On the Complementarity between Education and Training*

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Abstract

This paper is an empirical investigation of the complementarity between education and training in 13 European countries, based on the European Community Household Panel (ECHP). We confirm the standard result that training incidence is higher among the better educated and find that the relationship between educational attainment and training incidence varies significantly both across countries and across birth cohorts. The data also show that countries with a higher educational attainment, higher union density and a lower value of the Kaitz index have a higher training incidence. Finally, there is some evidence in support of the complementarity between training and education in the production of human capital, because individuals with better education enjoy relatively higher private returns from recent training.

1 Introduction

There is a large empirical literature that investigates the incidence of training and its economic returns. Most of this literature, however, is based on national data and comparative work to "..assess the relative size of the returns to training in different countries.." (Pischke [2000]) is scarce. One important empirical topic in this literature is whether training and education are complements or substitutes. Quoting from

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Heckman [1999] "..human capital has fundamental dynamic complementarity features. Learning begets learning. Skills acquired early on make later learning easier" (p.6).

Three questions are relevant here:

- does the incidence of training increase among the better educated;

- does a higher supply of educated workers in a country favor both the adoption of new technologies and the incidence of training (network externalities);

- are the private returns to training higher for the better educated?

When training matters for earnings and for economic growth at large, and both the incidence and the returns to training increase for the better educated, more and better education becomes an important policy priority.

In this paper, we try to answer these questions by using a large dataset, the European Community Household Panel (ECHP), that covers 13 European countries and includes common questions about education and training. The ECHP data have two advantages: the first is comparability; the second is that we can exploit the between - country variation in education and training existing in Europe to study whether the relationship between these variables is affected by cross country differences in educational attainment and school design.

Labor market institutions also matter for the investment in training. As recently discussed by Acemoglu and Pischke [1999], labor market imperfections, such as for example the minimum wage and the active presence of unions, can alter in a significant way the implications of the standard beckerian framework for the private incentives to invest in training and for training incidence.

This empirical paper is organized as follows. Section 2 spells out the empirical implications of the relationship between education and training. Section 3 illustrates the data. Sections 4 and 5 are devoted to the empirical evidence on training incidence and to the private returns to training. Conclusions follow.

2 Education and Training

The idea that education and training are complements goes back at least to Rosen [1976], who argued in his theory of lifetime earnings that education improves job related learning skills, thereby reducing training costs. The empirical implication is that individuals with more education should receive, ceteris paribus, more training.

When the human capital accumulated at school facilitates training, both on the job and off the job, we expect older individuals to have a lower training incidence than younger workers with the same educational attainment, because their education and learning skills are more outdated (see Neuman and Weiss [1995]). The empirical implication is that the complementarity between education and training should be lower for individuals belonging to older birth cohorts.

It is natural to expect that not only the quantity but also the quality of education matters for the relationship between education and training. The organization of schools in Europe differs markedly. Broadly speaking, we can classify national systems according to the level of differentiation of secondary schools between vocational and general. While in some countries, most notably Germany, tracking into vocational and general streams starts early, at about 10 years of age, in other countries, such as Ireland or the UK after the reform of the mid 1960s, secondary schools are comprehensive and differentiation starts later. If comprehensive systems reduce specialization in favor of flexibility, as suggested by Shavit and Muller [1998] and Brunello and Giannini [2000], the empirical implication is that these systems require, for a given level of education, more training that stratified systems.

Government training policies are often justified by the presence of externalities. As discussed by Soskice [1994], Snower [1994] and Brunello and Medio [2001], a training supply externality occurs when an increase in the supply of educated workers raises the probability that firms fill successfully their training vacancies for skilled jobs. The empirical implication is that training incidence should increase with the educational attainment not only of the individual but also of the labor force.

Education and training can be complements in the production of

human capital, that affects earnings capacity. Following Willis [1986], let earnings growth $\ln W$ be proportional to earnings capacity H, and assume that earnings capacity depends on education and training. Then we have

$$\ln W = g\left[H(E,T)\right] \tag{1}$$

where E is for educational attainment (years of schooling) and T is for training. Complementarity between E and T in the production of earnings capacity implies that

$$\frac{\partial \ln W}{\partial T \partial E} > 0 \tag{2}$$

suggesting that individuals with higher education have more to gain from investing in training.

The standard economic theory of training was developed by Becker by assuming competitive labor markets. When labor markets are non - competitive, however, labor market institutions that affect wage compression can affect training incidence. Acemoglu and Pischke [1998] show that a more compressed wage structure, induced either by a minimum wage or by the presence of unions, is likely to increase the provision of general training when firms bear the training cost. When both firms and workers contribute to training investments, however, wage compression may increase or decrease the total provision of training. The sign of this relationship is an empirical matter.

3 The Data

The data used in this paper are drawn from the 1994 and 1996 waves of the European Community Household Panel, a household survey that covers 13 European countries[1]. 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 obviously increases comparability. Each wave includes a household and a personal file, and the same households and individuals are interviewed over several years. In the first wave, 60500 nationally representative households

[1]The countries are: Germany, Denmark, Netherlands, Belgium, France, UK, Ireland, Italy, Greece, Spain, Portugal, Austria and Sweden. We exclude Luxembourg from this study.

and approximately 130000 individuals were interviewed[2]. In the third wave, the number is higher because Austria and Sweden joined in the project.

We consider in this paper only individuals aged between 16 and 60 who have completed schooling and are working in paid employment more than 15 and less than 60 hours per week[3]. This reduces our sample to about 45000 individuals in 1996. The key training question in the survey asks whether the interviewed person has been in education or training since January of the year before the year of the interview. The reference period is 1993-4 for the first wave, 1994-5 for the second wave and 1995-6 for the third wave. Since the reference period of the second wave overlaps with the other two waves, we focus only on the first and last wave.

Individuals who have been in education or training during the reference period are asked what kind of course they have been on. The alternatives include general education, training, both on and off the job, and language courses. We define the dummy variable T as equal to 1 when the individual has been in vocational education or training, and equal to 0 otherwise.

The survey then asks individuals with $T = 1$ the type of vocational education received, and distinguishes among third level qualification, such as technical college (9.4%), specific vocational training at a vocational school or college (34.1%), vocational training in a dual system (14.9%), training in a working environment (39.1%) and else (2.5%). In some countries, most notably the UK and Sweden, the response rate to this question is significantly below the share of trained individuals. For this reason, we prefer not to use in this paper the potentially useful distinction between general and firm specific training.

Importantly, the ECHP survey asks individuals about the highest level of general education completed, and codes the answers into three categories: less than second stage level or lower secondary education (E_1 :ISCED 0-2), second stage level or upper secondary education (E_2 :

[2]See European Commission [1999]

[3]Therefore we exclude individuals in paid apprenticeship, training, self-employment and unpaid family workers.

ISCED3); recognised third level education (E_3 : ISCED 5-7). Table 1 shows by country and gender the percentage of individuals interviewed in 1996 who received training during the reference period ($T = 1$) and the distribution of individuals by highest education attainment.

The percentage of people receiving training during the reference period is highest in Sweden, Denmark and the UK and lowest in Greece, Italy and Portugal. In some countries, the percentage of trained individuals is higher among females than among males. Upon inspection, there is no clear pattern relating the percentage of trained individuals with the share of individuals with higher education. Denmark has almost a twice as high a proportion of trained individuals as Belgium, but about the same proportion of college graduates; Greece has a very low proportion of trained individuals, despite having a composition of educational attainment rather similar to the UK, where the proportion of trained individuals is much higher.

4 Training Incidence

We start our empirical investigation by estimating a probit model for the incidence of training in 1996

$$\Pr ob\left[T = 1\right] = \Phi\left(Z^{'}\beta\right) \tag{3}$$

where Z is a set of explanatory variables, β is a vector of parameters, and Φ is the standard normal distribution. In the baseline regression, we include among the explanatory variables: a gender dummy ($Gender$), equal to 1 for males and to 0 for females; two education dummies, one for attained tertiary education (E_3) and the other for attained upper secondary education (E_2); age (Age), actual experience, measured as age minus age at labor market entry (X), marital status ($Married$); days of absence from work during the month before the interview due to illness or other reasons ($Absence$); health conditions ($health = 1$ if conditions are good or fair, 0 otherwise); average hours worked per week ($hours$); sector of employment ($Private$ =1 if employed in the private sector, 0 otherwise); unemployment during the 5 years before the survey ($unemp5$) and a dummy equal to 1 when the individual has experienced

during the 5 years before the survey at least one unemployment spell longer than one year (ul).

The summary statistics of these variables are shown in Table 2. It turns out that close to 20% of the individuals in the sample have undertaken some training during the period 1995-96. Average age and average experience are close to 40 and 20 years respectively. Close to 60% of the sample is composed of males working in the private sector. While only about 2.5% of the sample is in poor health, more than 20% have experienced unemployment in the five years before the survey, and 8% have been in at least one unemployment spell lasting more than 1 year.

Table 3 presents our results on training incidence. The coefficients in the table are marginal effects, that measure the marginal change in the probability of training when the explanatory variable changes marginally. We find that training incidence is higher among younger individuals who are single, healthy, and have not experienced unemployment during the 5 years before the survey, and lower among individuals who have accumulated more days of absence and worked shorter hours in the private sector.

We also find that individuals with college education ($E_3 = 1$) have the highest probability of receving training. Individuals with upper secondary education ($E_2 = 1$) do better than individuals with lower education but not as well as college graduates. This result is expected and confirms the broad view that the incidence of training is higher among the better educated.

The relationship between educational attainment and training incidence varies significantly across countries, as documented in columns (3) and (4) of the table, where we present the results of a regression that includes interactions between each educational dummy and country dummies. For ease of interpretation, we only report the significant interactions. The Netherlands is the only country in the sample where higher education *reduces* the incidence of training. To the other extreme, Ireland is the country in the sample where better education increases training incidence the most.

The uncovered differences in the relationship between education and

training incidence could depend, at least in part, on the way schools are organized in European countries. One important dimension of school design is the degree of differentiation between vocational and academic or general tracks. In some countries (for instance Germany), differentiation is high and starts early on. In other countries, secondary schools are comprehensive and there is little differentiation between tracks (for instance Ireland). School design in other countries falls between these two extremes (Shavit and Muller [1998]).

We consider whether school design matters in the last two columns of the table, where we show the results of interacting each educational dummy with the dummy $Tracking$, that is equal to 3 for the countries where secondary schools are very stratified (Germany and Austria), to 2 for countries where stratification is important (the Netherlands and Belgium), to 1 where there is some degree of stratification (France, Italy, Spain and Portugal) and to 0 where schools are comprehensive (UK, Ireland, Denmark and Sweden)[4]. The results in the last two columns of Table 3 suggest that the impact of educational attainment on the incidence of training is lower in more stratified schooling systems. This appears to be consistent with the view that stratified schools increase specialization, thereby reducing the need to undertake additional training after labor market entry.

We study whether the uncovered complementarity between educational attainment and training incidence varies with the cohort of birth by replacing individual age with a set of cohort dummies and by including the interactions between these dummies and the two educational dummies. Table 4 presents the results. When we consider individuals with at most lower secondary education, the evidence suggests that older individuals receive less training. When we turn to upper secondary or tertiary education, however, the evidence shows the contrary, and older educated individuals receive more, not less, training than younger workers.

[4]We have assigned values to countries depending on the school age when differentiation begins. See OECD [1992], Hannan, Raffe and Smyth [1996] and Lassibille and Navarro Gomez [1998] for details on school design in Europe.

We can think of at least two alternative explanations of these findings. First, training is more frequent among better educated older workers because the vintage of their human capital has depreciated faster than the human capital of younger workers. In such circumstances, training operates as a substitute for outdated education. Alternatively, recall that we only consider training incidence during the two years before the survey. If training before this interval and current training are complements, so that learning begets learning, older educated workers have a higher training incidence because they have received more training in the past.

In the presence of network esternalities, we expect the incidence of training in each country to increase with the aggregate supply of educated workers, that we measure with the percentage of individuals who have attained at least upper secondary education in 1992[5]. We also expect incidence to vary with labor market institutions, because wage compression affects the incentives to invest in training.

The country differences in labor market institutions are illustrated in Table 5. We exclude Greece from this and the next table, because of lack of data. Our indicators of labor market institutions include the OECD index of employment protection (EPL), that increases with the degree of protection and is highest in Italy (14.25) and lowest in the UK (2.25); average union density ($Udens$) during the period 1975-95, that ranges from 14% in France and Spain to 86% in Sweden; and the Kaitz index ($Minw$), the ratio between the minimum wage and the average wage, that is lowest in Spain (0.32) and highest in Italy (0.71).

By increasing turnover costs and discouraging involuntary separations, higher employment protection is expected to favor the investment in human capital. In an imperfect labor market, stronger unions increase wage compression, reduce turnover and encourage firms to sponsor general training programs (Acemoglu and Pishke [1999]; Booth, Francesconi and Zoega [1999]). Finally, a high minimum wage relative to the average wage also increases wage compression and favors firm - sponsored general training. As stressed by Acemoglu and Pischke [1998], however, "..non - competitive theories do not predict that wage compression should nec-

[5]Source: OECD [1995].

essarily increase training, but that this is a possibility..." (p.16).

Table 5 also includes the dummy $Tracking$ introduced above and the share of active population with at least upper secondary education in 1992. Educational attainment is highest in Germany, Austria, Sweden and the UK and lowest in Italy, Spain and Portugal.

Table 6 presents our estimates of the incidence of training when the country dummies are replaced by a vector of institutional variables, that include Epl, $Udens$, $Tracking$, $Ed92$ and the $Kaitz$ index[6]. These variables vary across countries but are constant among individuals belonging to the same country. Therefore, we adjust the standard errors by allowing errors to be indipendent among countries and dependent within countries. Our findings are summarized as follows:

- the incidence of training is higher in countries with a higher supply of educated labor, suggesting the presence of a positive supply externality;
- training is more frequent in countries where union density is higher;
- training is less frequent in countries with a higher minimum wage;
- training incidence is lower in countries with more stratified secondary schools;
- there is no significant relationship between employment protection and training incidence.

Since both a higher union density and a higher minimum wage lead to more wage compression, the evidence on the relationship between wage compression and training incidence is mixed. Our results suggest that countries with relatively high union density and low minimum wages (Sweden) have a higher training incidence than countries with relatively low union density and high minimum wages (Italy).

[6] An alternative to replacing country dummies with institutional variables is to use a two step method: in the first step we estimate country dummies; in the second step we use weighted least squares to regress these dummies on institutional variables. See Card and Krueger [1990].

5 Training and Earnings Growth

Consider the following Mincerian earnings functions, that associate earnings to training and education in 1994 and 1996:

$$\ln W_{94i} = f_i + Y'_{94i}\alpha + \beta_{94}T_{94i} + \sum_h \gamma_{94h}E_{hi}$$
$$+\text{interactions } \left[T_{94i}, (E_{hi}, X_{94i}, X^2_{94i}, E_{hi}X_{94i}, E_{hi}X^2_{94i})\right] + \epsilon_{94i} \qquad (4)$$

where W_{94} are hourly net earnings in 1994[7], Y_{94} is a vector of individual characteristics in 1994, including occupational and sectoral dummies, T_{94} is the dummy for training in 1994, X_{94} is labor market experience in 1994 and we include the interactions among training and the variables in parentheses;

$$\ln W_{96i} = f_i + Y'_{96i}\alpha + \sigma_{96}T_{96i} + \beta_{96}T_{94i} + \sum_h \gamma_{96h}E_{hi}$$
$$+\text{interactions } \left[T_{94i}, (E_{hi}, X_{96i}, X^2_{96i}, E_{hi}X_{96i}, E_{hi}X^2_{96i})\right]$$
$$+\text{interactions } \left[T_{96i}, (E_{hi}, X_{96i}, X^2_{96i}, E_{hi}X_{96i}, E_{hi}X^2_{96i})\right] + \epsilon_{96i} \qquad (5)$$

where W_{96} are hourly earnings in 1996, Y_{96} is a vector of individual characteristics in 1996, T_{96} is the dummy indication training in 1996 and X_{96} is labor market experience in 1996, and we are explicitly allowing for the possibility that previous training experiences affect in a different way both past and current earnings.

Following Blundell, Dearden and Meghir [1994], Arulampalam, Booth and Elias [1997] and Lynch [1992], we eliminate the time invariant individual fixed effect f_i by taking first differences over time[8]. Recalling that our longitudinal sample includes only stayers, who were employed both in 1994 and in 1996, we have that $X_{96} = X_{94} + 2$ and obtain

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

[8] By so doing we are forced to eliminate from the sample the data for Austria and Sweden, that are not available in 1994.

$$\Delta \ln W_{96i} = \Delta Y_{96i}^{'}\alpha + \sigma T_{96i} + \beta T_{94i} + \sum_h \gamma_h E_{hi}$$

$$+\text{interactions } \left[T_{94i}, (E_{hi}, X_{94i}, X_{94i}^2, E_{hi}X_{94i}, E_{hi}X_{94i}^2))\right]$$

$$+\text{interactions } \left[T_{96i}, (E_{hi}, X_{94i}, X_{94i}^2, , E_{hi}X_{94i}, E_{hi}X_{94i}^2))\right] + \epsilon_{96i} - \epsilon_{94i} \quad (6)$$

where we have dropped the time subscripts to indicate that most parameters are combinations of the original parameters in (4) and (5). When the economic returns to training are not independent of educational attainment, at least some of the interactions involving training and education should be significantly different from zero.

While the time invariant fixed effects have been removed by differentiation over time, we cannot rule out the possibility that participation in training programs, both in 1994 and in 1996, be correlated with the transitory shock $\epsilon_{96i} - \epsilon_{94i}$. We take care of this possibility in two ways. First, we introduce country specific dummies, that should capture the effects of country specific aggregate shocks. Second, we follow Blundell, Dearden and Meghir [1994] and add to the empirical model in (6) two inverse Mills ratios, λ_{96} and λ_{94}, obtained by fitting probits for training in 1996 and 1994. Since identification requires exclusion restrictions, we operate as follows:

- the training probit for 1996 includes all the explanatory variables in Table 3 drawn from the 1994 wave, with the exclusion of sectoral and occupational dummies and of $unemp5$ and ul, that are from the 1996 wave, plus training incidence in 1994 and a dummy indicating whether the individual was searching for a new job back in 1994;

- the training probit for 1994 includes the variables in Table 3 drawn from 1994.

In practice, identification is obtained by excluding from the earnings growth regression marital status, days of absence, health condition, assignment to private employment and hours worked in 1994 plus unemployment history 5 years before joining the survey.

The presence of temporary shocks can also induce endogeneity in employment status in 1996 because of the effect these shocks can have on turnover decisions. We deal with this problem by estimating the employment selection term λ_E from an employment probit[9].

We start our analysis of the returns to training in Table 7, where we present the estimates of the simplest model without interactions (columns 1 and 2) as well as a more general model, that allows the coefficient of training incidence in 1994 and 1996 to vary across countries (columns 3 and 4). For the general model we report only the significant interactions. The table shows that: a) training in 1994 affects significantly earnings growth between 1994 and 1996 only in Italy; b) training in 1996 has a small significant effect on earnings growth, that varies across countries. If we ignore the interactions with country dummies, training in 1996 increases earnings growth between 1994 and 1996 by 2.4 percentage points. When we consider these interactions, the impact of training on earnings growth is significant and between 5 and 6% in France, the UK and Ireland and close to 3% in Germany. It is not significant in the remaining seven countries; c) the selection terms for training and employment λ_{96}, λ_{94} and λ_E are not significantly different from zero.

Table 8 presents the results of the estimation of Eq. (5). We show two alternative versions of the same model: the full specification in columns (1)-(2), and a restricted specification that includes only the significant interaction terms in columns (3) and (4). Focusing on the simplest specification, we find evidence of significant interactions between training in 1994 and 1996 and educational attainment.

Table 9 shows that the relationship between educational attainment and training varies with labor market experience. Consider first training in 1994. At zero labor market experience ($X = 0$), the percentage increase in hourly earnings is close to 3.4%, independently of educational attainment. For high school and college graduates, this percentage falls as experience increases: at 20 years of experience, close to the sample average, the contribution of training in 1994 to earnings growth is nega-

[9]See Arulampalam, Booth and Elias [1998] for an alternative approach that uses a bivariate probit.

tive (-2%) among college graduates and close to 2% among high school graduates. This is evidence against the hypothesis that training and education are complements in the production of hyman capital.

Next consider training in 1996. Here, the evidence goes in the opposite direction, and the contribution of training to earnings growth declines with labor market experience but is always higher for the better educated. At zero market experience, earnings growth increases with training by 8.8% among college graduates, by 5.3% among high school graduates, and remain unaffected among individuals with less education.

When we consider individuals who have been trained both in 1994 and 1996 and compare them with the rest of the sample, the overall evidence is in favor of complementarity between education and training only for those with less than 20 years of labor market experience. Once again, returns are highest at labor zero experience (close to 12% among college graduates, close to 9% among high school graduates and about 3.4% for the less educated) and decline as experience increases.

The existing empirical research on the impact of training spells on current and future earnings usually finds that training matters. According to Lynch (1992), training affects significantly the earnings of young American workers[10]. Blanchflower and Lynch (1994) study the earnings of young Americans and find that employer provided training increase earnings by about 12%. Arulampalam, Booth and Elias (1995) find that that expected earnings of young Britons who have experienced at least one training event increased by more than 10%. Positive effects of training on earnings are also found by Blundell, Dearden and Meghir (1994), who use the same dataset. Pischke (1996) examines German data and find that the returns to training are relatively low, at least compared to the US experience. In particular, employer provided training increases the earnings of training recipients by only 2 to 5 percent[11]. Groot, Hartog and Oosterbeck (1994) study the Dutch case and estimate that employees who have participated at least once to employer provided training earn 11% more than other employees. Finally, Goux and Maurin (1998)

[10] See also Brown (1989) and Bishop (1994).

[11] See also Winkelmann (1994)

use French data and show that the returns to training are close to zero.

Our evidence contributes to this literature with the following results: a) current (and lagged) training increases earnings growth significantly in less than half of the countries in our sample; b) in these countries, the average percentage increase is close to 5-6%, with the exception of Germany, where it is close to 3%; c) the private returns to training are higher at the start of the working life and decline with labor market experience. If there is persistency in training, so that individuals who have invested early keep on investing later in their working life, this result suggests that the marginal returns to training are decreasing; d) there is evidence that the returns from recent training episodes are higher among the better educated.

6 Summary

We have used the European Community Household Panel to study in a comparative perspective the interaction between training and educational attainment. We have identified three areas of interaction: 1) educational attainment and training incidence; 2) aggregate educational attainment as a positive external effect on training; 3) complementarity of education and training in the production of human capital.

We have found that individuals with higher education are more likely to invest in training. The link between these two variables is much stronger in countries with a comprehensive school system (the UK or Ireland) than in countries with a stratified system (Germany), suggesting that the accumulation of vocational skills is less intense in the former system. Rather unexpectedly, we have also found that the relationship between education and training is stronger for the older and educated birth cohorts, which points either to the possibility that training is a substitute for outdated education or to persistency in investment in training.

There is evidence in support of the presence of a positive supply externality, because countries with higher educational attainment have a higher training incidence, even after controlling for individual attainment. Labor market institutions also matter for training incidence,

which is higher in countries with higher union density and lower minimum wages (as a proportion of the average wage).

Finally, we have found that the returns to training decline with labor market experience, which suggests that investment early in the working life might be more productive than later investment. Overall, there is some evidence in favor of the complementarity between education and training in the production of human capital. This evidence is stronger for current training and for individuals with relatively short labor market experience.

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Table 1. Training incidence. By educational attainment. By country and gender. 1996. Number of observations: 45444. M: males; F:females; Nobs: number of observations.

	T	T	E_3	E_3	E_2	E_2	$Nobs$
	M	F	M	F	M	F	
Denmark	.491	.522	.369	.424	.416	.375	3786
Germany	.253	.250	.298	.163	.504	.568	2495
Netherlands	.110	.142	.238	.231	.572	.543	4113
Belgium	.203	.178	.363	.505	.352	.290	2244
France	.169	.180	.245	.307	.451	.410	5013
UK	.437	.417	.305	.271	.350	.375	2939
Ireland	.100	.145	.222	.254	.397	.510	2365
Italy	.076	.118	.097	.121	.402	.496	5351
Greece	.048	.065	.274	.406	.344	.320	2562
Spain	.139	.202	.247	.378	.193	.236	4245
Portugal	.025	.032	.046	.098	.117	.171	3959
Austria	.233	.213	.078	.110	.789	.676	2954
Sweden	.515	.565	.274	.452	.544	.362	3418

Table 2. Summary statistics of the variables in the training regression. 1996. Number of observations: 45444

	Mean	Stand. Dvt.
T	.209	.407
Age	38.228	10.363
Exp	19.450	11.393
Married	.647	.477
Absence	1.117	4.258
Hours	38.770	8.260
Health	.974	.158
Unemp	.231	.421
Ulong	.080	.272
Gender	.568	.495
Private	.657	.474

Table 3. Training Probits. Wit8h and without interactions with school design (tracking). Marginal effects.

	Coef.	Std. Dvt.	Coef.	Std. Dvt.	Coef.	Std. Dvt.
$Gender$	-.004	.004	-.004	.004	-.003	.004
E_3	.085**	.008	.087**	.008	.099**	.010
E_2	.056**	.005	.048**	.009	.073**	.007
$E_3 * Track.$					-.011**	.005
$E_2 * Track.$					-.015**	.005
$E_3 * NL$			-.112**	.008		
$E_3 * BE$			-.031**	.015		
$E_3 * FR$			.067**	.020		
$E_3 * IR$			.100**	.028		
$E_2 * GE$			-.029**	.012		
$E_2 * DK$			-.028*	.013		
$E_2 * NL$			-.075**	.013		
$E_2 * UK$			.054**	.022		
$E_2 * IR$			.057**	.022		
$E_2 * SP$			.070**	.020		
$E_2 * AU$			-042*	.026		
$E_2 * SW$			.044**	.003		
Age	-.003**	.0006	-.003**	.0006	-.002**	.00006
X	-.0002	.0005	.00001	.0005	-.0002	.0005
$Married$	-.009**	.004	-.008*	.004	-.009**	.004
$Absence$	-.001**	.0004	-.001**	.0004	-.001**	.0004
$Unemp5$	-.041**	.005	-.041*	.005	-.042**	.005
$Ulong$	-.026**	.008	-.025**	.009	-.025**	.0009
$Health$	.023*	.012	.025*	.013	.024*	.012
$Private$	-.054**	.006	-.053**	.006	-.054**	.006
$Hours$	.002**	.0002	.002**	.0002	.002**	.0002
$Nobs$	37756		37756		37756	
R^2	0.22		0.23		0.23	

*significant at the 10% level of confidence;** significant at the 5% level of confidence. Robust standard errors. Each regression includes country, occupation and sector specific dummies. NL: Netherlands; BE: Belgium; FFR: France; IR: Ireland; GE: Germany; DK: Denmark; SP: Spain; AU: Austria; SW: Sweden; UK: United Kingdom.

Table 4. Training Probit. With cohort effects.

	Coef.	Std. Dvt.
$Gender$	-.004	.004
E_3	.052**	.014
E_2	.033**	.017
$E_3 * C3039$	.018	.016
$E_3 * C4049$	.034**	.017
$E_{3*}C50$	.056**	.021
$E_2 * C3039$	.016	.014
$E_2 * C4049$	.027*	.014
$E_2 * C50$	.051**	.018
$C3039$	-.022*	.011
$C4049$	-.037**	.013
$C50$	-.068**	.014
X	-.001**	.0004
$Married$	-.011**	.004
$Absence$	-.001**	.0004
$Unemp5$	-.040**	.005
$Ulong$	-.028**	.009
$Health$	.024*	.013
$Private$	-.054	.006
$Hours$	.002	.0002
$Nobs$	37756	
R^2	0.225	

*significant at the 10% level of confidence;** significant at the 5% level of confidence. Robust standard errors. Each regression includes country, occupation and sector specific dummies.

Table 5. Labor market and education institutions. By country.

	Epl	*Udens*	*Kaitz*	*Track.*	*Ed*92
Germany	12	.33	.55	3	.82
Denmark	3.25	.73	.54	0	.59
Netherlands	7.25	.28	.55	2	.58
Belgium	10.5	.53	.60	2	.45
France	9.5	.14	.50	1	.52
UK	2.25	.43	.40	0	.68
Ireland	2.75	.53	.55	0	.42
Italy	14.25	.28	.71	1	.28
Spain	11.5	.14	.32	1	.23
Portugal	12.5	.44	.45	1	.14
Austria	9	.47	.62	3	.68
Sweden	10	.86	.52	0	.70

Notes: OECD [1999], Nickell and Layard [1999]

Table 6. Training probit. With country - specific variables.

	Coef.	Std. Dvt.
$Kaitz\ index$	-.393*	.210
$Udens$	.178**	.095
Epl	.007	.005
$Tracking$	-.063**	.019
$Ed92$	.505**	.089
$Gender$	.0006	.007
E_3	.113**	.022
E_2	.070**	.018
Age	-.003**	.001
X	-.0001	.001
$Married$	-.012**	.006
$Absence$	-.002**	.001
$Unemp5$	-.035**	.011
$Ulong$	-.021	.022
$Health$	.020*	.017
$Private$	-.059**	.023
Hours	.001**	.0005
Nobs	35439	
R^2	0.20	

Note: see Table 3

Table 7. Training and earnings growth.

	(1)	(2)	(3)	(4)
	Coef.	St.Dvt.	Coef.	St.Dvt.
$Gender$	.076**	.007	.075**	.007
E_3	.159**	.009	.159**	.009
E_2	.052**	.006	.052**	.006
X	.003**	.0009	.003**	.0009
X^2	-.00005**	.00002	-.00005**	.00002
T_{94}	.001	.011	.005	.010
T_{96}	.024**	.008	-.055	.011
$T_{94} * IT$			.054**	.018
$T_{96} * GE$			.028*	.016
$T_{96} * FR$			.059**	.023
$T_{96} * UK$			.063**	.017
$T_{96} * IR$			.057*	.034
λ_E	.011	.013	.009	.010
λ_{T96}	.012	.008	.019	.005
λ_{T94}	-.005	.009	-.008	.007
Nobs	21726		21726	
R^2	.080		.081	

Notes: see Table 3.

Table 8. Training and earnings growth, including interactions between education and training

	(1)		(2)	
	Coef.	St.Dvt.	Coef.	St.Dvt.
Gender	.069**	.007	.069**	.007
E_3	.028	.026	.033	.025
E_2	-.019	.021	-.023	.020
X	-.002*	.001	-.002*	.001
X^2	.00005	.00003	.00004	.00003
T_{94}	.090**	.057	.033**	.017
T_{96}	-.079	.067	-	-
$X * T_{94}$	-.006	.005	-	-
$X * T_{96}$	.006	.006	-.002	.001
$X^2 * T_{94}$	.0001	.0001	-	-
$X^2 * T_{96}$	-.0001	.0001	.0001**	.00004
$E_3 * T_{94}$	.058	.069	-	-
$E_2 * T_{94}$	.035	.065	-	-
$E_3 * T_{96}$	.190**	.070	.088**	.024
$E_2 * T_{96}$	.149**	.075	.053**	.025
$X * E_3$	.011**	.002	.010**	.002
$X * E_2$	.006**	.002	.006**	.001
$X^2 * E_3^b$	-.0001**	.00006	-.0001**	.00005
$X^2 * E_2^b$	.0001**	.00005	-.0001**	.00004
$X * E_3 * T_{94}$	.004	.007	-.002**	.0008
$X * E_2 * T_{94}$	.009	.006	-.0005	.0007
$X^2 * E_3 * T_{94}$	-.0002	.0001	-	-
$X^2 * E_2 * T_{94}$	-.0002	.0001	-	-
$X * E_3 * T_{96}$	-.015**	.007	-.003**	.001
$X * E_2 * T_{96}$	.013*	.007	-.002*	.001
$X^2 * E_3 * T_{96}$	.0002*	.0001	-	-
$X^2 * E_2 * T_{96}$	.0002*	.0001	-	-
λ_E	-.015	.014	-.016	.014
λ_{T96}	-.016*	.009	.017*	.009
λ_{T94}	-.017	.011	-.017	.011
Nobs	21726		21726	
R^2	.0825		.0823	

Table 9. Earnings growth due to participation to training in 1994. By educational attainment.

	E_1	E_2	E_3
T_{94}			
$exp = 0$	.034	.034	.034
$exp = 10$	.007	.028	.034
$exp = 20$	-.020	.022	.034
T_{96}			
exp $= 0$	.088	.053	0
$exp = 10$	.030	.005	-.014
$exp = 20$	.012	-.003	-.008