, evaluating the French system provides some interesting insights into how training affects the labour market. In particular, the French system shows how wages and job mobility of lower-skilled workers could be affected in other countries if their governments required firms to spend more on training. [2]

The French National Institute of Statistics and Economic Studies (INSEE) has recently conducted a survey on a representative sample of French workers, which gives the identification numbers of the employing firms both before and after

[2] Notice that in the late 1980s, French firms spent more than their American or Japanese competitors on training. The average training expenditure was 2.5% in France compared to 1.8% in the US. In 1993, the average expenditure was 3.5% in France.

participation in training programs. The possibility of matching workers and their firms is unique to the French system. In all the other countries, the empirical analyses based on individual data are unable to match workers with the training strategies of the employing firms (see for instance the various studies in Lynch, 1994). In particular, the origin of the observed impact of training on wages—does it reflect true returns to training or does it reflect the correlation between training and the firm-specific compensation policy—cannot be identified. Our data enable us to go one step further to examine the impact of post-school training on wages when we control for firm effects.

This paper is organized as follows. Section 2 describes the data. Section 3 presents the econometric model, which is a system of three simultaneous equations: the first one describes training program selection; the second one describes post-training mobility; and the last one is a wage equation which includes training and post-training mobility as covariates. The system is recursive and we propose a two-stage estimation method. We analyse the results in Sections 4 and 5. Once we take into account the heterogeneity of firms' economic performances and the selectivity of both training and post-training mobility, the estimated impact of training on wages is close to zero.

2. The data

The data used in this paper come from the French survey on Education and Qualifications (*Enquête sur la Formation et la Qualification Professionnelle*, hereafter FQP), which was conducted at the beginning of 1993 by the French National Institute of Statistics and Economic Surveys (INSEE). The sample is made up of households. It was designed to represent the French adult population, 20 to 64 years old, at the time of the survey. [3] The sample is stratified along three main dimensions: region, place of residence (urban vs. rural), and number of adults living in the household. The stratification procedure and the sampling fractions are fixed so that each individual between the ages of 20 and 64 have the same probability of being in the sample. The sample yielded 12,640 households, of which 88.4% responded. The number of *individual* (and useable) responses yielded 18,023 cases. The sample includes both males and females who are employed, unemployed or out of the labour force.

The following standard information is compiled for each interviewee: age, nationality, labour-market status (employed, unemployed, out of the labour force), occupation (4-digit index, 318 items), seniority, industry and size of the employing firm, school-leaving date, and educational attainment. In this study, labour-market

[3] The only restriction is that the field consists of all conventional households residing in metropolitan France (= mainland + Corsica).

Table 1
Incidence of firm-provided training between 1988 and 1993 in percent

Participation in firm-provided training	Size of the firm				Total private sector	Public	Total
	0 to 9 workers	10 to 49 workers	50 to 499 workers	500 workers or more			
Men	17.6	20.9	32.6	41.0	26.6	34.5	28.1
Women	18.5	23.5	24.4	36.7	23.8	31.6	26.3
Occupation type							
- managers and engineers	18.8	33.1	47.1	47.3	33.4	33.2	33.3
- technicians, foremen	28.1	30.6	42.6	52.7	38.2	42.6	39.5
- routine non-manual employees (administration)	26.6	31.2	31.8	38.0	30.6	35.4	32.1
- unskilled non-manual workers	8.0	15.0	18.5	20.6	12.4	15.4	13.1
- skilled manual workers	11.0	13.2	25.1	27.8	18.4	21.9	18.7
- unskilled manual workers	4.4	10.2	10.9	21.9	10.4	5.9	9.8
Total	18.0	21.8	29.4	39.5	25.5	32.9	27.3

Source: FQP survey, 1993, INSEE.
Field: wage-earners in 1988 and 1993, aged 20 to 64.

experience is measured by the number of years between leaving school and the survey date. The survey contains supplementary information on the workers' situations five years before the survey (i.e., at the beginning of 1988): labour-market status, occupation, seniority, industry and size of the employing firm.

The FQP survey also provides information on net annual earnings. Respondents are asked to give their wages for the year prior to the survey (i.e., in 1992). The number of months spent in full-time or part-time jobs are also recorded. [4] This information is used to reconstruct the full-time equivalent annual earnings for each respondent.

In the FQP survey, each respondent also reports (1) whether he/she participated in any employer-sponsored training programs between the beginning of 1988 and the beginning of 1993 and (2) if he/she changed firms between the beginning of 1988 and the beginning of 1993. If the respondent reports having participated in employer-sponsored training programs, he/she is asked to give the date of the last one. If the respondent changed firms, he/she is asked to give the date of his/her departure from the 1988 firm. Some basic statistics are reported in Table 1.

The very interesting feature of the 1993 FQP survey is that it provides the current establishment identification number (SIRET number) for 80% of the workers surveyed, and the 1988 establishment identification number for about the same number of respondents. This information is collected and coded in several

[4] For months of part-time, the survey specifies the number of hours worked per week.

stages which are described in Appendix A. We used these identification numbers to match the FQP individual file with the Corporate Tax Return databases (*Bénéfices Industriels et Commerciaux*, hereafter BIC). Each year, the French administration gathers all the available information on the annual fiscal situation of the firms in the BIC database.

We matched the FQP file successively with five BIC databases, i.e., for 1988, 1989, 1990, 1991, 1992. For each given year, the match turns out to be successful for about 80% of the 1993 available identification numbers and for about the same number of 1988 identification numbers. The employers not included are very small firms that are not bound to the same fiscal declarations as the larger ones.

When an employer is both in a fiscal database and in the FQP survey, we can extract (1) the number of employees (L_t), (2) the total wage bill (W_t), (3) and the total operating income (i.e., profit) for the corresponding year t. We use this information in order to build (1) the profit per worker of both the 1988 and 1993 employer between 1988 and 1992 (i.e., P_t/L_t, $t = 1988, \ldots, 1992$), (2) the mean wage paid by these employers between 1988 and 1992 (i.e., W_t/L_t, $t = 1988, \ldots, 1992$), (3) and the total growth employment rate of these firms between 1989 and 1992 (i.e., $(L_t - L_{t-1})$, $t = 1989, \ldots, 1992$) P_t), for each worker in the FQP survey. As for the 1993 employer, we are also able to build the mean wage of the co-workers in 1992 (i.e., $(W_{92} - W_{92})/(L_{92} - 1)$, where W_{92} is the 1992 wage of the considered worker).

In the econometric exercise, we focus on workers who were in the private-sector in 1988. Moreover, we only consider workers whose last participation in a continuous training program occurred in the 1988 firm between the beginning of 1989 and the beginning of 1992. To study the impact of training on earnings, it is indeed necessary to focus on training sessions which occur before the period that corresponds to the reported earnings (i.e., 1992). All in all, the size of the sample used in the econometric exercise is 4333. Information derived from the matched databases is available for about 60% of the workers in this sample.

3. The econometric model

The FQP survey gives three basic categories of wage determinants: (1) those that are unaffected by participation in continuous training (i.e., gender, educational level, age, size and industry of the firm providing the training, etc.); (2) those that can be affected by participation in continuous training (i.e., individual position in the occupational hierarchy, seniority); (3) and participation in continuous training itself. To study the impact of participation in continuous training between the beginning of 1989 and the beginning of 1992, one simple strategy is thus to make an OLS regression of the 1992 wages on (1) the 1992 measurement of the determinants which are unaffected by continuous training, (2) the 1988 measurement of the determinants that can be affected by continuous training, (3) a dummy

variable denoting participation in continuous training between the beginning of 1989 and the beginning of 1992.

Such an approach would be similar to most of the existing attempts to identify the impact of training. However, it still neglects several important issues.

First of all, workers are undoubtedly selected for training programs according to their measured *and* unmeasured abilities. If high unmeasured abilities determine both wages and training program selection, we can observe higher wages for workers who receive training even if the training has no real impact on wages.

Second, the impact of training on the wages of stayers (i.e., workers who do not switch firms after participating in a training program) is likely to be different than it is on the wages of movers. As for stayers, training specifically related to their positions in the firm can have a positive impact on their wages, whereas more general training may not have an impact at all. For movers, on the other hand, general training can have positive benefits on their value on the job market, whereas this kind of training may have absolutely no impact in their present company. Thus, we must consider post-training mobility as a potential determinant of the return to training and add both a mobility variable and a mobility-training interaction variable to the list of wage determinants.

Lastly, firms are most likely to train workers who are the least likely to quit or be fired after the training sessions. Thus, we can expect a negative correlation between being trained and post-training mobility. If this turns out to be the case and if a correlation exists between the unobserved determinants of mobility and wages, then the standard OLS estimates of the returns to training will still be biased, even if the unobserved determinants of training and wages are not correlated.

To address these basic selectivity issues, a wage model must be built with *two* selection criteria: training *and* post-training mobility. To be more specific, let T_i be the dummy that denotes that worker i was trained by his 1988-firm between the beginning of 1989 and the beginning of 1992 and let M_i be the dummy that denotes that worker i left his 1988-firm. We will consider the following system of three simultaneous equations:

$$T_i = 1 \text{ if } X_{1i}\alpha_1 + u_{1i} > 0 \text{ and } T_i = 0 \text{ otherwise} \quad (1)$$

$$M_i = 1 \text{ if } X_{2i}\alpha_2 + T_i\beta + u_{2i} > 0 \text{ and } M_i = 0 \text{ otherwise} \quad (2)$$

$$\log w_i = X_{3i}\alpha_3 + T_i\gamma_s + M_i(T_i\gamma_m + \phi_m) + \varepsilon_i \quad (3)$$

where w_i represents the wage of worker i in 1992. The γ_s coefficient represents the impact of training on the wages of stayers, while the γ_m coefficient captures the difference between the impact of training on movers and the impact of training on stayers. X_1 is a set of independent variables that influence participation in continuous training between the beginning of 1989 and the beginning of 1992 while X_2 is a set of independent variables that determine post-training mobility. Finally, X_3 represents a set of variables that determine wages for 1992.

Within our framework, identification does not require any exclusion restrictions and can be achieved by functional form. Notice, however, that our data-set provides variables that influence T_i, but not M_i (i.e., $X_1 \not\subset X_2$). This in itself is enough to identify β. Our data-set also contains variables that explain training and mobility, but not wages (i.e., $X_1 \not\subset X_3$ and $X_2 \not\subset X_3$). Again, this in itself is enough to identify the γ and ϕ coefficients.

More precisely, X_1 includes variables that describe the economic performances of the firm in 1988, *before* training (i.e., firm's mean wage, operating income and growth rate in 1988) while X_2 only includes the variables that describe the firm's performances from the same year as training. Lastly, X_3 includes variables that describe the firm's situation in 1992. We also include variables that describe the spouse's occupational situation as specific determinants of mobility.

The $(u_{1i},\ u_{2i},\ \varepsilon_i)$ triplets are assumed to be independent, identically and normally distributed. **V** represents their variance–covariance matrix with:

$$\mathbf{V} = \begin{bmatrix} 1 & \rho & r_1\sigma \\ \rho & 1 & r_2\sigma \\ r_1\sigma & r_2\sigma & \sigma^2 \end{bmatrix}$$

The ρ, r_1 and r_2 parameters control for the simultaneity of the employers' decisions. The unobserved factors that cause a firm to train a worker are likely to be those that also cause the firm to offer secure positions and promotions to the same worker.

There are several possible estimation methods for such a simultaneous equation model. It is possible to estimate all the parameters simultaneously using the maximum-likelihood technique. Such an approach is not difficult per se, but implies rather heavy computational burden. The model is recursive and we will follow a more comprehensive two-stage strategy. First, we will estimate the parameters that rule participation in training program (T_i) and mobility (M_i) using a bivariate-probit model. [5] This model provides estimates of $\lambda_{1i} = E(u_{1i}/T_i,\ M_i)$ and $\lambda_{2i} = E(u_{2i}/T_i,\ M_i)$ (see Appendix B). Second, we shall estimate the wage equation using λ_{1i} and λ_{2i} as supplementary independent variables in order to control for the selectivity of training and mobility. Within our framework, the selectivity bias (i.e., $E(\varepsilon_i/T_i,\ M_i)$) is a simple linear combination of λ_1 and λ_{2i} (again, see Appendix B). Notice that, if ρ is small, then the coefficient which corresponds to λ_{1i} (λ_{2i}) in the wage equation is proportional to r_1 (r_2).

4. Results

Let us first consider the results of the bivariate model, beginning with the training equation (Table 2).

[5] The bivariate probit was carried out with Gauss (version 3.1.3, maxlik procedure).

Table 2
Firm-provided training and post-training mobility. A bivariate probit analysis

Independent variables[a]	Estimate (standard error)
Dependent variable: participation in firm-provided training (T_i)	
Intercept	−1.713 (0.062)
Industry	
- agriculture, food, meat and dairy products	−0.233 (0.059)
- energy	0.480 (0.104)
- intermediate goods	−0.197 (0.060)
- equipment goods	−0.085 (0.055)
- consumer products	−0.600 (0.056)
- building and construction	−0.487 (0.056)
- wholesale and retail trade	−0.327 (0.059)
- transportation, telecommunications and mail	−0.022 (0.063)
- other private sector services	−0.228 (0.048)
- real estate and credit agencies	−0.162 (0.139)
- insurance	0.085 (0.089)
- banking and finance	ref
Firm size	
- 0 to 9 workers	−0.175 (0.033)
- 10 to 49 workers	ref
- 50 to 499 workers	0.297 (0.035)
- 500 workers or more	0.353 (0.035)
Educational level[b]	
- level 1 (no diploma)	ref
- level 2	0.159 (0.034)
- level 3	0.269 (0.040)
- level 4	0.277 (0.038)
- level 5	0.236 (0.117)
- level 6	0.382 (0.037)
- level 7	0.249 (0.097)
- level 8 (PhD)	0.227 (0.056)
Experience and seniority	
- experience ≤ 5 years, seniority ≤ 2 years	ref
- experience ≤ 5 years, seniority 2 to 5 years	0.221 (0.054)
- experience 5 to 10 years, seniority ≤ 2 years	0.043 (0.036)
- experience 5 to 10 years, seniority 2 to 5 years	−0.010 (0.047)
- experience 5 to 10 years, seniority 5 to 10 years	0.071 (0.032)
- experience 10 to 20 years, seniority ≤ 5 years	0.200 (0.032)
- experience 10 to 20 years, seniority 5 to 10 years	0.060 (0.030)
- experience 10 to 20 years, seniority 10 to 20 years	0.247 (0.033)
- experience 20 to 30 years, seniority ≤ 5 years	0.267 (0.034)
- experience 20 to 30 years, seniority 5 to 10 years	0.068 (0.035)
- experience 20 to 30 years, seniority 10 to 30 years	−0.083 (0.035)
- experience ≥ 30 years, seniority ≤ 5 years	0.151 (0.030)
- experience ≥ 30 years, seniority 5 to 10 years	−0.079 (0.095)
- experience ≥ 30 years, seniority ≥ 10 years	−0.485 (0.066)
Occupation type	
- managers and other senior executives	0.439 (0.050)
- engineers and higher-grade professionals	0.478 (0.055)

Table 2 (continued)

Independent variables[a]	Estimate (standard error)
Occupation type	
- technicians	0.641 (0.050)
- foremen	0.699 (0.053)
- other lower-grade professionals	0.680 (0.042)
- routine non-manual employees (administration)	0.508 (0.049)
- skilled manual workers (craftsmen)	0.315 (0.046)
- skilled manual workers (operators)	0.206 (0.048)
- other skilled manual workers	0.176 (0.051)
- unskilled manual and non-manual workers	ref
Women	−0.051 (0.032)
Change in the firm's total employment	
- expanding firm	−0.068 (0.041)
- contracting firm	ref
Firm's profit per employee	
- Op. income per employee > 100,000 Francs	0.024 (0.031)
- 50,000 ≤ op. Income per emp. ≤ 100,000 Francs	0.255 (0.054)
- 20,000 ≤ op. Income per emp. ≤ 50,000 Francs	0.221 (0.042)
- 0 ≤ op. Income per emp. ≤ 20,000 Francs	0.203 (0.049)
- op. income per emp. ≤ 0 Francs	0.192 (0.049)
- unknown	ref
Mean wage within the firm	
- mean wage > 200,000 Francs	0.249 (0.060)
- 170,000 ≤ mean wage ≤ 200,000 Francs	0.263 (0.048)
- 130,000 ≤ mean wage ≤ 170,000 Francs	0.183 (0.038)
- mean wage ≤ 130,000 Francs	ref
Dependent variable: Post-training mobility (M_i)	
Intercept	−0.624 (0.045)
Participation in a training program (T_i)	−0.121 (0.336)
Women	−0.081 (0.036)
Firm size	
- 0 to 9 workers	0.027 (0.032)
- 10 to 49 workers	ref
- 50 to 499 workers	−0.159 (0.041)
- 500 workers or more	−0.237 (0.042)
Educational level[b]	
- level 1 (includes no diploma)	ref
- level 2	−0.027 (0.044)
- level 3	−0.083 (0.042)
- level 4	−0.138 (0.050)
- level 5	0.033 (0.155)
- level 6	0.064 (0.090)
- level 7	0.293 (0.068)
- level 8	−0.084 (0.070)
Occupation type	
- managers and other senior executives	0.324 (0.076)
- engineers and higher-grade professionals	−0.043 (0.066)
- technicians	−0.075 (0.074)
- foremen	0.092 (0.059)

Table 2 (continued)

Independent variables[a]	Estimate (standard error)
Occupation type	
- other lower-grade professionals	0.070 (0.063)
- routine non-manual employees (administration)	−0.021 (0.045)
- skilled manual workers (craftsmen)	0.229 (0.037)
- skilled manual workers (operators)	0.048 (0.032)
- other skilled manual workers	0.131 (0.036)
- unskilled manual and non-manual workers	ref
Industry	
- agriculture, food, meat and dairy products	0.035 (0.052)
- energy	−0.123 (0.082)
- intermediate goods	0.129 (0.042)
- equipment goods	0.160 (0.036)
- consumer products	0.184 (0.054)
- building and construction	0.403 (0.050)
- wholesale and retail trade	0.334 (0.047)
- transportation, telecommunications and mail	0.387 (0.036)
- other private sector services	0.308 (0.043)
- real estate and credit agencies	0.493 (0.136)
- insurance	−0.125 (0.061)
- banking and finance	ref
Experience and seniority	
- experience ≤ 5 years, seniority ≤ 2 years	ref
- experience ≤ 5 years, seniority 2 to 5 years	−1.180 (0.083)
- experience 5 to 10 years, seniority ≤ 2 years	0.758 (0.064)
- experience 5 to 10 years, seniority 2 to 5 years	−1.372 (0.227)
- experience 5 to 10 years, seniority 5 to 10 years	−0.153 (0.072)
- experience 10 to 20 years, seniority ≤ 5 years	0.322 (0.054)
- experience 10 to 20 years, seniority 5 to 10 years	−0.498 (0.068)
- experience 10 to 20 years, seniority 10 to 20 years	0.122 (0.053)
- experience 20 to 30 years, seniority ≤ 5 years	−0.121 (0.050)
- experience 20 to 30 years, seniority 5 to 10 years	−0.625 (0.052)
- experience 20 to 30 years, seniority 10 to 30 years	−0.043 (0.047)
- experience ≥ 30 years, seniority ≤ 5 years	−0.496 (0.047)
- experience ≥ 30 years, seniority 5 to 10 years	−0.388 (0.060)
- experience ≥ 30 years, seniority ≥ 10 years	−0.171 (0.069)
Profit per employee (post-training)	
- Op. income per employee $>$ 100,000 Francs	0.089 (0.037)
- 50,000 $\leq$ op. income per emp. $\leq$ 100,000 Francs	−0.115 (0.045)
- 20,000 $\leq$ op. income per emp. $\leq$ 50,000 Francs	−0.187 (0.038)
- 0 $\leq$ op. Income per emp. $\leq$ 20,000 Francs	0.054 (0.036)
- op. income per emp. ≤ 0 Francs	−0.008 (0.035)
- unknown	ref
Mean wage within the firm (post-training)	
- mean wage $>$ 200,000 Francs	0.184 (0.035)
- 170,000 $\leq$ mean wage $\leq$ 200,000 Francs	−0.053 (0.034)
- 130,000 $\leq$ mean wage $\leq$ 170,000 Francs	0.034 (0.037)
- mean wage $\leq$ 130,000 Francs	ref

Table 2 (continued)

Independent variables[a]	Estimate (standard error)
Change in the firm's total employment (post-training)	
- expanding firm	−0.308 (0.031)
- contracting firm	ref
Gender and occupation of the spouse	
- man, manager, higher-grade professional	−0.105 (0.041)
- woman, manager, higher-grade professional	0.504 (0.072)
- man, foreman, technician	0.211 (0.028)
- woman, foreman, technician	0.198 (0.032)
- other occupation	ref
Gender and degrees of the spouse	
- man, vocational training diploma	0.306 (0.038)
- woman,vocational training diploma	0.118 (0.036)
- man, no diploma or primary diploma	−0.112 (0.035)
- woman, no diploma or primary diploma	0.217 (0.039)
- other degrees	ref
Gender and marital status	
- married man	−0.027 (0.033)
- married woman	−0.190 (0.033)
- single, divorced or widowed	ref
Correlation	
Between Training and Mobility	−0.171 (0.186)
Number of observations	4333
Log-likelihood	−3771.1

Source: FQP survey 1993, INSEE.
Field: wage-earners, not civil servants in 1988.
[a]In the training equation, the independent variables correspond to the situation in 1988. In the post-training mobility equation, the firm's variables correspond to the training firm's situation the same year the training takes place, while the worker's variables correspond to the same year as in the training equation (i.e., 1988).
[b]The educational levels are the following. Level 1: no diploma or the primary-school leaving diploma, now abolished CEP (*Certificat d'Etudes Primaires*); Level 2: The diploma at the end of fourth year of secondary school, the BEPC (*Brevet d'Etudes du Premier Cycle*); Level 3: vocational training diploma, mainly the CAP (*Certificat d'Aptitudes Professionnelles*) and the BEP (*Brevet d'Etudes Professionnelles*); Level 4: *baccalauréat*, the advanced high-school leaving diploma; a prerequisite for admission into university; Level 5: two years of academic post-*baccalauréat* studies (DEUG, *Diplôme d'Etudes Universitaires Générales*); Level 6: two years of vocational post-*baccalauréat* studies (*DUT*, *Diplôme Universitaire de Technologie*, and BTS, *Brevet de Technicien Supérieur*), paramedical diplomas; Level 7: three or four years post-*baccalauréat* of academic studies (*licence*, *maîtrise*); Level 8: college graduates, Ph.D.
Dependent variables: Participation in firm-provided training between 1989 and 1992 (T_i); Post-training mobility (M_i).

(1) Training is significantly more frequent among workers from large firms and from industries dominated by a few large companies, such as insurance, finance or energy. The probability of an employee participating in a training program also

depends on the firm's mean wage: the higher the firm's mean wage, the higher the frequency of training programs. In other words, the higher the average quality of the workforce, the higher the individual likelihood of receiving training.

On the contrary, the probability of being trained does not depend significantly on the firm's profit per worker or the change in total number of employees. De facto, training is neither more or less prevalent in expanding or declining firms.

(2) The probability of being trained depends strongly on the position within the occupational hierarchy. Interestingly, training efforts are not concentrated on occupations that are at the top or bottom of the hierarchy, but on those in the middle (technicians, foremen, etc.).

(3) When we consider workers with more than 20 years of experience in the labour market, training turns out to be significantly more prevalent among low-seniority workers compared to those who have spent most of their career within the same firm. On the contrary, when we consider workers with less than 20 years of experience in the labour market, the probability of being trained is greater among high-seniority workers.

(4) Training is the least prevalent among workers who have no educational qualifications at all. There are no significant variations as to who participates in training programs among educated workers.

All in all, there are less variations in training probability in relation to the level of transferable human capital (i.e., experience or education) than to the firms' characteristics or to the worker's position in the occupational hierarchy.

Let us now consider the mobility equation.

(1) Workers are more likely to leave small firms (< 50 employees) than large ones (50 employees or more). They are also more likely to leave firms that are downsizing than firms that are expanding. The firm's overall performance has a greater impact on the probability of an individual leaving the firm than on him or her being trained.

(2) Workers who hold managerial positions within the occupational hierarchy are more likely to leave their firms than those in subordinate positions. However, the position in the occupational hierarchy has much less impact on the probability of an individual changing firms than on him/her being trained.

(3) When we consider workers with more than 20 years of experience in the labour market, changing firms turns out to be significantly less prevalent among low-seniority workers. On the contrary, when we consider workers with less than 20 years of experience in the labour market, the likelihood of them changing firms is stronger among those with the longest seniority.

(4) The impact of training on changing firms is negative, but small and not significantly different from zero.

Let us recall that this impact is identified because the variables that describe the firm's economic situation correspond to 1988 in the training equation (i.e., a pre-training year), while they correspond to the training year in the mobility equation.

Moreover, there are some more training determinants that do not belong in the set of variables that influence the likelihood of changing firms. For instance, training is much less frequent within very small firms (i.e., < 10 employees) than within firms with 10–50 employees, while there is no significant differences between the exit rates of the workers from these two categories of firms. The incidence of training reaches its lowest level in the consumer-product industry, even though the workers within this industry are neither more nor less mobile than the workers of the other industries. Similarly, technicians and foremen are more likely to participate in continuous training than both unskilled and skilled workers, while they are neither more nor less mobile. In France, workers with no educational qualifications are less likely to be trained than those with the lowest level of formal education, but are not more likely to change firms. All these differences contribute to the identification of the net impact of training on mobility.

The last significant result from our bivariate analysis concerns the estimated ρ coefficient: it is negative, but very small and not significantly different from zero. We can consider that important determinants of both training and mobility were not omitted.

Let us now consider the wage equation (Table 3, Model 1).

(1) The estimated γ_m, ϕ_m and γ_s are negative, but not significantly different from zero. As it turns out, French workers who received training between 1989 and 1992 did not earn more than the others in 1992.

(2) There are no significant wage variations in relation to the profit per worker or to the firm's growth rate. Workers did not earn more in high-profit firms than in low-profit ones. However, ceteris paribus, the higher the average wage of co-workers, the higher the individual worker's wage.

(3) The other estimated impacts are very standard and are not reported in the table. Wages are higher in large firms than in small ones, and they increase according to education or experience in the labour market. [6]

(4) The estimated r_1 is positive and significantly different from zero. The unobserved determinants of participation in firm-provided training programs turn out to be wage determinants. High-wage workers are more likely to be selected for a training programs than other workers.

The estimated r_2 is positive, but not significantly different from zero. The unobserved determinants for changing firms are only slightly correlated with wages.

In order to have an idea about the kind of bias that these correlations can induce, we have made supplementary regressions without the λ_{1i} and λ_{2i} variables (Table 3, Models 2 and 3). Within this framework, the estimated γ_s becomes positive, and is significantly different from zero (about $+7\%$). Using the same

[6] When we add «time elapsed since training» as an additional explanatory variable for wages, we find that its impact is positive (about one percent per year) but not significantly different from zero.

Table 3
The impact of firm-provided training on wages

Independent variable[a]	Model (1)	Model (2)	Model (3)
Firm-provided training (T_i)	−0.057 (0.068)	0.066 (0.020)	0.071 (0.020)
Post-training mobility (M_i)	−0.117 (0.084)	−0.076 (0.017)	−0.075 (0.017)
Interaction Training-Mobility ($T_i \times M_i$)	−0.013 (0.047)	−0.005 (0.046)	−0.008 (0.046)
Mean wage of the coworkers			
- mean wage > 200,000 Francs	0.092 (0.034)	0.099 (0.034)	–
- 170,000 ≤ mean wage ≤ 200,000 Francs	0.033 (0.033)	0.038 (0.033)	–
- 130,000 ≤ mean wage ≤ 170,000 Francs	0.005 (0.027)	0.007 (0.027)	–
- mean wage ≤ 130,000 Francs	−0.048 (0.028)	−0.049 (0.027)	–
- mean wage unknown	ref	ref	–
Profit per worker			
- Op. Income per worker > 100,000 Francs	ref	ref	–
- 50,000 ≤ op. Income per w. ≤ 100,000 Francs	0.015 (0.028)	0.016 (0.028)	–
- 20,000 ≤ op. Income per w. ≤ 50,000 Francs	0.017 (0.028)	0.019 (0.028)	–
- 0 ≤ op. Income per w. ≤ 20,000 Francs	0.031 (0.030)	0.034 (0.030)	–
- op. Income per w. ≤ 0 Francs	0.010 (0.029)	0.013 (0.029)	–
Growth rate of the number of employees			
- expanding firm	−0.003 (0.024)	−0.002 (0.024)	–
- contracting firm	ref	ref	–
λ_1	0.072 (0.038)	–	
λ_2	0.024 (0.048)	–	–
R^2	0.513	0.512	0.509
Number of parameters	453	451	442
Sample size	4333	4333	4333

Source: FQP survey, 1993, Insee.
Field: wage-earners in 1988 and in 1993, not civil servants.
[a]Each model also includes also the following explanatory variables (not reported in the table): experience in 1988 and seniority in 1988 (14 dummies), nationality (French, foreign), place of residence (Paris, non-Paris), gender, industry of the employing firm (96-heading classification), 5 firm size dummies, 318 occupation type dummies, 8 educational-level dummies. Standard errors are in parentheses.
To estimate λ_1 and λ_2, we used the probit model presented in Table 2 (see Appendix B).

French survey and analysing standard OLS regressions, Hocquet (1997) has reported similar estimates.

Thus, when we do not control for training and mobility selectivity, French data yield results which lie between those reported by Pischke (1996) for Germany and those reported by Blanchflower and Lynch (1994) for the United States, or by Groot et al. (1994) for the Netherlands. Using German panel data and individual fixed effect models, Pischke (1996) analysed a three-year period and reported a return to company-provided training programs of 2% for men and 5% for women. Blanchflower and Lynch (1994) report a return to company-training of around 12% in the United States, when analysing the earnings of non-college graduates at age 25 minus their earnings at age 20 (see also Lynch, 1992). Considering samples

of Dutch workers with the same observed characteristics from 1953, Groot et al. (1994) estimate that, in 1983, employees who had participated in company-training programs earned around 11% more than the others.

5. Discussion

As it turns out, participation in firm-provided training has no real impact on wages. To what extent does this result reflect the special features of the French system? For instance, can we argue that this result reflects the French scheme as being peculiarly selective?

According to a recent survey conducted by Eurostat on the European Community, participation in firm-provided training is almost four times higher in firms with more than 1000 employees than in those with 10–50 employees (see Kerr, 1996). The same survey shows that the incidence of firm-provided training in Europe is six times higher in white-collar industries (finance, insurance or energy industries) than in blue-collar industries (consumer-product sector, construction). Knoke and Kallenberg (1994) report that the same results hold true for the United States. In particular, large US firms provide much more training than small ones. Thus, the strong variations in training practices across firms and industries do not seem to be a distinctive feature of the French system. [7]

De facto, the French scheme lowers the marginal training costs for all workers in firms with more than ten employees, regardless of their occupations. Firms receive no special incentive for training certain categories of workers over others. [8] Furthermore, the same legal constraints are applied to all firms, whatever their size or industry. The objective of this scheme is to encourage uniform increases in firm-provided training rather than to modify the distribution of training efforts across the different categories of firms and workers.

Concerning the zero-impact of training on wages, it can be argued that French firms are given incentive to provide cosmetic training scheme that have little impact on productivity. De facto, they lose money when they do not give the impression that they train their employees. The zero-impact would reflect the peculiarity of the French system that encourages training even when it is not needed.

[7] Kerr (1996) does not report specific figures about inequalities in training opportunities across occupations within the different industries. However, according to Pischke (1996), the German white-collar workers receive a lot more training than German blue-collar. In France and Germany, the probability of being trained depends on the individual's position in the occupational hierarchy as much as on the size of the firms.

[8] In this respect, the French system is different from those whose training courses are directed towards specific populations of workers, like in Denmark, for example (see Jensen et al., 1993).

It is somewhat difficult to follow this argument. First, about 28% of the workers from the French private-sector are in firms with *less* than ten employees. These firms are not bound by the legal constraints. Second, according to the French Labour Ministry, firms with more than ten employees that spend more than the legal 1.5% represent each year about 60% of the total number of workers in firms with more than ten employees.[9] Lastly, the firms with more than ten employees that do not spend anything—and pay the 1.5% tax—represent about 5% of the same total. All in all, about 80% of the workers from the French private-sector are either in firms that are not concerned by the law (<10 employees) or in firms with more than 10 employees that either spend more than required by law or nothing at all. Thus, each year, the vast majority of workers are in firms which training efforts are no doubt pertinent and certainly not cosmetic.

The zero-return result is much more likely to be linked to selectivity than to the particularities of the French system and data. When we do not build upon the special features of our matched worker–firm database, we find that training has an impact on wages highly similar to those already found in other countries.

From a theoretical standpoint, Becker (1964) shows that within a competitive context, firms are not likely to provide training programs that improve the market value of their workers: the more transferable the training investment, the more difficult it is to receive a return on it. Competitive firms are the most likely to sponsor training programs that increase non-transferable skills and have no impact on the workers' market value and wages. Perhaps a more sophisticated model could explain that employer-provided training actually improves wages, but the basic human capital model does not seem to hold true for this hypothesis. A more surprising result would be to find that that firm-provided training has no real impact on the *firms'* performance. Further research is still needed to explore this issue.

6. Conclusion

Concerning the impact of training on wages, our study yields three main results: (1) When we use the same kinds of data and models as the existing ones, we find that French workers earn about 5% more after a training period. This is a rather standard result.

(2) When we build on the uniqueness of our French data and control for both the selectivity of firms' training practices and the selectivity of post-training mobility, our estimated returns to training fall close to zero. Most of the wage differential observed across trained and untrained workers reflects that workers who are the most likely to be chosen for training programs are also those who

[9] The firms whose training efforts are twice as high as the legal 1.5% represent one third of the total number of workers in firms with more than ten employees.

have the highest unobserved abilities. This result holds true for both stayers and movers.

(3) Firm-provided training lowers the probability of employees switching firms. However, the net impact of training on mobility is small and not significantly different from zero.

These results do not mean that firm-provided training does not improve productivity. They only suggest that training mostly benefits employers. We need further research to analyse the firms' performance and to test this hypothesis.

In this paper, we do not differentiate training programs according to the acquired qualifications. Further research is needed to further explore whether the selection process and the impact of training vary across the different training categories.

Appendix A

The respondents give their work address and its identification number (if they know it). [10] The data are entered into a computer, then assembled at a computing centre in Nantes for collation with the official national business register, SIRENE. In nearly 60% of the cases, the information gathered from the respondent offers an instant, straightforward match with a single establishment in the official register. For all these cases, the national centre extracts the relevant information on the employer from SIRENE which is then used to enhance the final FQP file. In other words, the information on establishments and companies that appears in the final file (including location, industry, and SIRET number) is taken from the legal register, not from survey respondents. In about 20% of the cases, the information obtained from the respondent matches two possible establishments in SIRENE. Typically, they are establishments from the same company with similar or identical addresses. For these occurrences, the coding centre lists the two possible responses; it is up to the INSEE survey local managers to choose the most likely case. Here as well, the employer's information incorporated into the survey file is derived from the official register, not from the statements of the workers surveyed. In the 20% or so remaining cases, the address given by the respondent is incorrect or incomplete, preventing the work establishment from being identified. It should be noted that all the employer identification numbers chosen comply with a dual arithmetic constraint. [11] No identification number can be transferred to the FQP

[10] SIRET numbers appear on pay slips.

[11] The establishment identification number (SIRET number) comprises 14 digits, of which the first nine are the enterprise identification number (SIREN number). Let $x_1, x_2, \ldots, x_{14}$ be the digits, $x_0 = 0$, and $y_k = 2x_k$. also, if y_k has two digits, let x_k^1 and x_k^2 be these two digits. If y_k has justone digit, let $x_k^1 = 0$ and $x_k^2 = y_k y$. The numbers $\Sigma_{k=0}^{6}(x_{2k}^1 + x_{2k}^2 + x_{2k+1})$ and $\Sigma_{k=1}^{7} x_{2k-1}^1 + x_{2k-1}^2 + x_{2k}$ must be multiples of 10.

survey file unless it meets that constraint, so coding errors are highly improbable. Concerning the firm in 1988, the identification stages for the 1988 work address are quite the same as for the current work address. During the interview, the respondents are asked the address of the establishment where they work in 1988.

Appendix B

First, using the same notations as in the text, we have:

$$E(\varepsilon_i/F_i, M_i) = \theta_1 \lambda_{1i} + \theta_2 \lambda_{2i} \tag{B1}$$

with $\theta_1 = \frac{r_1 - \rho r_2}{1-\rho^2}\sigma$ and $\theta_2 = \frac{r_2 - \rho r_1}{1-\rho^2}\sigma$. To control for selectivity bias, we only need to estimate λ_{1i} and λ_{2i}. Notice that when $\rho = 0$ then θ_j is simply proportional to r_j.

Second, if D_{jmi} denotes the dummy variable whose value is one when $(-1)^m(X_{ji}\alpha_j + u_{ji})$ is positive, we can write:

$$\lambda_{ji} = \sum_{l=1}^{2}\sum_{k=1}^{2} D_{1ki} D_{21i} E\left(u_{ji}/D_{1ki} = 1; D_{21i} = 1\right) \tag{B2}$$

Thus, to estimate the λ_{j1} we only need to estimate the different $E(u_{ji}/D_{1ki} = 1; D_{21i} = 1)$. The estimation of these variables is a joint-product of the bivariate-probit. We can use the following formula:

$$E(u_1/u_1 < x; u_2 < y) = -\frac{\varphi(x)\phi\left(\frac{y-\rho x}{\sqrt{1-\rho^2}}\right) + \rho\varphi(y)\phi\left(\frac{x-\rho y}{\sqrt{1-\rho^2}}\right)}{\phi_2(x; y; \rho)} \tag{B3}$$

where φ is the probability density function and ϕ the cumulative distribution function of the standard normal distribution, while ϕ_2 is the cumulative distribution function of the standard bivariate normal distribution.

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