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IS TRAINING MORE FREQUENT WHEN WAGE COMPRESSION IS HIGHER? EVIDENCE FROM 11 EUROPEAN COUNTRIES

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Abstract

In this empirical paper, I use the 1996 wave of the ECHP dataset to investigate the relationship between measures of wage compression and training incidence in 11 European countries. After controlling for individual factors and country specific institutional differences, I find evidence of a positive and significant relationship between wage compression and training, both firm-specific and general. While the finding for firm-specific training is consistent with both competitive and non-competitive approaches, the result for general training is only consistent with the non-competitive approach.

JEL Classification: J24, J31.

Keywords: training, Europe.

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1 Introduction

Becker's theory of training predicts that in a competitive labor market a compressed wage structure discourages investment in general skills. In this theory, workers pay for their general training and a more compressed wage structure reduces the private incentives to undertake the investment. When labor markets are not competitive, however, wage compression can encourage firms to pay for general training and can increase the overall investment in general skills (see Acemoglu and Pischke [1999], hereafter AP).

According to AP, wage compression occurs when the (marginal) effect of firm - sponsored training on productivity exceeds the (marginal) effect on the firm's wage. By paying for training, the firm can increase output more than wages. In these circumstances, training can be more profitable than no training. The positive effect of wage compression on general training is clear when the training cost is entirely borne by the firm. When the cost is shared by the firm and the worker, the total investment in general skills can increase or decrease[1].

When training is firm - specific, firms and workers share the costs and the benefits of the investment. In this case, independently of whether labor markets are competitive or non - competitive, a higher degree of wage compression increases the firm - sponsored component and reduces the worker - financed component of training. Overall, total investment in firm - specific skills can increase or decrease.

Wage compression can be generated by labor market institutions, including the minimum wage and wage bargains that involve unions. Previous empirical research in the U.S. on the relationship between labor market institutions that affect wage compression and training compares training incidence in states with different institutions (see AP [1999b], Leighton and Mincer [1988] and Neumark and Wascher [2001])[2].

AP suggest that a complementary approach is to look at training

[1] AP stress this point as follows: "..It is important to emphasize, overall, that non - competitive theories do not predict that wage compression should necessarily increase training, but that this is a possibility." (p.16)

[2] An interesting recent study by Peraita [2001] focuses on Spain.

incidence across countries with different wage structures. A prediction of the non - competitive theory of training is that company provided formal training should be higher in countries with a more compressed wage structure. They notice, however, that the comparison of training levels across countries can be difficult because the data are collected using different methods, and the measured training levels are not easily comparable (AP [1999]).

This difficulty is partially removed in the European Community Household Panel (ECHP), a large household survey that covers most member countries in Europe. Rather than trying to harmonize output from national surveys, the European statistical agency (Eurostat) adopts an input oriented approach and uses the same "community" questionnaire as the base for the national versions of the survey. The data are collected by the National Collection Units and finally checked by Eurostat (European Community [1999]). A desirable feature of ECHP is that the definitions of and questions on training and earnings, the reference period and the survey methods are common across countries. This format increases comparability, but does not eliminate all problems, as the interpretation of common questions can vary across countries because of country - specific institutions and history (OECD [1991]).

In this empirical paper, I use the 1996 wave of ECHP to investigate the relationship between wage compression and training incidence in 11 European countries. To preview the main results, I find that, after controlling for individual factors and country specific observed and unobserved differences, there is evidence of a positive and significant relationship between wage compression and firm - specific training. More importantly, this positive relationship is confirmed in the case of general training. While the former finding is consistent with both competitive and non - competitive approaches to training, the latter result is only consistent with the non - competitive approach.

The material included in the paper is organized as follows. Section 2 illustrates the empirical strategy, Section 3 describes the data and Section 4 presents the results. Conclusions follow.

2 The empirical strategy

Comparative work on post-school training shows that the incidence of training varies considerably across developed countries (see Lynch [1994]). This variation is often explained by the presence of institutional factors. In some countries, the argument goes, there is a set of institutions, including the school system, local chambers of commerce, employer association and work councils that support a high training equilibrium (Soskice [1994]). Labor market institutions that compress the wage structure and affect the expected returns to training can also influence the training decision. Examples of these institutions are the minimum wage, labor unions, and the degree of centralization of the wage bargain.

The degree of wage compression varies across OECD countries (see OECD [1999]). Given this variation, it is tempting to look at the correlation between country - specific measures of wage compression and training incidence. This approach, however, has two problems. First, there are other country - specific variables beside wage compression that can affect training; second, the heterogeneity of individuals and jobs suggests that the relevant measure of wage compression should not refer to the entire wage distribution in a country.

To illustrate the second point, consider the decision to invest in training by a 35 years old professional who is employed in the service sector. Conditional on productivity, the relevant measure of wage compression for this individual is earnings after training relative to earnings before training takes place. Assuming that the available information on the wage distribution is used to infer individual wages, a reasonably close proxy of the relevant measure of wage compression for this professional can be constructed by using the portion of the observed wage distribution that refers to employees in the same broad profession and sector and with at least 35 years of age. Since earnings vary with age, occupation and sector, the portion of the wage distribution associated to younger employees in completely different professions and sectors is unlikely to be informative.

Define C_{cjsa} as the selected measure of wage compression in country c, occupation j, sector s and age group a. It is convenient to specify the empirical relationship linking individual training and wage compression as follows

$$T_{icjsa} = \alpha + \beta X_{icjsa} + \gamma D_c + \delta D_j + \kappa D_s + \lambda D_a + \sigma C_{cjsa} + \epsilon_{icjsa} \quad (1)$$

where T is a dummy equal to 1 if the individual i has invested in training and to 0 otherwise; X is a vector of individual controls, D_c, D_j, D_s and D_a are vectors of country, occupation, sector and age group dummies and ϵ_{icjsa} is the error term. The dummies capture observed and unobserved country, sector, occupation and age group effects on training incidence. Country dummies, for instance, capture institutional factors as well as average wage compression, and sectorial dummies absorb the differences in the relative importance of training across industrial sectors. Conditional on these dummies, the coefficient σ in (1) is identified by the within - country variation in the selected measures of wage compression.

I measure wage compression C in two alternative ways: first, I consider the 90 - 10 wage differential ($D91$) by country, occupation, sector and age group. This differential is the ratio of the upper earnings limit of the ninth decile of employees to the upper limit of the first decile. Second, I use the 90 - 50 ($D95$) and the 50 - 10 ($D51$) wage differentials. The higher the value taken by these indicators, the lower wage compression. Notice that wage compression could be affected by the decision to invest in skills, because individual wages depend on training. I avoid this problem by using measures of training from one wave and measures of wage compression from a previous wave of the same survey.

3 The data

The data on training incidence used in this paper are drawn from the 1996 wave of the European Community Household Panel. As pointed out in the introduction, the main advantage of these data is that the same "community" questionnaire is adopted by the national data collection units in each participating country, which increases comparability. The survey is composed of a household and a personal file, and the same households and individuals are interviewed over time. The 1996 wave covers individuals from 14 countries and the reference period is the calendar year before the survey[3].

The key question on training in the survey asks whether the interviewed individual has been in vocational education or training during the reference period[4]. Respondents who have been in vocational education or training are asked to select the type of training received among the following options: a) third level qualification, such as technical college; b) specific vocational training at a vocational school or college; c) specific vocational training within a system providing both work experience and complementary instruction elsewhere; d) specific vocational training in a working environment, without complementary instruction elsewhere[5].

I use this classification to distinguish between general and firm - specific training. Option c) refers to training in systems that alternate school work with work experience, as in the German dual system. Following AP [1999], who treat this system as general training, I consider options a, b and c as general and option d as firm specific training[6]. General training accounts for about 48% of all training episodes in the selected sample. The large majority of all training events (about 80% of the total) is paid or organized by the employer. This percentage falls to about 69% in the case of general training.

In this paper I consider only male employees aged between 16 and 55 in 1995 who are employed in manufacturing, building and private services, and I avoid endogeneity issues by computing the measures of wage compression $D91$, $D95$ and $D51$ from the 1994 wave, at the price of excluding individuals from Austria and Finland, who are interviewed

[3] The participating countries are: Austria, Germany, Denmark, Netherlands, Belgium, Finland, France, UK, Ireland, Italy, Luxembourg, Greece, Spain, Portugal. I exclude Luxembourg from this study because of its small size.

[4] The exact wording of the question in the 1996 survey was: "Have you at any time since January 1995 been in vocational education or training, including part-time or short courses?"

[5] The residual option "other" has few observations, that are dropped from the sample.

[6] The main results of the paper hold also when a narrower definition of general training, that includes only options a) and b), is used.

Table 1. Training incidence and measures of wage compression, by country. Male employees.

	T	$D91$	$D95$	$D51$
Germany	.239	5.417	1.683	3.234
Denmark	.442	3.289	1.511	2.179
Belgium	.198	3.316	1.636	2.013
France	.176	3.263	1.775	1.851
UK	.403	4.282	1.896	2.238
Ireland	.096	4.743	1.613	2.870
Italy	.067	3.242	1.649	1.980
Spain	.134	3.254	1.788	1.840
Portugal	.024	7.077	2.199	3.157
Netherlands	.135	2.464	1.476	1.671
Greece	.047	3.618	1.678	2.149

Note: T=training incidence (both firm - specific and general) in 1995; $D91$: 90 - 10 wage differential, computed as the ratio of the 90th percentile wage to the 10th percentile wage; $D95$: 90 - 50 wage differential, computed as the ratio of the 90th percentile wage to the 50th percentile wage; $D51$: 50 - 10 wage differential, computed as the ratio of the 50th percentile wage to the 10th percentile wage. Source: ECHP.

only in 1996. Table 1 shows both training incidence in 1995, defined as the percentage of employees in the sample who have undertaken either firm - specific or general training in the reference period, and average wage compression by country[7].

Training incidence is highest in Denmark, the UK and Germany and lowest in Portugal, Greece and Italy. The evidence in the table is broadly consistent with the comparative evidence provided by the OECD and drawn from national surveys, which shows that training incidence in (West) Germany and the UK is higher than in France and Spain (OECD [1991]).

[7] While the relationship

$$D91 = D95 * D51$$

holds in each cell (defined by the country, occupation, sector and age group), it does not necessarily hold when I consider country averages.

Turning to the measures of wage compression, one well known source is the OECD [1999], which has computed country specific values of $D91$, $D95$ and $D51$ for the early 1990. There are several problems with this source for the purposes of this paper: first, information on Spain, Greece and Ireland is missing; second, information on Germany is limited to the previous West Germany; last but not least, the OECD indicators are developed using heterogenous national sources. I overcome these problems by using the 1994 wave of ECHP. My definition of earnings is net annual wages and salaries of individuals with paid employment and working full - time between 30 and 70 hours per week[8].

Considering first $D91$ and recalling that wage compression is higher when $D91$ is lower, the table shows that average wage compression is lowest in Portugal, Germany (inclusive of the previous East Germany), the UK and Ireland, and highest in Spain, Italy and the Netherlands. In the UK and Portugal wage compression is comparatively low both in the upper ($D95$) and in the lower part ($D51$) of the earnings distribution. It is particularly low in Germany and Ireland only below median earnings. In Spain, wage compression is either higher or lower than in Germany depending on whether one considers earnings below or above the median.

Visual inspection of the table does not show a clear relationship between country - specific training incidence and average wage compression. This is not surprising, since the discussion in the previous section suggests that country specific indicators of wage compression are less informative than indicators that apply to portions of the wage distribution. Therefore, I construct measures of wage compression that vary by country, occupation, sector and age group. In order to avoid having too few observations in each portion of the wage distribution, I divide occupations into managers, technicians and professionals on the one hand and clerks and blue collars on the other hand; I also divide sectors into manufacturing and building and private services. Finally, I retain the entire age spectrum for individuals in the age group 16-35 and only the earnings distribution of those aged more than 35 for the age group 36-55. The reason for this choice is that the portion of the wage distribution

[8] With the exception of France, where earnings are gross of taxes.

Table 2. Measures of wage compression, by profession, sector of activity and age group. Male employees.

	$D91$	$D95$	$D51$
Managers / Professionals	4.203	1.790	2.312
Clerks and Blue Collars	3.288	1.542	2.113
Manufacturing and Building	4.057	1.715	2.324
Services	3.928	1.751	2.210
Age < 36	4.757	1.726	2.706
Age > 35	3.225	1.740	1.826
All	3.992	1.733	2.266

Note: $D91$: 90 - 10 wage differential, computed as the ratio of the 90th percentile wage to the 10th percentile wage; $D95$: 90 - 50 wage differential, computed as the ratio of the 90th percentile wage to the 50th percentile wage; $D51$: 50 - 10 wage differential, computed as the ratio of the 50th percentile wage to the 10th percentile wage. Source: ECHP.

that refers to employees aged 16 to 35 is not relevant as a proxy of individual wage compression for employees aged more than 35.

Table 2 shows the average values of $D91$, $D95$ and $D51$ for the two occupational groups, the two sectors and the two age groups. Wage compression, measured by $D91$, is lower among managers and professionals than among clerks and blue collars and in the manufacturing and building sector than in the private services sector. Quite naturally, given that earnings profiles are concave, junior workers face lower compression than senior workers.

4 The Empirical Evidence

I start the empirical analysis by estimating the following probit model

$$\Pr ob\left[T_{icjsa}=1\right]$$
$$=\Phi\left[\alpha+\beta X_{icjsa}+\lambda A_{icjsa}+\gamma D_c+\delta D_j+\kappa D_s+\sigma \ln C_{cjsa}\right] \quad (2)$$

where Φ is the standard cumulative normal. I define the dependent variable T as equal to one in the event of both general and firm - specific training and to zero in the event of no training. Moreover, I use the logarithm of C as the measure of wage compression, individual age A in place of age dummies, and a detailed list of occupations and sectors to construct 8 occupational dummies and 12 sectorial dummies. The vector X includes the following variables: two education dummies, one for attained tertiary education ($College$) and the other for attained upper secondary education ($High\ Sch$); experience, defined as age minus age at labor market entry (Exp); marital status ($Married$); and long term unemployment ($Ul = 1$: presence of at least one unemployment spell longer than one year in the five years before 1995, 0 otherwise).

Average age and experience in the sample are 36.62 and 18.67 years respectively. The percentages of employees with college education and a high school degree are 0.175 and 0.393; close to 62% of all employees are married and 8.9% have experienced at least one spell of long term unemployment.

I take explicitly into account the fact that training T and wage compression C are measured at different levels of aggregation and adjust the standard errors by allowing errors to be independent among clusters (country by occupation by sector by age group) and dependent within clusters. Table 3 contains the estimates of the probit model. I use the log of $D91$ as the measure of wage compression in column (1) and the log of $D95$ and $D51$ as alternative measures of wage compression in column (2).

I find that training incidence is higher among college graduates, as expected. I also find that training is lower among the more experienced and those who are married. Importantly, the experience of a spell of long term unemployment in the five years before the survey reduces the probability of training. This result confirms that long term unemployment has a scarring effect. The size of the effect, however, is small: the discrete change in the probability of training associated to the experience of a long term unemployment spell is -0.037[9].

[9] This change is computed as the probability of training when $ul = 1$ minus the probability of training when $ul = 0$, by keeping the other independent variables at their sample mean values.

Table 3. Probit regression with measures of wage compression. Dependent variable: vocational education and training in 1995. Male employees.

	With $D91$	With $D51$ and $D95$
College	0.438* (0.052)	0.438* (0.052)
High School	0.212* (0.051)	0.211* (0.051)
Age	-0.003 (0.006)	-0.003 (0.006)
Experience	-0.014* (0.004)	-0.014* (0.004)
Married	-0.023 (0.036)	-0.023 (0.036)
Ul	-0.227* (0.077)	-0.228* (0.077)
D91	-0.205* (0.056)	-
D95	-	-0.325 (0.193)
D51	-	-0.182* (0.067)
CoDum	Yes	Yes
OccDum	Yes	Yes
SecDum	Yes	Yes
R - sq	0.186	0.186
# obs.	14135	14135

Note: training includes both firm - specific and general training. Cluster adjusted robust standard errors in parentheses with p<0.01 = *. College: college dummy; High School: high school dummy; Experience: actual experience; married: marital status; Ul: long term unemployment dummy; $D91, D95$ and $D51$: 90 - 10, 90 - 50 and 50 - 10 wage differentials; CoDum: country dummies; OccDum: occupation dummies; SecDum: industry dummies.

The key result in the table is that there is evidence of a negative and significant relationship between $D91$ and training incidence. Since wage compression is lower the higher the value taken by $D91$, this evidence points to the presence of a positive and significant relationship between wage compression and training. Based upon these findings, I calculate that a one percent increase of wage compression increases the probability of training by 0.038[10].

I also find evidence of a negative relationship between $D95$, $D51$ and training incidence. The estimated effect is quantitatively larger but less precise for $D95$ than for $D51$. I calculate that a one percent reduction in $D95$ and $D51$ raises the estimated probability of training by 0.061 and 0.034 respectively. The larger effect of $D95$ can be explained by noticing that training incidence is significantly higher among individuals with earnings in the upper part of the income distribution. On average, this incidence is 0.260 among individuals with earnings above the median and 0.163 among individuals with earnings below the median[11]. Training occurs more frequently among individuals in the upper part of the earnings distribution, and these individuals look at this part of the distribution to extract information on wage compression and their expected wages.

The probit regression in Table 3 does not distinguish between firm - specific and general training. I capture the difference between these two types of training by allowing the dependent variable T to assume three separate values, 0 in the case of no training, 1 in the case of firm - specific training and 2 in the case of general training. Since these categories are not naturally ordered, I estimate a multinomial logit model, using no training as the baseline category. Each estimated coefficient reported in Table 4 can be interpreted as the proportional change in the odds ratio when the associated independent variable changes marginally.

[10] Letting $Prob(T=1) = \Phi(x^{'}\beta)$, this change is computed as

$$\frac{\partial \Phi}{\partial x} = \phi(x^{'}\beta)\beta$$

where ϕ is the normal density function. The calculation is performed by the option *dprobit* in Stata 7.0.

[11] Peraita [2001] finds a similar distribution of training by income in Spain.

The table shows that a marginal increase in wage compression (equivalent to a marginal reduction in $D91$, $D95$ and $D51$) leads to an increase in the log odds ratio of firm - specific and general training with respect to no training. To illustrate these results, recall that the exponentiated value of the estimated coefficients is the relative risk ratio for a unit change in the corresponding variable, which shows how the probability of (firm - specific and general) training varies relative to no training when wage compression changes. It turns out that the relative risk ratio is equal to 0.702 in the case of firm - specific training and to 0.525 in the case of general training. Since both ratios are less than 1, either type of training becomes less likely relative to no training when wage compression declines. Qualitative results do not change when I consider $D95$ and $D51$ in place of $D91$. The larger effect of $D95$ on training incidence is also confirmed, but only in the case of general training.

The qualitative findings in Table 4 do not depend on the adopted definition of general training and hold also when a narrower definition is used, that allocates specific vocational training within a system providing both work experience and complementary instruction elsewhere (the dual system) to firm - specific rather than to general training[12]. Overall, I find a positive relationship between wage compression and training, both firm - specific and general. While the result concerning firm - specific training is consistent with both competitive and non - competitive theories of training, the evidence about general training is only consistent with the non - competitive approach.

5 Conclusions

In this empirical paper, I have used the 1996 wave of the ECHP dataset to investigate the relationship between measures of wage compression and training incidence in 11 European countries. I have accounted for the presence of cross - country variation in training incidence with country - specific dummies, that capture country specific observed and unobserved effects, including the wide array of institutions which affect the decision

[12] The estimates are available from the author upon request.

Table 4. Multinomial logit with with measures of wage compression. Dependent variable: vocational education and training in 1995. Male employees.

	Firm specific tr.		General training		Firm specific tr.		General training	
College	0.809*	(0.105)	0.753*	(0.148)	0.814*	(0.106)	0.764*	(0.146)
High School	0.469*	(0.106)	0.362*	(0.138)	0.472*	(0.106)	0.357*	(0.136)
Age	0.020	(0.115)	-0.042*	(0.016)	0.019	(0.118)	-0.041*	(0.015)
Experience	-0.035*	(0.009)	-0.013	(0.011)	-0.035*	(0.009)	-0.011	(0.107)
Married	0.067	(0.089)	-0.106	(0.085)	-0.068	(0.089)	-0.097	(0.086)
Ul	-0.251	(0.199)	-0.597*	(0.196)	-0.249*	(0.200)	-0.608*	(0.197)
D91	-0.353*	(0.133)	-0.644*	(0.146)	-		-	
D95	-		-		-0.118	(0.374)	-2.277*	(0.554)
D51	-		-		-0.407*	(0.157)	-0.426*	(0.186)
CoDum	Yes		Yes		Yes		Yes	
OccDum	Yes		Yes		Yes		Yes	
SecDum	Yes		Yes		Yes		Yes	
R - sq	0.222		0.223		0.223		0.223	
# obs.	14135		14135		14135		14135	

Note: the baseline category is no training. Cluster adjusted robust standard errors in parentheses with p<0.01 = *. College: college dummy; High School: high school dummy; Experience: actual experience; married: marital status; Ul: long term unemployment dummy; $D91, D95$ and $D51$: 90 - 10, 90 - 50 and 50 - 10 wage differentials; CoDum: country dummies; OccDum: occupation dummies; SecDum: industry dummies.

to invest in skills. Conditional on these and other effects, I have identified the empirical relationship between wage compression and training by exploiting the within - country variation in wage compression, that I allow to vary by occupation, sector and age group.

I have found evidence of a positive and significant relationship between wage compression and both firm - specific and general training. While the positive relationship between wage compression and firm - specific training is consistent with both competitive and non - competitive approaches to training, a similar relationship involving general training is only consistent with the non - competitive approach.

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