(Mis-)matching in Germany

An analysis on the basis of employees' formal qualifications and skills

▶ **People are not always employed in jobs that perfectly match their skills and abilities. Research on the question as to what constitutes a good match is usually based on the empirical correspondence between employees' formal qualifications and the formal qualification requirements of their jobs, but so far no up-to-date and in-depth information exists on the incidence of skill-based mismatching in Germany. This article uses the BIBB/BAuA Employment Survey 2006, which yields rich information fitting the job-requirement approach, to provide up-to-date and in-depth figures on the incidence of formal and skill-based mismatching in Germany. Moreover, it studies the extent to which mismatching varies with employees' socio-demographic and qualification characteristics and with job tasks.**

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Current research

Mismatching, i. e. a lack of correspondence between the skills of an employee and the skill requirements of that person's job, might have negative consequences for the individual concerned (e. g. in the form of wage penalties[1] or job dissatisfaction), for the employer's business, and for the national economy. Studies of Germany and other economically advanced countries demonstrate that mismatching is a relevant phenomenon in labour markets (cf. McGuinness 2006). Meta-analyses of international studies (mainly from the 1980s and 1990s) which incorporate estimates for Germany (cf. McGuinness 2006; Groot/Van Den Brink 2000) indicate comparatively low rates of formal mismatching in Germany (cf. McGuinness 2006, p. 388; Green/McIntosh 2000), but so far there is no information on the incidence of skill-based mismatching in Germany. International research shows that the proportion of overqualified employees exceeds the proportion of under-qualified employees in most countries. The extent to which this currently applies to Germany, and whether this is valid for both types of matching (formal and skill-based) is a further issue requiring investigation. Moreover, some studies also show that younger employees, women and people with migrant backgrounds are more frequently overqualified, whereas male employees are less likely to be overqualified (cf. McGuinness 2006, p. 388; Green/McIntosh 2000).

An analysis of formal matching in Germany (Pollmann-Schult/Mayer 2004) shows differences between cohorts within matching categories between various vocational qualifications below the tertiary level. Another series of studies (including Biersack et al. 2008; Fehse/Kerst 2007) addresses the issue of adequate employment of tertiary-level graduates from various disciplines. The Educational Reporting Consortium (Konsortium Bildungsberichterstattung 2006, pp. 185 ff.) has shown that formal over-qualification has increased for graduates from academic tertiary-

1 *As regards wage penalties from mismatching in Germany cf. Rohrbach-Schmidt/Tiemann 2011a.*

level institutions between 1984/1995 and 2004 (19.8 %) and is currently slightly above the level of over-qualification of graduates from (upper secondary) vocational education and training institutions (2004: 17.2 %). As far as we know, no study has focused on how far the differences between various vocational qualifications at the secondary and tertiary-level affect both types of matching in Germany.

Finally, some studies see signs of an increase in over-education in Europe in recent years (cf. GREEN 2006; KORPI/TAHLIN 2009). Even though we are unable to demonstrate whether mismatching has increased or decreased in Germany, to look for trends we extend our analyses by considering job tasks. We use a classification of occupational activities into cognitive (analytical and interactive) and manual routine and non-routine job tasks, which are linked to assumptions about labour market demand over time (cf. AUTOR et al. 2003). Thus, it is predicted that while the relative demand for cognitive and manual routine job tasks should decline, the relative demand for high-skilled cognitive and (simple) manual non-routine activities should increase over time (cf. Table 3, p. 7; for evidence of such a development in Europe, cf. GOOS/MANNING/SALOMONS 2009).

(Mis)matching in Germany

A feature common to previous studies on mismatching in Germany is their focus on formal matching (DALY/BÜCHEL/DUNCAN 2000; BÜCHEL 2002; BAUER 2002). The data of the BIBB/BAuA Employment Survey 2006 (cf. box) which was conducted by the Federal Institute for Vocational Education and Training (BIBB) and the Federal Institute for Occupational Safety and Health (BAuA) enables direct comparisons between formal qualifications and the formal requirements for employees. In addition to this, the survey also allows for analysis of the relationship between employees' skills and the requirements of the workplace.

The BIBB/BAuA Employment Survey 2006

The Employment Survey of the Working Population on Qualification and Working Conditions in Germany 2006, carried out by the Federal Institute for Vocational Education and Training (BIBB) and the Federal Institute for Occupational Safety and Health (BAuA), covers a representative cross-section of the labour force. It includes information on the respondents' qualifications and career history (school education, initial and continuing vocational education and training, career development and change of occupation, usefulness of vocational qualifications etc.), as well as on detailed job-related information (organisational information, job tasks, job skill requirements, working conditions, health etc.). With a total sample size of 20,000 it is well suited to the study of specific social groups (such as the elderly, females, employees with non-formal qualifications, employees with different national backgrounds) and developments within detailed occupations, industries and vocational fields.

Information on the BIBB/BAuA Employment Survey 2006 is available at www.bibb.de/arbeit-im-wandel (in German). For information in English on the data and how to access it, please visit www.bibb.de/en/50113.htm.

INCIDENCE OF MISMATCHING

To measure formal (mis)matching we use the information on respondents' educational attainment and respondents' assessment of the typical vocational qualification that is required to do their current job.[2] Comparing both variables[3] it can be shown that approximately ten per cent of employees are under-qualified and fewer than twenty per cent are over-qualified in their current job. Thus, around 70 per cent are matched in terms of formal qualifications (cf. Table 1). Additionally, the BIBB/BAuA survey asked employees whether, in their job, they generally feel being up to, overstrained or undertrained by the requirements against their skills. On the basis of this definition of matching, i. e. the matching between the skills and knowledge of the job holder and the job's skill requirements, more than 80 per cent of employees are adequately employed (cf. ibid). As with formal matching, it is observable that higher proportions of employees are over- than under-qualified. This corresponds with results from other countries (cf. GREEN/MCINTOSH 2007; MCGUINNESS 2006). With minor exceptions (less than 5 %), German employees thus feel matched to the requirements of their jobs.

Combining the various matching measures (cf. Table 2, p. 6) reveals that, to a large extent, the different types of mismatching are independent of one another. "Twofold" over-qualification and under-qualification, i. e. an over-qualification or under-qualification in both formal and skills-based terms, are extremely rare in Germany (4.3 % and

Table 1 **Formal and skill-based (mis)matching**

	Formal matching		Skill-based matching	
	Thousands	Per cent	Thousands	Per cent
Under-qualified	3,503	10.6	925	4.6
Matched	23,663	71.2	16,295	81.6
Over-qualified	6,047	18.2	2,749	13.8
Total	**33,213**	**100.0**	**33,189**	**100.0**

Note: Differences are due to missing values.

Source: BIBB/BAuA Employment Survey 2006, weighted values, own calculations.

2 *In other surveys, apart from self-assessments, expert ratings or average educational levels are used in order to measure the qualification requirements of jobs. However, both suffer from not capturing within-occupational heterogeneity, being less current and possibly less valid (e. g. expert ratings are based on single raters). For a detailed discussion of various measurement methods, cf.* HARTOG *(2000).*

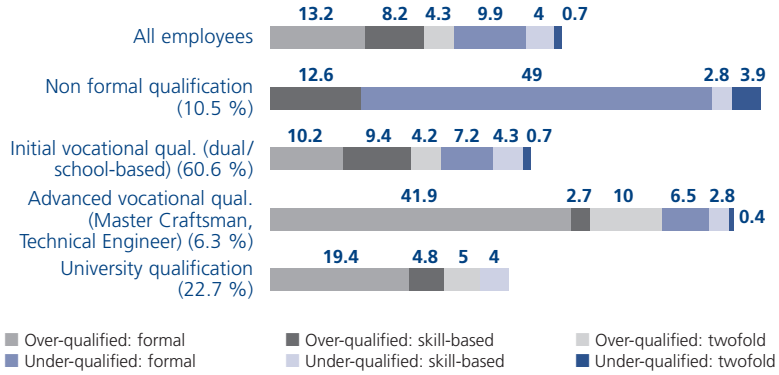
3 *Both variables were surveyed using the same response items: "no vocational education and training qualification" (no qualification), "completed vocational education and training qualification, including school-based vocational training" (dual/school-based training), "Master Craftsman or Technical Engineer qualification, trade and technical school qualification" (advanced training) and "university of applied sciences or university qualification" (higher education qualification).*

Table 2 **Formal and skill-based (mis)matching combined**

Type of (mis)matching	Thousands	Per cent
Under-qualification	**4,804**	**14.5**
• Twofold	220	0.7
• Skill-based	1,310	4.0
• Formal	3,274	9.9
Matched qualification and skills	**19,806**	**59.7**
Over-qualification	**8,548**	**25.8**
• Formal	4,387	13.2
• Skill-based	2,733	8.2
• Twofold	1,428	4.3
Total	**33,158**	**100.0**

Source: BIBB/BAuA Employment Survey 2006, weighted values, own calculations.

Figure **(Mis)matching by qualifications** (in %)



Source: BIBB/BAuA Employment Survey 2006, weighted values, own calculations.
Note: Differences between totals and 100 correspond to the matched proportions in each qualification group.

0.7 % respectively). Moreover, a larger share of employees is (only) inappropriately employed in terms of their formal qualifications (13.2 % and 9.9 %). Skill-based mismatching without formal mismatching occurs less frequently (8.2 % and 4.0 %). These results indicate that over-qualification and under-qualification in Germany are comparatively low, particularly compared to Anglophone countries (cf. McGuinness 2006; Groot/van den Brink 2000).

SOCIO-DEMOGRAPHIC DIFFERENCES IN (MIS)MATCHING

Both formal and skill-based mismatching vary significantly with employees' socio-demographic characteristics. Whereas the chance of being matched is equally distributed between men and women, the direction of mismatching varies by employees' sex. The incidence of formal and twofold under-qualification is higher for men and that of formal and twofold over-qualification is higher for women. Also, the incidence of mismatching (most notably twofold and skill-based) is higher for employees with a migrant background. However, a migrant background does not have an independent effect on mismatching – the bivariate tabulation hides the impact of intervening variables such as qualification, age and industry (cf. Rohrbach-Schmidt/Tiemann 2011a). An analysis of mismatching by age-cohorts shows that compared to the main working-age population, young employees aged 15 to 24 and older employees (age 65 and above) are matched less often. Whereas young workers entering the labour market may possibly accept a mismatched position with the aim of obtaining an initial "foothold in the market", mismatched employment of workers aged 65 and over possibly occurs on grounds of securing any kind of earning opportunity.

QUALIFICATION-RELATED DIFFERENCES IN (MIS)MATCHING

Relating mismatching to different qualification levels (highest level of vocational education attained) reveals some decisive matching patterns (cf. Figure): firstly, employees with an apprenticeship qualification (in the German vocational education and training (VET) sector) and university graduates perform equally well in finding a matched job. This clearly underlines the particular position of the VET system in Germany. In the case of over- or under-qualification in terms of formal credentials, employees with an apprenticeship do slightly better than graduates from tertiary-level academic institutions (19.4 % as opposed to 17.4 %). With regard to skills and knowledge, however, employees who have completed dual and school-based VET are more likely to be over-qualified than university graduates. Compared to these two groups, employees without qualifications and those who have undergone advanced training to obtain a Master Craftsman or Technical Engineer qualification are significantly less likely to have a matched job. However, the completion of a Master Craftsman or Technical Engineer qualification generally leads to over-qualified employment only from a formal point view, not necessarily with regard to the required skills.

JOB-TASK-RELATED DIFFERENCES IN (MIS)MATCHING

Differences within the matching categories also emerge with regard to job-task-related characteristics, i. e. groups of occupational activities introduced by Autor et al. (2003) – cf. Tables 3 and 4. Roughly speaking, cognitive non-routine tasks which exhibit a particularly rising labour market demand are less likely to be executed by employees who are mismatched in formal and skill-based terms. On the contrary, mismatched employees perform both cognitive and manual routine tasks more frequently. Non-routine manual tasks are more frequent with under-qualified employees and less frequent with over-qualified employees. Overall, the results might be interpreted as a sign of (rising) mismatching in routine tasks and in non-routine manual tasks through displacement processes.
This interpretation is supported by an analysis of occupational groups and industries (results are available on

request). Lower occupational groups (ISCO-88 Main Groups 8 and 9) and commercial occupations are particularly characterised by formal and skill-based over-qualification. From all industry branches, commercial occupations also display the highest values for routine cognitive tasks. Against that background, a decrease in the demand for routine tasks could lead to an increase in mismatched employment in Germany, as in other European countries.

Trend towards more mismatching in Germany?

Formal and skill-based over-qualification and under-qualification are relevant phenomena of the German labour market, albeit to a limited extent. Over-qualification, as is the case for other countries, plays a greater role than under-qualification. Employees tend to be mismatched in terms of formal credentials rather than with regard to their skills. This means that although relevant proportions of employees are formally under- or over-qualified, their skills or abilities are in fact appropriate for the jobs that they do. We find some striking patterns for relevant subgroups of employees of different socio-demographic and qualification characteristics, among them that employees with an initial vocational qualification from the German apprenticeship training system perform as well as university graduates in obtaining a matched job.

This might play a part in explaining why the incidence of mismatching is somewhat lower in Germany than in other countries. Moreover, matching is linked with more non-routine activities and fewer routine activities. Against the background of an increase in formal over-qualification in some European countries, our analyses suggest that mis-

Table 3 **Operationalisation of occupational activities within the routine/non-routine scheme developed by Autor et al. (2003)**

Task group	Typical level of qualification	Assumed labour market demand	Item in BIBB/ BAuA 2006a, b
Non-routine cognitive: analytical	High	Rising	F310, F311, F313, F318
Non-routine cognitive: interactive	High	Rising	F312, F314
Routine: cognitive	Medium	Falling	F307, F308
Routine: manual	Medium/low	Falling	F304, F305, F306
Non-routine: manual	Low	Constant/rising	F315, F316, F317

[a] Alignments are initially based on a factor analysis solution. The variables of the first of the four factors were subsequently aligned to the sub-categories "analytical" and "interactive," respectively.

[b] The question posed was how often the following activities (random order) occur at work – frequently, sometimes or never. The index is the sum of the employee's point scores (frequently = 1, sometimes = 0.5, never = 0) divided by the total number of activities in the respective task group.

F303 Manufacturing, producing of products and goods* **
F304 Measuring, testing, quality control
F305 Operating, controlling machines, plants, technical processes
F306 Repairing, maintenance
F307 Buying, providing, selling
F308 Transporting, stocking, posting
F309 Promoting, marketing, public relations*
F310 Organising, planning/preparing work processes
F311 Researching, developing, designing
F312 Training, teaching, tutoring, education
F313 Gathering information, investigating, documenting
F314 Consulting, advising
F315 Entertaining, accommodating, preparing food
F316 Nursing, caring, healing
F317 Securing, protecting, guarding, monitoring, traffic
F318 Working with computers
F319a Cleaning, waste disposal, recycling*

* Items were not included in the index because they have high loadings on more than one factor.
** Additionally included in "routine manual" in Rohrbach-Schmidt/Tiemann 2011a. Also see Rohrbach-Schmidt/Tiemann 2011b.

	Under-qualification			Match	Over-qualification			All employees
	Twofold	Skill-based	Formal		Formal	Skill-based	Twofold	
Task indicator (0-100, mean values)								
Non-routine-cognitive: analytical (F 310, F311, F313, F318)	47.5	50.3	56.6	53.6	41.5	46.3	30.8	50.6
Non-routine-cognitive: interactive (F312, F314)	48.4	51.6	56.7	56.5	43.6	50.0	34.0	53.1
Routine-cognitive (F307, F308)	41.1	38.5	39.6	36.5	38.8	39.2	37.0	37.5
Routine-manual (F304, F305, F306)	47.9	46.8	43.6	41.4	36.1	43.4	32.4	41.0
Non-routine manual (F315, F316, F317)	32.6	27.2	23.4	21.3	18.1	21.0	16.5	21.2

Source: BIBB/BAuA Employment Survey 2006, weighted values, own calculations.

Note: The values in the table are mean values of the various matching categories for the task indices and state how much the various matching categories are characterised by these tasks – measured as the frequency with which such activities are exercised. For example, employees who are twofold under-qualified perform non-routine analytic activities less frequently than matched employees (47.5 versus 53.6).

Table 4
Matching according to task groups

matching could also rise with changes in the demand for skills in Germany. However, to validate this assumption, the analyses presented here would need to be supplemented by an analysis of longitudinal data. ■

Literature

Autor, D. et al.: The skill content of recent technological change: An empirical exploration. In: Quarterly Journal of Economics, 118 (2003) 4, pp. 1279-1334

Bauer, T. K.: Educational mismatch and wages. A panel analysis. In: Economics of Education Review 21 (2002) 3, pp. 221-229

Biersack, W. et al: Akademiker/-innen auf dem Arbeitsmarkt: Gut positioniert, gefragt und bald sehr knapp. In: IAB-Kurzbericht 18/2008

Büchel, F.: The effects of overeducation on productivity in Germany – the firms' viewpoint. In: Economics of Education Review 21 (2002) 3, pp. 263-275

Daly, M. C.; Büchel, F.; Duncan G. J.: Premiums and penalties for surplus and deficit education. Evidence from the United States and Germany. In: Economics of Education Review 19 (2000) 2, pp. 169-178

Fehse, S.; Kerst, Ch.: Arbeiten unter Wert? Vertikal und horizontal inadäquate Beschäftigung von Hochschulabsolventen der Abschlussjahrgänge 1997 und 2001. In: Beiträge zur Hochschulforschung 29 (2007) 1, pp. 72-98

Goos, M.; Manning, A.; Salomons, A.: Job polarization in Europe. In: American Economic Review: Papers & Proceedings 99 (2009) 29, pp. 58-63

Green, F.: Demanding work. The paradox of job quality in the affluent economy. Princeton, N.J.: Princeton University Press 2006

Green, F.; McIntosh, S.: "Is there a Genuine Underutilisation of Skills Amongst the Over-qualified?" In: Applied Economics 39 (2007) 4, pp. 427-439

Groot, W.; van den Brink, H. M.: Overeducation in the labour market. A meta-analysis. In: Economics of Education Review 19 (2000) 2, pp. 149-158

Hartog, J.: Over-education and earnings: where are we, where should we go? In: Economics of Education Review 19 (2000) 2, pp. 131-147

Konsortium Bildungsberichterstattung: Bildung in Deutschland. Bielefeld 2006

Korpi, T; Tåhlin, M.: Educational mismatch, wages and wage growth. Overeducation in Sweden 1974-2000. In: Labour Economics 16 (2009) 2, pp. 183-193

McGuinness, S.: Overeducation in the labour market. In: Journal of Economic Surveys, 20 (2006) 3, pp. 387-418

Pollmann-Schult, M.; Mayer, K. U. 2004: Returns to skills: vocational training in Germany 1935-2000. Max Planck Gesellschaft – eDocument Server. 2004. – URL: http://edoc.mpg.de/ac_oai.pl (retrieved 08.12.2009)

Rohrbach-Schmidt, D.; Tiemann, M.: Qualification and skill-based mismatching in Germany. In: Green, F.; Keese, M. (eds.): Job tasks, work skills and the labour market (OECD). Paris 2011a

Rohrbach-Schmidt, D.; Tiemann, M.: Mismatching and job tasks in Germany – rising over-qualification through polarization? In: Empirical Research in Vocational Education and Training, 3 (2011b) 1, pp. 39-54

Spitz-Oener, A.: Technical change, job tasks, and rising educational demands: Looking outside the wage structure. In: Journal of Labour Economics 24 (2006) 2, pp. 235-270