

**Continuous training and wages in Germany.
An empirical analysis using a comparison-
group approach.**

Katja Görlitz, RWI Essen

**International Workshop in Nuremberg, IAB
Education in Adulthood and the Labour Market**

November 2009

Motivation



- Further training of employees is an important tool for fostering lifelong learning
 - Training might exhibit several positive impacts to individuals
 - A large literature is concerned with estimating the impact of training on wages for individuals
 - Empirical findings are mixed:
 - “Naïve” estimates find huge effects of training on wages (Blundell et al. 1996, Parent 1999, Goux and Maurin 2000, Jürges and Schneider 2006, Mühler et al. 2007)
 - Controlling for time-invariant unobserved ability leads to much smaller coefficients (Lynch 1992, Pischke 2001, Frazis and Loewenstein 2005, Mühler et al. 2007)
- Training decisions seem to be associated with selection processes
- Estimating the causal effect of training is difficult

Topics of This Talk



Research question:

- What is the impact of training on individuals' wages?
 - Do training returns differ with the frequency of participation?
 - Does it matter to account for firm characteristics?
 - What is the size of the selection bias?
- To answer these questions, a new approach to estimate wage returns suggested by Leuven and Oosterbeek (2008) is used

The Data



- German linked employer-employee data (WeLL)
 - First wave: 6,404 telephone interviews with employees
 - Survey design: employees were employed in December 31 2005 in one out of 149 establishments
 - Selection criteria for establishments: establishment size and industry
 - Dependent variable: gross monthly wages in the end of 2007 (during the time of the interview)
 - Definition of training: only “class-room” training (e.g. courses, lectures, seminars)
 - **Data Restriction:**
 - Delete observations with gross monthly wages of less than 800 Euros and with more than 20,000 Euros
 - Employees who left their employer between December 31th 2005 and the time of the interview are excluded
- *5,407 observations enter the regression analysis*

Identification Strategy

- A new approach suggested by Leuven and Oosterbeek (2008):
 - Comparing wages of training participants with wages of non-participants ***that both have similar characteristics***
 - This is assumed to be the case for non-participants who intended to participate but did not do so because of a random event
 - Using Dutch data: no impact of particip. in one course on wages
 - The WeLL data contains the following question:
Did you intend to participate in training courses, seminars or lectures in the last two years without realizing this plan?
 - Random events: cancelled by the organizer, health, family, job-related
- This question is used to apply the new approach to German data
- Extensions of the approach:
- Not only one course, but also the second and third course
 - Applying establishment fixed effect

The „comparison“ group



Training attendance of employees within the last 2 years:

No training participation (tr1)	1,686
No training participation, but intended to participate in one course (tr2)	148
Training participation in only one course (tr3)	1,476
Training participation in only one course and intended to participate in a second course (tr4)	179
Training participation in exactly two courses (tr5)	801
Training participation in two courses and intended to participate in a third course (tr6)	157
Training participation in exactly three courses (tr7)	355
Training participation in more than three courses or intended to do forth course (tr8)	431
Employees who intended to attend a course having non-random reasons to cancel plans regardless of actual participation (tr9)	174
<hr/>	
Total	5,407

Are training participants similar to the comparison group?

Balancing between treatment and comparison group:

	Employees with one course (tr ₃) versus those willing to attend one course (tr ₂)				Employees with two courses (tr ₅) versus those with one course willing to attend another (tr ₄)				Employees with three courses (tr ₇) versus those with two courses willing to attend another (tr ₆)			
	(1)				(2)				(3)			
	tr ₃	tr ₂	tr ₃ -tr ₂	t -value	tr ₅	tr ₄	tr ₅ -tr ₄	t -value	tr ₇	tr ₆	tr ₇ -tr ₆	t -value
Male	0.66	0.68	-0.02	0.37	0.64	0.65	-0.01	0.24	0.59	0.61	-0.03	0.54
German	0.95	0.96	-0.01	0.32	0.96	0.93	0.03	1.65	0.97	0.96	0.01	0.72
Age	46.99	44.59	2.39	3.18 ***	46.43	44.60	1.83	2.63 ***	45.20	44.34	0.86	1.02
Married	0.76	0.74	0.02	0.64	0.77	0.77	0.00	0.07	0.66	0.68	-0.03	0.56
Child	0.38	0.42	-0.03	0.82	0.37	0.49	-0.11	2.74 ***	0.36	0.38	-0.02	0.53
Years of schooling	12.81	12.58	0.22	1.12	13.16	13.36	-0.20	0.93	13.58	13.93	-0.35	1.37
Tenure	233.65	205.50	28.15	2.61 ***	221.52	204.71	16.81	1.64	204.25	193.91	10.34	0.85
White collar employee	0.65	0.61	0.03	0.81	0.76	0.81	-0.05	1.47	0.84	0.89	-0.06	1.74 *
Full time job	0.87	0.84	0.03	0.81	0.85	0.87	-0.02	0.80	0.86	0.85	0.02	0.52
Temporary contract	0.04	0.03	0.00	0.09	0.02	0.04	-0.02	1.08	0.04	0.06	-0.02	0.98

Notes: The t-test for independent samples is used. Significance level: *** 1%, ** 5%, * 10%.

Are non-participants similar to the comparison group?

Balancing between non-participants and comparison group:

	Non-participants (tr_1) versus those willing to attend one course (tr_2)				Non-participants (tr_1) versus those with one course willing to attend another course (tr_4)				Non-participants (tr_1) versus those with two courses willing to attend another course (tr_6)			
	tr_2	tr_1	$\diamond_{tr_2-tr_1}$	t -value	tr_4	tr_1	tr_4-tr_1	t -value	tr_6	tr_1	$\diamond_{tr_6-tr_1}$	t -value
Male	0.68	0.65	0.03	0.62	0.65	0.65	0.00	0.08	0.61	0.65	-0.04	0.96
German	0.96	0.91	0.05	2.71 ***	0.93	0.91	0.02	0.76	0.96	0.91	0.04	2.44 **
Age	44.59	48.07	-3.48	4.65 ***	44.60	48.07	-3.47	5.26 ***	44.34	48.07	-3.73	5.34 ***
Married	0.74	0.74	-0.01	0.16	0.77	0.74	0.02	0.68	0.68	0.74	-0.06	1.57
Child	0.42	0.32	0.10	2.42 **	0.49	0.32	0.17	4.33 ***	0.38	0.32	0.07	1.61
Years of schooling	12.58	11.95	0.63	3.27 ***	13.36	11.95	1.41	6.91 ***	13.93	11.95	1.98	8.77 ***
Tenure	205.50	239.07	-33.57	3.13 ***	204.71	239.07	-34.36	3.50 ***	193.91	239.07	-45.16	4.34 ***
White collar employee	0.61	0.42	0.20	4.75 ***	0.81	0.42	0.39	12.42 ***	0.89	0.42	0.48	17.23 ***
Full time job	0.84	0.86	-0.02	0.50	0.87	0.86	0.01	0.43	0.85	0.86	-0.01	0.43
Temporary contract	0.03	0.04	-0.01	0.57	0.04	0.04	0.00	0.23	0.06	0.04	0.01	0.76

Notes: The t-test for independent samples is used. Significance level: *** 1%, ** 5%, * 10%.

Results



Regressors	Log monthly wage (1)		Log monthly wage (2)	
	Coeff.	Stand. Err.	Coeff.	Stand. Err.
No training participation, tr ₁	Base category		Base category	
No training participation, but intended, tr ₂	0.069 ***	0.023	0.034 *	0.020
Training participation in only one course, tr ₃	0.050 ***	0.014	0.044 ***	0.009
Training participation in one course, but intended to do another, tr ₄	0.103 ***	0.026	0.044 **	0.018
Training participation in exactly two courses, tr ₅	0.086 ***	0.017	0.070 ***	0.012
Training participation in two courses, but intended to do another, tr ₆	0.123 ***	0.023	0.082 ***	0.015
Training participation in exactly three courses, tr ₇	0.120 ***	0.019	0.091 ***	0.012
Training participation in more than three (intended) courses, tr ₈	0.149 ***	0.024	0.138 ***	0.018
Training intention cancelled due to non-random reason, tr ₉	0.078 ***	0.025	0.062 ***	0.017
Individual charact.	Yes		Yes	
Firm fixed effects	No		Yes	
F-test for tr ₂ =tr ₃	0.57		0.29	
F-test for tr ₂ =tr ₃ , p-value	0.4501		0.59	
F-test for tr ₄ =tr ₅	0.46		1.67	
F-test for tr ₄ =tr ₅ , p-value	0.4977		0.2	
F-test for tr ₆ =tr ₇	0.02		0.25	
F-test for tr ₆ =tr ₇ , p-value	0.8859		0.61	
Observations	5,407		5,407	
R-squared	0.54		0.52	
F-statistic	85.96 ***		86.73 ***	

Notes: OLS regression results are shown. Standard errors are clustered at the establishment level. The control variables include male, German, age and age squared, married, child, an interaction term of male and child, years of schooling, tenure and tenure squared, skilled white collar worker, full time job and temporary contract. Full estimation results are documented in Table A-4 in the Appendix. Significance level: *** 1%, ** 5%, * 10%.

Results



Regressors	Log monthly wage (1)		Log monthly wage (2)	
	Coeff.	Stand. Err.	Coeff.	Stand. Err.
No training participation, tr ₁	Base category		Base category	
No training participation, but intended, tr ₂	0.069 ***	0.023	0.034 *	0.020
Training participation in only one course, tr ₃	0.050 ***	0.014	0.044 ***	0.009
Training participation in one course, but intended to do another, tr ₄	0.103 ***	0.026	0.044 **	0.018
Training participation in exactly two courses, tr ₅	0.086 ***	0.017	0.070 ***	0.012
Training participation in two courses, but intended to do another, tr ₆	0.123 ***	0.023	0.082 ***	0.015
Training participation in exactly three courses, tr ₇	0.120 ***	0.019	0.091 ***	0.012
Training participation in more than three (intended) courses, tr ₈	0.149 ***	0.024	0.138 ***	0.018
Training intention cancelled due to non-random reason, tr ₉	0.078 ***	0.025	0.062 ***	0.017
Individual charact.	Yes		Yes	
Firm fixed effects	No		Yes	
F-test for tr ₂ =tr ₃	0.57		0.29	
F-test for tr ₂ =tr ₃ , p-value	0.4501		0.59	
F-test for tr ₄ =tr ₅	0.46		1.67	
F-test for tr ₄ =tr ₅ , p-value	0.4977		0.2	
F-test for tr ₆ =tr ₇	0.02		0.25	
F-test for tr ₆ =tr ₇ , p-value	0.8859		0.61	
Observations	5,407		5,407	
R-squared	0.54		0.52	
F-statistic	85.96 ***		86.73 ***	

Notes: OLS regression results are shown. Standard errors are clustered at the establishment level. The control variables include male, German, age and age squared, married, child, an interaction term of male and child, years of schooling, tenure and tenure squared, skilled white collar worker, full time job and temporary contract. Full estimation results are documented in Table A-4 in the Appendix. Significance level: *** 1%, ** 5%, * 10%.

Results



- Coefficient for the first course: $tr3-tr2= 1.1\%$
 - Coefficient for the second course: $tr5-tr4= 2.6\%$
 - Coefficient for the third course: $tr7-tr6= 0.9\%$
- Even though the coefficients are large and they differ in terms of its size, they are statistically insignificant

Regressors	Log monthly wage	
	(2)	
	Coeff.	Stand. Err.
No training participation, tr_1	Base category	
No training participation, but intended, tr_2	0.034 *	0.020
Training participation in only one course, tr_3	0.044 ***	0.009
Training participation in one course, but intended to do another, tr_4	0.044 **	0.018
Training participation in exactly two courses, tr_5	0.070 ***	0.012
Training participation in two courses, but intended to do another, tr_6	0.082 ***	0.015
Training participation in exactly three courses, tr_7	0.091 ***	0.012
Training participation in more than three (intended) courses, tr_8	0.138 ***	0.018
Training intention cancelled due to non-random reason, tr	0.062 ***	0.017
Individual charact.	Yes	
Firm fixed effects	Yes	
Observations	5,407	
R-squared	0.52	
F-statistic	86.73 ***	

Notes: OLS regression results are shown. Standard errors are clustered at the establishment level. The control variables include male, German, age and age squared, married, child, an interaction term of male and child, years of schooling, tenure and tenure squared, skilled white collar worker, full time job and temporary contract. Significance level: *** 1%, ** 5%, * 10%.

Results

- Selection effect of the training decision can be observed by tr_2
- Non-participants who intended to participate in training have an average wage advantage of 3.4% compared to non-participants who did not have training intentions
- Is there selection for the number of attended courses?
- Coefficient for selection into second courses: $tr_4 - tr_3 = 0.1\%$
- Coefficient for selection into third courses: $tr_6 - tr_5 = 1.2\%$
- These differences are not statistically significant

Regressors	Log monthly wage	
	(2)	
	Coeff.	Stand. Err.
No training participation, tr_1	Base category	
No training participation, but intended, tr_2	0.034 *	0.020
Training participation in only one course, tr_3	0.044 ***	0.009
Training participation in one course, but intended to do another, tr_4	0.044 **	0.018
Training participation in exactly two courses, tr_5	0.070 ***	0.012
Training participation in two courses, but intended to do another, tr_6	0.082 ***	0.015
Training participation in exactly three courses, tr_7	0.091 ***	0.012
Training participation in more than three (intended) courses, tr_8	0.138 ***	0.018
Training intention cancelled due to non-random reason, tr	0.062 ***	0.017
Individual charact.	Yes	
Firm fixed effects	Yes	
Observations	5,407	
R-squared	0.52	
F-statistic	86.73 ***	

Notes: OLS regression results are shown. Standard errors are clustered at the establishment level. The control variables include male, German, age and age squared, married, child, an interaction term of male and child, years of schooling, tenure and tenure squared, skilled white collar worker, full time job and temporary contract. Significance level: *** 1%, ** 5%, * 10%.

Conclusion



- Even though the coefficients for participation in only one course, for the second and third course are larger than 1%, respectively, they are not statistically significant
- The selection effect of the decision to participate in training is statistically significant (3.4%)
- There seem to be no pronounced selection effect for choosing the number of courses (in particular, for a maximum of three attended courses)
- Accounting for firm fixed effects matters when estimating training returns which confirms previous findings (Goux and Maurin, 2000)

Thank you for your attention