

Technological change and employer provided training: evidence from German establishments

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Hypothesis

- Technological change increases demand for skills
- Continuous training a mechanism to increase the skill intensity of the workforce

Suggesting: technical progress strengthens the importance of training

Theoretical platform

Build upon Acemoglu's model (2003) and incorporate elements from Snower's model (1996)(rising marginal training costs)

Technical progress enables firms to produce more. The pace of technical progress is limited by workforce skills, hence a need for continuing training.

Data

IAB establishment panel data

Private sector only: profit maximising behaviour

Training incidence: probability of providing training

- panel data 1993-2004; since 1996 East Germany as well

Training intensity (number/share); events):

- the number/share of workers that undertook training in the last 6 months (panel data: 1999, 2001 and 2003)

Technology change measures:

- State of the technology: new; norm; and old
- Volume of investments in the prior year
- Whether establishment invested in ICT in the previous year
- If investments foreseen for the coming year
- New management practices
 - team working
 - quality circles
- Apprenticeship training

- Continuing training: *‘did your enterprise pay for further training in the first half of the year? i.e. were employees released from work in order to participate in establishment or external training measures or did your company bear the costs of external training measures?’*
- Technological change just changes in production methods and the capital intensity of production and changes in organisation and work practices which result in higher productivity. In our empirical work we separate these two types of technological change.

Descriptive statistics

- 1993-2003; 59% (East) and 63% (West) provided training.
- 36% and 31% of workers undertook training in East and West respectively.

Econometric setup

- Incidence:
 - binary probit model
- Intensity: (number/share of workers that undertook training)
 - tobit model:
 - conditional marginal effects
 - unconditional marginal effects

Panel estimator

Empirical findings

Incidence:

Establishments operating with new technologies more prone to train

Investment volume positively influences training probability in East only.

Team working and share of apprentices (+);
%of unskilled workers (+); part-time (-);
good profitability (+).

Empirical findings: Training intensity

Conditional upon training provision in establishments that (unconditional MFX greater magnitude):

- Operated new technology; the share of workers that undertook training was 3% greater compared to those with norm technology
- Invested in ICT in prior year (4% greater)
- Foresaw investment for the current year (3% greater in West and 5% in East)
- Operating with teams

Empirical findings: Training intensity (cont.)

- Greater share of apprentices (+ West only)
- Interaction dummy
(%apprentices*technology change measures;- effect in East); eastern establishments may be able to meet the demand imposed by technological change by providing initial training; this may indicate differences between the technologies adopted in two regions.
- Share of unskilled workers (-); works councils (+).

Endogeneity

- Two-way relationship between training and technological change
- Addressing endogeneity:
 - Investments in ICT in prior year (\checkmark)
 - State of technology: accumulated capital stock (\checkmark)
 - Investment volume lagged (\checkmark)
 - Investments foreseen for the current year!!!
 - Difficult to find suitable instrumental variable (Machin and Van Reenen, 1998)
 - We should use panel not pooled estimates
 - no techniques in place to test for endogeneity with panel data; unable to analyse the reverse causation from training to technology

Robustness

- Zwick (2002 and 2006)
- IAB cross section from 1997: new technology and ICT investment lead to greater training intensity

Concluding remarks

Positive relationship between technological change and continuing training

Concluding remarks

Policy guidelines:

- One way to induce firms to provide training is by enhancing incentives for firms to undertake more rapid technological change
- Enhancing initial human capital may foster training provided by firms

Limitations:

- Data related:
 - training intensity and technology change measure;
 - instrumental variable for technological change
- Estimation techniques that would enable to address endogeneity issue