

The Effect of the Business Cycle on Apprenticeship Training: Evidence from Germany

Guido Baldi · Imke Brüeggemann-Borck ·
Thore Schlaak

Published online: 1 November 2014
© Springer Science+Business Media New York 2014

Abstract The benefits of dual apprenticeship programs are usually discussed in the context of reducing structural unemployment rates, especially among the young. Related to this, the long-run benefits of dual apprenticeship programs are extensively analyzed in the literature. However, empirical evidence regarding the short-run effects of the business cycle on the number of apprenticeships is scarce. In this paper, we use panel-data at the German federal states level ranging from 1999 through 2012 to analyze the effects of the business cycle on the number of new apprenticeship contracts. Using different sample periods and model specifications, we do not find a robust and significant effect of the business cycle on apprenticeships. Hence, the apprenticeship system seems to dampen the volatility of youth unemployment.

Keywords Economic fluctuations · Education · Hiring · Unemployment

We thank participants and two anonymous referees for useful comments. All remaining errors are the responsibility of the authors. The views expressed in this paper are those of the authors and not necessarily those of DIW.

G. Baldi (✉)

German Institute for Economic Research (DIW), Mohrenstr. 58, 10117 Berlin, Germany
e-mail: guido.a.baldi@gmail.com

G. Baldi

Department of Economics, University of Bern, VWI, Schanzeneckstr. 1, CH-3001 Bern, Switzerland

I. Brüeggemann-Borck

Department of Cooperative Studies, Berlin School of Economics and Law, Lichtenberg Campus,
Alt-Friedrichsfelde 60, 10315 Berlin, Germany
e-mail: imke.brueggemannborck@hwr-berlin.de

T. Schlaak

Research Cluster Macroeconomics and Financial Markets, German Institute for Economic Research
(DIW), DIW, Mohrenstr. 58, 10117 Berlin, Germany
e-mail: tschlaak@diw.de

JEL Classification E32 · I21 · J63**Introduction**

While the economic literature extensively investigates the role of skill acquisition in the context of long-run economic growth, the short-run relation between the business cycle and skill-acquisition is much less understood (see e.g. Méndez and Sepúlveda 2012). In this paper, we focus on one particular way of skill acquisition, namely the dual-apprenticeship system, which is a market-driven form at the upper-secondary school level. In this system apprentices have a contract with a firm and receive training both at school and at the firm. Therefore, the number of new apprenticeship contracts depends on the number of school graduates that are looking for an apprenticeship and the number of apprenticeship contracts offered by firms. This form of education is mainly present in countries from Continental and Northern Europe such as Germany, Switzerland, Austria, the Netherlands, Denmark and Sweden. The influence of the business cycle on the number of apprenticeship programs is a research question of high policy relevance for countries where these programs play an important role. In countries like Germany, Austria or Switzerland, at least half of primary and secondary school graduates start an apprenticeship program. Thus, a large part of the young people in education can potentially be affected by movements in output growth and the level of unemployment.

Our research is also of interest for countries, where dual-apprenticeships are less common. For example, dual-apprenticeship systems are nearly absent in Southern European countries as well as in the UK and Ireland. Given that many of these countries are struggling with high unemployment rates especially among the young, the EU Commission (see e.g. European Commission 2012) advocates the implementation of apprenticeship programs in these countries, based among others on the idea that such programs help lower structural and cyclical unemployment among young people.

Since firms are naturally exposed to the business cycle, the number of apprenticeship contracts they offer may depend on the economic stance. However, the sign of the relation is far from clear. It will be positive if firms reduce the number of apprenticeship contracts along with overall employment in a recession. Moreover, labor contract regulation is normally stricter than for usual employees. A firm can only terminate a training contract unilaterally for economic reasons. As a consequence, firms might be reluctant to hire an apprentice if the business or economic stance is bad or if business expectations are poor. On the other hand, the relation between the business cycle and the number of apprenticeship contracts could also be negative, because apprentices constitute a cheap low-skilled labor input for firms that might substitute for other unskilled workers in a recession. In addition, hiring and training an apprentice can be seen as an investment by the firm. For example, firms might expect that the economy will have recovered by the time the apprenticeship ends. In addition, apprentices may carry out parts of skilled as well as unskilled work, which gives the firm flexibility in assigning tasks to apprentices. Therefore, it is conceivable

that output volatility can show either a positive or a negative effect on the number of apprenticeship contracts.

The literature review by Brunello (2009) shows that the number of offered apprenticeship contracts is usually lower during a recession. This implies that the decision on the number of offered apprenticeship contracts is not qualitatively different from the general recruitment strategy of firms (see e.g. Lindley 1975; Brunello and Medio 2001). Several papers investigating different countries provide empirical evidence that an economic downturn or periods of high unemployment lead to a lower number of offered apprenticeship positions. Using firm-level data for the period from 1993 to 2003, Dietrich and Gerner (2007) find a significant relation between short-term business expectations and offered apprenticeship contracts. An increase in the expected business volume by one percent raises the number of apprenticeship contracts by 0.35 percent. For Norway, Askildsen and Nilsen (2005) show that the number of apprenticeship contracts decreases with employment. Westergaard-Nielsen and Rasmussen (1999) find that firms' demand for apprentices is positively related to the demand for skilled labor in Denmark. For Switzerland, Schweri and Müller (2008) and Mühlemann et al. (2009) find a small positive effect of GDP growth on the firms' propensity to train and on the apprenticeship ratio in Switzerland. However, business cycle effects on apprenticeship training tend to be weaker than on overall labor demand.

Our aim is to empirically investigate the sign of the average effect of the business cycle on apprenticeship contracts for Germany. In our empirical analysis, we use data on newly offered and concluded apprenticeship contracts at the level of the 16 German states from 1999 through 2012. The federalistic nature of the German education system makes such an analysis reasonable, since demographic developments, the industry structure and also business cycles can vary considerably across the states. Based on the panel structure of our data, our findings show that the estimated effect from income growth and unemployment on the number of apprenticeship contracts is weak and hardly significant.

This paper is structured as follows. Section [The German Apprenticeship System](#) outlines the characteristics of the German apprenticeship system and compares it briefly to other countries. Section [Data and Methodology](#) describes the data set used and the methodology for our estimations. The results of our estimations are presented in Section [Results](#). Finally, Section [Conclusion](#) contains the conclusion.

The German Apprenticeship System

In Germany, vocational training is attained by completing one of more than 300 programs of officially recognized occupations in order to gain all competence of a skilled worker in that field. In general, around one half of school graduates start vocational training each year (Bundesinstitut für Berufsbildung (BIBB) 2013a; Statistisches Bundesamt 2013). There are three notable elements that make the German dual-apprenticeship system special in an international context. One element is the *corporate organization* of the system: the state, unions and employers jointly decide on the principles of apprenticeship. Second, the education is *dual*, meaning

that it consists of school-based and firm-based training elements. The third element is the *vocationalism* of the system, i.e. the accumulation of occupation-specific knowledge and skills. An apprenticeship system with these characteristics is described as collectivistic, see e.g. Ebner and Nikolai (2010). Austria and Switzerland have established similar systems as Germany.

The corporate organization is reflected in nationwide standardization of programs concerning content and duration. Duration ranges from two to four years. The share of firms fulfilling the requirements for dual-apprenticeship training is at a constant level of about 59 % of German firms. The number of firms actively participating in apprenticeship training was substantially lower in 2012 with a share of 31 % of all firms, see e.g. Hartung (2012).

The duality of the concept is the core element of vocational formation in Germany. Every dual apprenticeship is based on a private-law contract between the apprentice and the training firm for the apprenticeship. The contract automatically terminates with completion of the training. The apprentices receive a standardized salary that varies between different professions and sectors. During the course of an apprenticeship, trainees switch between learning in vocational schools, which covers about 40 % of the total training time, and working periods in the firm. During in-firm periods the trainees undergo practical training and gather firm-specific knowledge (Biavaschi et al. 2012). All apprenticeships end with a final exam issued by a central federal committee board.

A firm's decision to employ apprentices depends on the benefits and costs of training an apprentice. First, as trainees are skilled workers by the end of the apprenticeship, firms can meet their need of specialized personnel over a medium-term time horizon. In other words, apprenticeship helps to satisfy firms' demand for skilled workers and thereby retains their competitiveness. Second, training costs are an important factor as well. There are, apart from providing the vocational schooling, no governmental subsidies for the training firms. Smaller firms face positive net costs from training due to larger relative costs of providing workspace for apprentices. Still, some firms face negative net costs, since apprentices' wages are low compared to regular wages. Therefore, trainees might be hired even if firms have no demand for specialists (Niederalt 2004). Moreover, vocational training gives firms the opportunity to screen possible future employees who additionally have gathered firm-specific knowledge.

Trainees have incentives to participate in the German apprenticeship system since it provides the chance to cross the "first barrier" in the labour market more easily. Due to the concept of vocationalism, apprentices are fully qualified workers by the end of their training. This is a key factor for a gradual transfer from school to employment and for long-run employment. According to Reinberg and Hummel (2005) participating in vocational training considerably reduces the risk of unemployment. Fedorets and Spitz-Oener (2011) show that human capital accumulated during vocational training is even transferable between different occupations, so vocationalism does not inhibit flexibility.

The German apprenticeship market is closely connected with the regular labor market. About 66 % of successful apprentices stay in the same firm, in which

they completed their apprenticeship. This can be seen as an indicator for a smooth transition from education to regular employment (Hartung 2012). On the other hand, young adults with poor school reports have severe problems to enter the labor market, since training firms recruit by market criteria and demand has regularly exceeded supply of apprenticeship contracts in recent years (Bundesinstitut für Berufsbildung (BIBB) 2013b).

Data and Methodology

Our methodology closely resembles the one in Mühlemann et al. (2009) and uses standard panel data methods to analyze the determinants of apprenticeship contracts at the regional level. Using firm-level data might be interesting for the analysis of sector specific features. However, in this paper, we focus on the relation between aggregate variables. The data we use consists of yearly information on offered apprenticeship contracts offered from businesses between 1999 and 2012 from all 16 German federal states. Additionally, for each state, we consider two variables related to the business cycle: the unemployment rate and the growth rate of regional real income. In addition, we control for demographic effects by considering demographic variables like the population of school leavers at age 16 and the number of first-year students. Descriptive statistics of the variables are provided in Table 1.

Figure 1 shows the log number of new apprenticeship contracts together with the growth rate of real income for each federal state. The visual inspection of the data reveals that real income growth rates showed no trend over the sample period. In the west German states, growth rates of real income decreased sharply during the economic crisis between 2007 and 2009. At the same time real income growth in the east German states remained more or less stable, with the exception of Sachsen-Anhalt, where the drop in the growth rate is small compared to the average decrease in the west German states. The rate of unemployment together with the log number of new apprenticeship contracts in each year for each federal state is displayed in Fig. 2. From 1999 to 2006/07, unemployment rates remained on high levels and started to decrease thereafter. In our estimations, we take these data characteristics into account by analysing corresponding sub-samples and sub-groups.

Table 1 Description of the data

	Mean	Std. Dev.	Max.	Min.	Obs.
Appr. contracts	29647.53	29645.35	122109	4064	224
Income	1413.39	1408.22	5207.02	230.12	224
Income growth	0.41	2.25	6.34	-10.62	208
Unemployment	12.19	4.78	22.10	4.20	224
School graduates	58021.48	54779.17	223515	7029	224
First year students	24056.62	23152.23	120305	3060	224

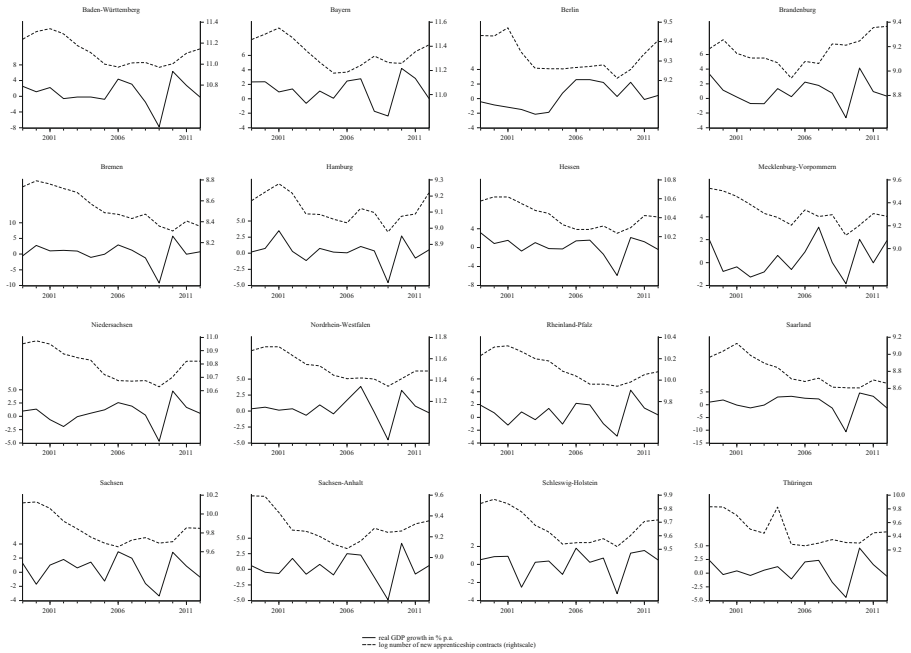


Fig. 1 Apprenticeship contracts and income growth in the German federal states

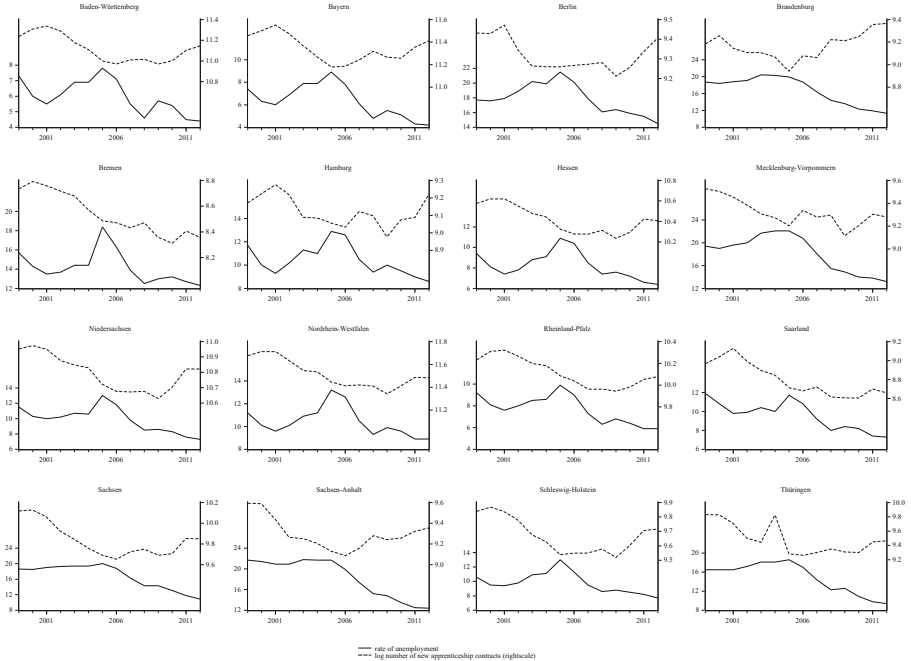


Fig. 2 Apprenticeship contracts and unemployment in the German federal states

A simple linear model that links the log-level of the number of apprenticeship contracts a_{it} to the growth rate of real income $\Delta y_{i,t-1}$ and to the unemployment rate u_{it} is

$$a_{it} = c_i + \theta \Delta y_{i,t-1} + \delta u_{it} + \mathbf{x}'_{it} \beta + \varepsilon_{it} \quad (1)$$

where i indexes the federal state, $i = 1, 2, \dots, 16$, and t indexes the year, $t = 1, 2, \dots, 14$. The variable c_i accounts for unobserved heterogeneity among the federal states. It is constant over time and may be correlated with income growth. For example, the c_i 's capture heterogeneity in the economic structures of the states. The vector \mathbf{x}_{it} comprises demographic variables that might be correlated with the business cycle and that have an impact on the number of apprenticeship contracts. Variation in the error-term ε_{it} stems from changes in the educational framework in federal state i in year t , which are not correlated with the business cycle and not autocorrelated (see e.g. Wooldridge 2002).

To meet concerns about the timing of the variables, we use the previous year's growth rate of real income in our regressions. New apprenticeship contracts are closed some time before the usual start of the training year on the first of August. Therefore, we use the previous year's growth rate of real income as an indicator for the business cycle in the beginning of the following year when, presumably, firms and apprentices form their decisions on new apprenticeship contracts.

In Eq. (1) the coefficient θ measures the ceteris paribus percentage change of apprenticeship contracts that is due to an increase in income growth by one percentage point and δ measures the ceteris paribus effect of a one percentage point increase in the unemployment rate. To obtain consistent estimates for θ and δ and to justify standard statistical inference, the regressors in (1) have to be strictly exogenous given the unobserved effect c_i , meaning that once $\Delta y_{i,t-1}$, u_{it} , \mathbf{x}_{it} and c_i are controlled for, $\Delta y_{i,s-1}$, u_{is} and \mathbf{x}_{is} have no partial effects on a_{it} for $s \neq t$. Strict exogeneity in terms of the errors can be stated as

$$E(\varepsilon_{it} | \Delta y_{i1}, \dots, \Delta y_{iT}, u_{i1}, \dots, u_{iT}, \mathbf{x}_{i1}, \dots, \mathbf{x}_{iT}, c_i) = 0, \quad i = 1, 2, \dots, 16. \quad (2)$$

Since we allow for state specific effects to capture unobserved fixed effects, we consider strong exogeneity a justifiable assumption in our model.

Results

Table 2 summarizes estimation results for different specifications of our empirical model (1). While the specifications in columns (1) to (3) of Table 2 include only business cycle variables, the regression presented in the last column is augmented with demographic control variables. In the specifications, in which income growth is included, its estimated coefficient varies between 0.7 and 1.2. Thus, an increase in income growth by one percentage point would trigger an increase in the number of new apprenticeship contracts by roughly one percent on average. However, as indicated by the relatively large standard errors the income effect is not statistically significant.

Table 2 Estimated business cycle effects on the number of apprenticeship contracts, the dependent variable is the number of apprenticeship contracts in federal state i in year t , a_{it} . The model includes state fixed effects. Sample period 1999–2012

	(1)	(2)	(3)	(4)
Constant	11.11*** (0.034)	11.09*** (0.08)	11.07*** (0.08)	14.73*** (1.34)
Income growth	1.11 (1.20)		1.16 (1.18)	0.72 (0.97)
Unemployment rate		0.005 (0.012)	0.006 (0.012)	−0.03* (0.02)
Log number of school graduates				0.22* (0.11)
Log number of first year students				−0.55*** (0.16)
Observations	224	224	224	224
Groups	16	16	16	16
Observations per group	14	14	14	14

Panel corrected standard errors in parentheses

* (‘***’, ‘**’, ‘*’) indicates statistical significance at 10 % (5 %, 1 %)

An increase in the rate of unemployment significantly lowers the number of new apprenticeship contracts in the specification where we control for the number of first year students and the number of school graduates, see column (4). The estimated elasticity of -0.03 is rather small, implying that the number of new apprenticeship contracts in Baden-Württemberg, for example, would have been decreased by 16 on average in 2012 if the rate of unemployment would have been increased by one percentage point in that year.

The estimated effect of income growth does not change substantially when the demographic control variables are included in the regression, see Table 2 column (4). The effect of the log number of school graduates is significant and shows the expected positive sign. The estimated elasticities of the number of new apprenticeship contracts with respect to the number of school graduates in a given year roughly correspond to the empirical observation that each year more than one third of school graduates start a dual training program on average. The relation between the log number of first year students and new apprentices is negative and strongly significant, thus reflecting substitution effects between university and firm level training. Potential heterogeneity among the west and the east German states gives reason to split the sample and to look for different effects in west and east Germany. More precisely, we allow for different effects of income growth and unemployment in the east and west German states by including corresponding interaction terms in the regressions. The specifications additionally include the logs of the two control variables,

the number of school graduates and the number of first year students. Estimation results for different sample periods are presented in the columns of Table 3. Estimated income effects, given in rows two and three of Table 3, are not significant except for the sample period 2007–2012 presented in the last column of Table 3, where income growth has a positive effect on the number of new apprenticeship contracts. While the estimated income effects are similar for the west and the east German states there are some differences with respect to the rate of unemployment. In the west German states we find significantly negative, albeit small, effects of unemployment on the number of new apprenticeship contracts in all subsamples. In the east German states the rate of unemployment is not significant except for 2007–2012, where it has a negative effect on the number of new apprenticeship contracts.

Taken together, the sub-sample results support our earlier impression that business cycle effects on the number of new apprenticeship contracts are small in size and that their statistical significance is rather weak. While we do not find any significant effects of income growth during normal times for both east and west German states,

Table 3 Estimated business cycle effects on the number of apprenticeship contracts in east and west Germany for different sample periods. The dependent variable is the number of apprenticeship contracts in state i in year t , a_{it} . The model includes state fixed effects

Variable	1999–2012	1999–2006	2007–2012
Constant	16.37*** (1.74)	12.26*** (2.85)	10.74*** (0.87)
Income growth, West	0.56 (0.93)	0.81 (0.86)	0.54* (0.31)
Income growth, East	1.09 (1.40)	2.07 (2.31)	1.16*** (0.21)
Unemployment rate, West	−0.04** (0.02)	−0.09*** (0.02)	−0.06** (0.02)
Unemployment rate, East	−0.02 (0.01)	−0.03 (0.03)	−0.04*** (0.01)
Log no. of school graduates	0.11 (0.11)	0.51** (0.22)	0.06 (0.07)
Log no. of first year students	−0.58*** (0.16)	−0.60*** (0.20)	−0.01 (0.01)
Obs.	224	128	96
Groups	16	16	16
Obs. per group	14	8	6

Panel corrected standard errors in parentheses

'*' ('**', '***') indicates statistical significance at 10 % (5 %, 1 %)

changes in the rate of unemployment significantly lower the number of new apprenticeship contracts in the west German states but not in the east German states. In normal times, the number of new apprenticeship contracts in the east German states is not affected by business cycle fluctuations. In the west German states the number of new apprenticeship contracts decreases with rising unemployment rates. Since the beginning of the financial crisis in 2007, the number of new apprenticeship contracts moves in the same direction as output growth in east and west Germany.

Conclusion

This paper has analysed the short-run reaction of apprenticeship programs offered by businesses to business cycle variables. Panel-data have been used for the German federal states ranging from 1999 to 2012 to show that the impact of business cycle fluctuations on the number of new apprenticeship contracts is weak and hardly significant on average. Hence, the apprenticeship system seems to have dampened the volatility of youth unemployment in Germany. We also document the importance of demographic variables in explaining the number of apprenticeship contracts.

References

- Askilden JE, Nilsen OA (2005) Apprentices and young workers: a study of the Norwegian youth labour market. *Scot J Polit Econ* 52(1):1–17
- Biavaschi C, Eichhorst W, Giuliatti C, Kendzia MJ, Muravyev A, Pieters J, Zimmermann NRPSKF (2012) Youth unemployment and vocational training. IZA Discussion Paper, pp 1–106
- Brunello G (2009) The effect of economic downturns on apprenticeships and initial workplace training: a review of the evidence. *Empir Res Vocat Educ Train* 1(2):145–171
- Brunello G, Medio A (2001) An explanation of international differences in education and workplace training. *Eur Econ Rev* 45(2):307–322
- Bundesinstitut für Berufsbildung (BIBB) (2013a) Datenreport zum Berufsbildungsbericht 2013 - Informationen und Analysen zur Entwicklung der beruflichen Bildung
- Bundesinstitut für Berufsbildung (BIBB) (2013b) Liste der staatlich anerkannten Ausbildungsberufe
- Dietrich H, Gerner H-D (2007) The determinants of apprenticeship training with particular reference to business expectations. *Zeitschrift für ArbeitsmarktForschung* 40(2/3):221–233
- Ebner C, Nikolai R (2010) Duale oder schulische berufsausbildung? Entwicklungen und Weichenstellungen in Deutschland, Österreich und der Schweiz. *Swiss Polit Sci Rev* 16(4):617–648
- European Commission (2012) Apprenticeship supply in the member states of the European union. Publications Office of the European Union
- Fedorets A, Spitz-Oener A (2011) Flexibilität und Anpassungsfähigkeit von Beschäftigten mit dualer Berufsausbildung. *Zeitschrift für ArbeitsmarktForschung* 44(1-2):127–134
- Hartung S (2012) Betriebliche Berufsausbildung und Weiterbildung in Deutschland. Institute for Employment Research (IAB)
- Lindley RM (1975) The demand for apprentice recruits by the engineering industry. *Scot J Polit Econ* 22(1):1–24
- Méndez F, Sepúlveda F (2012) The cyclicality of skill acquisition: evidence from panel data. *Am Econ J Macroecon* 4(3):128–52
- Mühlemann S, Wolter S, Wüest A (2009) Apprenticeship training and the business cycle. IZA Discussion Paper 228(4460):554–572
- Niederalt M (2004) Betriebliche ausbildung als kollektives phänomen. *Jahrbuch für Wirtschaftswissenschaften / Rev Econ* 55(1):80–105

- Reinberg A, Hummel M (2005) Höhere Bildung schützt auch in der Krise vor Arbeitslosigkeit. IZA Kurzbericht 9:1–6
- Schweri J, Müller B (2008) Die Ausbildungsbereitschaft der Betriebe: Entwicklungen 1995 bis 2005. Neuchâtel: Bundesamt für Statistik 18(1):359–375
- Statistisches Bundesamt (2013) Berufsbildung auf einen Blick
- Westergaard-Nielsen N, Rasmussen AR (1999) The Impact of Subsidies on the Number of New Apprentices Res Labor Econ 18(1):359–375
- Wooldridge JM (2002) *Econometric analysis of cross section and panel data*. MIT Press