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Who chooses teaching under different labor market conditions? Evidence from West Germany, 1980-2009

Martin Neugebauer¹

Abstract: To shed light on this question, this paper analyzes trends in labor market conditions and trends in teacher graduates' characteristics over three decades. Based on representative data from West Germany, it shows that teacher earnings have not declined over time. Likewise, there is no decline in academic aptitude among teacher graduates. Unemployment risks, on the other hand, have fluctuated greatly. In times of high unemployment risks, the likelihood to enter teaching was low, especially for persons with pronounced extrinsic job-security motivations. This changed markedly in recent years, when employment prospects became auspicious.

Keywords: Teacher Recruitment; Teacher Supply and Demand; Teacher Background; Teaching Motivations; Preservice Teacher Education; Trend Analysis

1 Introduction

Teacher labor markets in many countries have experienced major changes over the past decades. Several countries report that teacher pay has not kept up with earnings in other occupations (U.S.: Flyer & Rosen, 1997; Hanushek & Rivkin, 2007) (AUS: Leigh & Ryan, 2008) (U.K.: Dolton, 2005; Nickell & Quintini, 2002). What is more, many countries face cyclical waves of teacher shortages followed by surpluses (Watt, et al., 2012, p. 791). This has left different cohorts of new teachers with strikingly different career prospects. This paper assesses whether such fluctuations influence self-selection processes into teaching. Do labor market conditions influence who enters the profession? This question is timely in light of current debates on teacher quality and pressing teacher shortages in many countries, where a major challenge is to optimize the pool of individuals from which teacher candidates are drawn (OECD 2005; Schleicher 2011; UNESCO 2013). To inform teacher education systems about qualitative characteristics of the applicant pool of teacher candidates under different labor market conditions, this study analyzes the teacher labor market in West Germany over the past three decades. It then traces changes in academic aptitude and selected career choice motivations of student teacher graduates over the same time-period.

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So far, little is known on the interplay between labor markets and self-selection into teaching. Findings from the current study will help to fill this knowledge gap. First, it contributes to the literature by describing – for the first time – trends in earnings and unemployment risks of teachers relative to other tertiary-educated workers in West Germany. Second, while some studies analyze pre-training characteristics of student teachers relative to other university students (Gold & Giesen, 1993; Klusmann, Trautwein, Lüdtke, Kunter, & Baumert, 2009; Neugebauer, 2013), this study is the first to describe trends in such characteristics over several cohorts. It focuses on a limited set of characteristics – academic aptitude, as well as intrinsic (subject-interest) and extrinsic (job security) career choice motivations. These characteristics are chosen, because they are available in different cohorts, are correlated with the study success of student teachers (see below), and can arguably be influenced by labor market conditions. On a more general take, the paper shows how expected labor market returns may influence career choices.

1.1 Academic aptitude and motivation among teacher candidates

The recruitment of talented teacher personnel is a central goal for most educational systems (OECD, 2005; Schleicher, 2011). Such recruitment goals are based on the notion that “talented” persons can be identified prior to in-service teaching. It is argued that academic aptitude and certain motivations constitute important preconditions for how well and motivated a person learns during teacher education (e.g. Blömeke, Suhl, Kaiser, & Döhrmann, 2012; Klusmann, 2013; Mayr, 2010).

The available empirical evidence supports these conjectures, with some limitations. Results from several recent studies in Germany provide evidence that academic aptitude, measured in terms of *grade point averages* (GPA, henceforth) obtained in upper secondary graduation certificates (the Abitur), influences the amount of professional knowledge that student teachers accumulate by the end of their study course, net of teacher training effects (Blömeke & Buchholtz, 2011; Blömeke, et al., 2012; Kleickmann & Anders, 2011; Kleickmann, et al., 2013, p. 103; König, Tachtsoglou, & Seifert, 2012; Kunina-Habenicht, et al., 2013). In addition to GPA, *teaching motivations* is considered to be related to both positive and negative outcome variables among beginning teachers (see Watt & Richardson, 2007). However, research on the predictive value of motivations is still in its fledging stages. What we know so far is that especially intrinsic motivation (i.e. doing something because it is inherently interesting or enjoyable) results in high-quality learning (Ryan & Deci, 2000). In teacher research, intrinsic reasons to choose teaching are often distinguished into altruistic-pedagogical and subject-related motives (Brookhart & Freeman, 1992; Watt & Richardson, 2007). While altruistic-pedagogical motives (example item: “I love working with children”) are mostly unrelated to accumulated teacher knowledge, several studies find that subject-related motivation (example item “I am interested in mathematics”) is a relevant determinant for the amount of accumulated professional knowledge (Blömeke, et al., 2012; Kleickmann, et al., 2013, p. 103; König & Rothland, 2013). Furthermore, subject-interest correlates positively with learning strategies, study satisfaction (Künsting & Lipowsky 2011), and college grades (Blömeke, 2009), and negatively with college drop-out intention (Blömeke, 2009; Heublein, Hutzsch, Schreiber, Sommer, & Besuch, 2010). The effects of extrinsic

motivation (i.e. doing something because it leads to a separable outcome) are less clear, and correlations are typically weak. According to Watt and Richardson (2007) extrinsic motivations (also named ‘personal utility values’) such as job security, transferability, and time for family, relate negatively to later planned persistence and career choice satisfaction. Among student teachers, the strongest extrinsic career choice motivation is “job security” (König & Rothland, 2013; Watt, et al., 2012). Blömeke and colleagues (2012) find negative effects of such motivations (example item “I seek the long-term security associated with being a teacher”) on different professional knowledge dimensions among future primary school teachers. However, they cannot replicate this finding among secondary school teachers at the end of their teacher education program (Blömeke, Kaiser, & Döhrmann, 2011). One reason for the indefinite associations might be that persons with high extrinsic motivations can have high intrinsic motivations *at the same time*. If a person is characterized by high (extrinsic) job security motivations *and* high (intrinsic) subject-related motivations, no negative outcomes are to be expected. In turn, if a person’s motivational profile is dominated by security but not subject-related motivations, chances are that this person will invest less energy and accumulate less professional competence during teacher training.

1.2 Changes over time in response to labor market shifts?

In sum, the recruitment of personnel with high academic aptitude and teaching motivations that include high subject interests is one important cornerstone for raising professional teacher competence. Have these characteristics remained stable over the past decades or have persons with different characteristics been attracted to teaching, because the job environment has changed? Clearly, a teacher’s job environment is rather stable across time, because most features related to the task of teaching itself are relatively stable – teachers transfer knowledge, work with children and youth, and manage complex classroom environments. For this reason, one would assume rather similar characteristics of different cohorts of teacher trainees. However, some features related to the external conditions of the profession can change, such as earnings and employment prospects. Have these external conditions changed, and has this had an effect on who self-selects into the profession?

In recent years, debates on teacher recruitment have intensified as “some countries [...] express concern about the quality and motivation of a proportion of teacher trainees” (OECD, 2005, p. 29). These concerns are mainly based on studies by economists, showing that the academic aptitude of future teachers has been declining relative to other college-educated workers over the past decades in the U.S., U.K., and Australia (Bacolod, 2007; Corcoran, Evans, & Schwab, 2004; Hoxby & Leigh, 2004; Lakdawalla, 2006; Leigh & Ryan, 2008; Nickell & Quintini, 2002; Stoddard, 2003). The most frequently mentioned explanation for declining aptitude is related to shifts in earning opportunities outside of teaching. Over the course of the past decades, women especially have increasingly gained access to alternative occupations with attractive wages. Based on the underlying argument that individuals aim to maximize personal income, and that high aptitude individuals have the highest propensity to achieve high earnings, it is believed that increased labor market opportunities outside of teaching have detracted high-ability individuals – especially women – from teaching. Bacolod (2007) tests this hypothesis with U.S. data and finds indeed that where teacher wages became

relatively less attractive, both men and women were less likely to choose teaching as their occupation, especially those with high academic aptitude. Recent calculations show that teachers' wages in Germany are relatively good, both, in comparison with other tertiary-educated workers and in comparison with other countries (OECD, 2012, pp. 456-466; Weishaupt & Huth, 2012, pp. 97-98). But how have they developed over the past decades? If the theoretical argument holds, one would expect the same link in Germany, i.e. *declining academic aptitude in case of relative earnings decline*.

The mentioned studies have focused on earnings, but earnings are clearly not the only external return dimension influencing career choice, or the choice of associated fields of study. A recent study from Germany provides evidence that higher graduate unemployment in a given discipline reduces the share of students opting for the associated field of study, with a time lag of several years (Reisz & Stock, 2013). This is especially true for teacher studies, where employment opportunities are restricted to a certain employment sector. As mentioned in the previous section, the strongest extrinsic career choice motivation among student teachers is "job security". How do individuals with high job security motivations react to changing unemployment risks? It can be assumed that *persons who are extrinsically motivated by a desire to obtain a secure job are unlikely to choose teaching in times where unemployment risks are higher in teaching than in other occupations*. On the other hand, *one would not expect any effects on exclusively intrinsically motivated individuals*, who choose teaching for reason related to the teaching experience itself (e.g. interest in the subject taught, working with children). Despite decades of research on teachers' career choice motivations (e.g. Brookhart & Freeman, 1992; Rothland, 2011; Tudhope, 1944; Watt, et al., 2012; Young, 1995), only one study, to my knowledge, traces changes in motivations over cohorts (Jantzen, 1981). The author finds that extrinsic motivations, such as adequate income, retirement provisions and tenure laws were declining in importance between the mid-1940s and the late 1970s among pre-service teachers in the U.S., while intrinsic pedagogical motives such as an "interest in dealing with children" became more relevant over time. Interestingly, extrinsic motivations decreased and intrinsic motivations increased in times of teacher surpluses in the 1970s; prior to this time, between World War II and into the 1960s, teacher shortages were acute. While Jantzen (1981) does not directly discuss potential labor market influences on these motivational shifts, his findings are in line with my conjecture, that career prospects may influence the motivational composition of teacher candidates. Note that Jantzen's (1981) findings are based on non-random samples of student teachers at 1 to 3 institutions in California. In addition and like almost all studies in the field, Jantzen does not compare the motivations of teachers to motivations of students who choose not to become teachers. Hence, the reported changes may simply reflect general motivational shifts among entire student cohorts, and not describe genuine characteristics of teacher candidates.

To sum up, this study aims to answer the following research questions:

- How have teacher labor market conditions (earnings and unemployment risks) changed over the past 30 years?
- How have academic aptitude and motivational characteristics of applicants to the profession evolved over the same time-period, possibly in response to changing labor market returns?

More specifically, I assess whether there is a link between academic aptitude and earnings, and a link between unemployment risks and extrinsic ‘job security’ motivation. I contrast the developments in teaching with those outside of teaching, to disentangle general trends from typical trends among teachers. Such a comparative perspective is also important because the propensity to choose teaching will be influenced by the earnings and employment prospects of teachers *relative* to those of other occupations requiring similar levels of qualifications. The German system of teacher education requires candidates to study teaching at a university (phase 1, duration 3.5-5 years) followed by a preparatory training at teacher seminars and schools (phase 2, duration 1.5-2 years). Thus, unlike U.S. students, those in Germany typically choose their career path before university enrollment. Hence, a meaningful comparison group for teacher candidates are students or graduates in other fields of study. For labor market analyses, a meaningful comparison group to teachers are persons with tertiary education degrees, who work in other fields.

2 Methods

2.1 Data to analyze labor market conditions

To document trends in hiring numbers of new teachers, I draw on official statistical data. In addition, to study temporal developments in earnings and unemployment risks of teachers relative to other occupations on the basis of individual-level data, I draw on data from the German Microcensus (Federal Statistical Office, 2013). The Microcensus is the official annual labor force survey covering 1 percent of all German households. I use Scientific Use Files containing a 70 percent sample of the originally interviewed individuals from 15 different years (1980, 1985, 1987, 1989, 1991, 1993, 1995, 1996, 2000, and 2004-2009), in which information on field of study (including teacher studies) is available. The availability of field of study information is an important requirement to calculate unemployment rates for labor market entrants, because many of them have not yet worked in any job, which could otherwise serve as the basis to compare teachers and non-teachers. Major advantages of the Microcensus are a high continuity in survey questionnaires, large sample sizes, and compulsory response to most questions, contributing to a very low level of non-response. Because I am interested in long-term developments, I concentrate all analyses on the West German population (East German data is available only since 1991). I further restrict the sample to persons with tertiary degrees, to compare teachers to other persons with tertiary degrees, which I believe are the most informative comparison group. I exclude persons younger than 26 and all those who are still in any kind of full-time education or training, as well as those older than 56, to mitigate early retirement issues.

For the persons remaining, I identify the *current occupation*. I identify all teachers working in the general education system (i.e. in elementary, secondary, or special education schools). I exclude ambiguous cases and persons who work in pre-school, higher education, or as instructors outside of the general education system, such as driving school teachers or private tutors. I also record respondents’ *field of study* and their *(un)employment status*. Status of unemployment is measured according to the ILO convention as a binary variable differentiating between employed and unemployed. I exclude those who have not been

seeking a job in the last four weeks (inactive), and those still in education, vocational programs or military service (ILO, 2003). Finally, *personal net monthly income* is measured. The availability of net income data is a precondition for any meaningful comparison between teachers and other occupations, because the civil servant status of teachers implies that deductions from gross income vary substantially between teachers and other occupations. Because net monthly income is influenced by working hours, age, citizenship, marital status, other sources of income, and federal state, I control for these factors in the empirical models. The income information is given in intervals (e.g. 24 income categories in the year 2000). I take midpoints of the categories, and multiply the first and last income categories by .9 and 1.1, respectively. Net monthly earnings are adjusted by Consumer Price Index (base year = 2005). Income prior to 2002 is converted into Euros. In the analysis, I trim off the top and bottom 2.5 percent of the income distribution to minimize the bias caused by outliers. Overall, the sample comprises 295 467 persons. The data is summarized in Table 1.

Table 1: Data to analyze labor market conditions, by survey year

year	N	% teachers	% females	mean income (in EUR)	unemp. rates (in %)
1980	11 721	22	29	2 585	1
1985	14 006	23	28	2 320	4
1987	15 172	20	29	2 371	4
1989	15 298	19	33	2 380	4
1991	16 531	19	34	2 587	3
1993	17 627	17	35	2 532	4
1995	19 790	15	36	2 457	5
1996	20 641	13	37	2 364	4
2000	19 448	12	39	2 637	3
2004	21 269	11	41	2 629	4
2005	23 283	10	42	2 558	4
2006	25 005	10	42	2 552	4
2007	23 145	11	40	2 633	3
2008	24 724	11	41	2 582	3
2009	27 807	10	44	2 534	3
Total	295 467	14	38	2 524	4

Notes: German Microcensus, Scientific-Use-Files 1980-2009; individuals aged 26-56 with tertiary education. Net monthly income is CPI-adjusted (base year = 2005) and converted into Euros prior to 2002. Status of unemployment is measured according to the ILO conventions. The table illustrates how females have been underrepresented among tertiary degree holders, but have been catching up in recent years. It also shows that the share of teachers fluctuated, which will be discussed further in the results section.

2.2 Data to analyze characteristics of applicants to the profession

It is rather difficult to find data that captures characteristics of different cohorts of teacher candidates over a thirty-year time-period with identical measures of academic aptitude and motivational indicators. Especially data that includes comprehensive measurement of

motivations such as the FIT-Choice scale is unavailable.² The most suitable data source is the repeated series of Konstanz Student Surveys (Konstanz Research Group on Higher Education, 2013). Starting in the winter term 1982/83, a representative sample of tertiary students was interviewed on a wide range of topics concerning their student life. Since then, 10 further surveys have been carried out in intervals of two to three years, the most recent one in 2009/10. A two-stage sampling procedure was used. First, there was a structured selection of institutions of higher education, categorized by state, date of foundation and subject offerings. Within each institution, a random student sample was interviewed through mail surveys. Across surveys, the selection of institutions and the sampling strategy within institutions has remained largely constant. Likewise, the core program of the questionnaire has remained unaltered over time, including questions on demographics, high school grades, choice of field of study, and study motives. In order to compare teacher candidates to other students over a long period of time, I restrict the sample to West German students who have obtained the 'Abitur', which is the unrestricted higher education entrance qualification.³

While the high comparability of surveys makes them a good source for time trend analysis, the data is not without imperfections. One drawback of the data, as it is common for mail surveys, is that response rates dropped from 41 % in 1982/83 to 28 % in 2009/10. However, a comparison with official statistics shows that the marginal distributions of available variables match, except for gender. Because female students are overrepresented by about 5 percent in the more recent surveys, I constructed redressment weights to match the official gender distribution for each year. Another limitation to the Konstanz surveys is that they are cross-sectional, and thus not well suited to determine which students actually end up as teachers. To mitigate student dropout and mobility issues, and to proxy actual teacher candidates more closely, I restrict my sample to students reporting to finish their university education within the next 3 semesters (1/3 of the sample), assuming that systematic dropout does not occur shortly before students finish their degree. This assumption seems plausible, given that most dropouts and transitions to other fields of study occur in the first 2 semesters (Heublein, Spangenberg, & Sommer, 2003, p. 42). While far from perfect, this approach promises to be a reliable strategy to identify the applicant pool of future teachers and non-teachers as good as possible in lack of longitudinal data. According to their anticipated graduation year, I re-group the students into 7 graduate cohorts. The grouping is somewhat arbitrary. I ran several sensitivity checks varying the time cut-points for the groups and found out that results do not differ substantially. I ended up choosing groups which are sufficiently large and where the timing reflects different labor market situations. In each cohort, I can identify between 257 and 565 student teachers and between 1 161 and 3 553 other students,

² The FIT-Choice (Factors Influencing Teaching Choice) scale assesses the primary motivations of teachers to teach, and was demonstrated to be psychometrically sound (see Watt & Richardson, 2007 for details).

³ Students from universities of applied sciences are excluded, because 50.5 % of these students have restricted higher education entrance qualifications ('fachgebundene' and 'Fachhochschulreife'). Grades from these qualifications are not comparable to 'Abitur' GPA, which I will use as a measure of academic aptitude. In addition, students with a restricted entrance qualification are usually not able to enter university-based teacher programs. I also exclude students older than 35 (2 percent of the sample). These students do not typically enter any academic occupation: Because of free university tuition, some are officially enrolled to obtain student benefits (such as reduced public transport fees), but never intend to finish a degree. Others are pensioners who study for amusement.

who will graduate from their university-based training within the next 3 semesters (see Table 2). I refer to these “soon-to-graduate-students” simply as “graduates” in the remainder of the paper. A third drawback is the fact that different types of teacher studies (e.g. teachers for primary and upper secondary school) cannot be differentiated except for the first two cohorts, which is why I am forced to analyze them jointly (but see the tentative findings mentioned in ‘Summary and Discussion’).

Academic aptitude is measured through grade point averages (GPA) obtained in the upper secondary graduation certificate (the Abitur). ‘Abitur’ GPA is measured in 31 categories running from 1.0 to 4.0. For the analyses, GPA is reverse-coded so that higher values indicate better performance. For each student I calculate GPA *relative* to other students of the same graduate-cohort (using both standardized mean GPA and centile rankings). This measure gives the position of a graduate relative to other graduates of the same cohort. Unstandardized grades reveal moderate grade improvement over time (see Table 2). In case this would imply an absolute rise in academic aptitude over cohorts, a relative decline in teacher student grades could in fact mask an absolute rise. However, this is unlikely to have occurred. If anything, educational expansion has led to an increasing intake of less talented students (Walker & Zhu, 2005). The grade improvement much rather reflects inflation of grading practices, which is removed by standardization.

To measure *motivations* of graduates, I am restricted to using single-item indicators. I focus on the two previously discussed career choice motivations, intrinsic subject-related interest (= the motivational dimension which is most predictive for learning during teacher training) and extrinsic job security motivation (= the strongest extrinsic motivational dimension). On a 7-point likert item, students indicated how important subject-interest (‘Fachinteresse’) was when choosing their study program. On another 7-point likert item, they indicated how important a secure workplace (‘berufliche Sicherheit’) was. On average, students rated subject-related interest higher (M=4.85, SD=1.33) than job security (M=2.80, SD=1.89), which is in line with other studies (e.g. König & Rothland, 2012). I standardize the motivations similarly to ‘Abitur’ GPA, i.e. values reflect the importance of the motive relative to all other graduates of the same cohort. Sample characteristics are summarized in Table 2.

Table 2: Data to analyze characteristics of applicants to the profession, by year of graduation

year	N	% teachers	% females	unstd. mean GPA	unstd. subj.- interest	unstd. job security
1982-83	1 528	25	42	2.47	4.60	2.49
1984-87	3 570	16	41	2.55	4.85	2.48
1989-94	3 982	11	42	2.66	4.87	2.73
1995-98	2 052	15	46	2.72	4.88	2.71
2000-03	1 859	14	48	2.77	4.80	2.82
2004-06	1 609	15	52	2.72	4.89	3.06
2007-10	2 412	17	53	2.71	4.95	3.46
Total	17 012	15	45	2.65	4.85	2.80

Notes: Konstanz Student Surveys, 1982-2009; students graduating within 3 semesters, own re-grouping. ‘Abitur’ GPA is reverse-coded so that higher numbers indicate better GPA. Unstandardized measures show absolute shifts in graduate characteristics. In the analyses, I standardize measures per cohort to measure characteristics of teacher graduates relative to other graduates from that year.

3 Results

To make results more tangible, I rely on graphical representations of the major findings. Further in-depth analyses are provided in the appendix. Within the teacher workforce, the most important differentiation, both in terms of earnings and in terms of applicants' characteristics lies between teachers at different school types (i.e. upper secondary vs. other school types). While I focus my analysis on the teacher labor market as a whole, I point to differences between school types wherever the data allows me to do so.

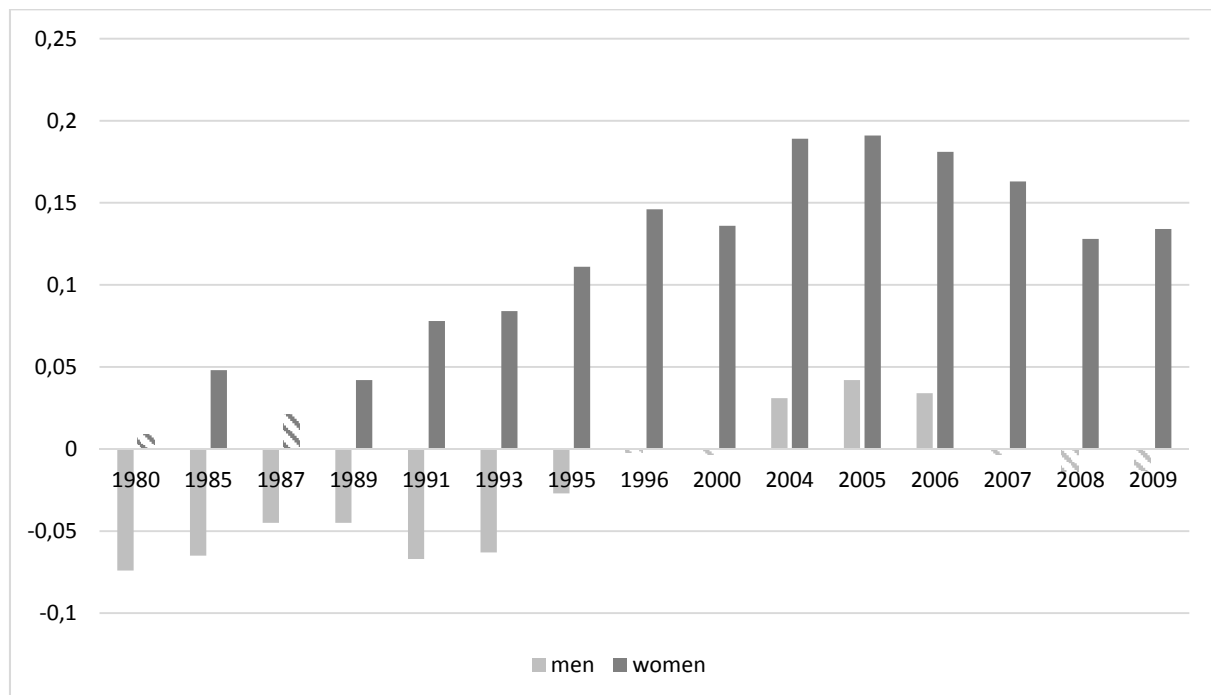
3.1 The changing attractiveness of the teacher labor market

The first research question of this study asks how teacher labor market have changed over the past 30 years.

3.1.1 Earnings

I start by describing trends in relative teacher earnings. To compare earnings of teachers against those of other university-educated workers, I ran a series of 30 Ordinary Least Squares (OLS)-regressions, two for each year (one for men, one for women), with log monthly income (5%-trimmed) as dependent variable and working as a teacher vs. working in another occupation as independent variable. Income is log-transformed to reach a better model fit, and so that income differentials between teachers and non-teachers can be interpreted as percentage point differences (Wooldridge 2009: 189-192). I control for potential confounders, such as working hours, age, citizenship, marital status, and federal state. Estimations are based on employed persons, aged 26-56, with tertiary degrees who make a living primarily from their own employment and who work at least 10 hours per week. Figure 1 shows bars representing the coefficients of the independent variable from these regression models (control variable coefficients are shown in the appendix). Bars can be interpreted as the percentage point difference in monthly earnings of teachers compared to other university-educated workers. Bars with diagonal lines indicate non-significant differences between the two groups.

Figure 1: Effect of working as a teacher compared to any other occupation for tertiary-educated workers on personal log net monthly income, by gender.



Notes: Bars with diagonal lines indicate non-significant differences ($p > 0.05$) between teachers and the comparison group. All models include controls for age, age², marital status, citizenship, working hours (in 5 hour steps), and federal state. The full set of covariates can be seen in table A2 (appendix), exemplarily for 2009. Estimations based on employed persons, aged 26-56, with tertiary degrees who make a living primarily from their own employment and who work at least 10 hours per week.

Source: *Microcensus*, different years, own calculations.

Between 1980 and 1995, male teachers earned between 7 and 2 percent less than their academic peers in other occupations, with narrowing differences. After that, earnings disadvantages disappear or are too small to pass the test of significance. Between 2004 and 2006, they even experienced a slight earnings advantage of 3-4 percent. For women, teaching has been a financially rewarding occupation in every year of the observation period. Compared to other female academics, their earnings are between 2 and 19 percentage points higher (The female advantage over males is, of course, due to the fact that the female comparison group earns less than the male comparison group). Only in 1980, teaching and non-teaching females do not differ significantly in their log monthly earnings. Between 1991 and 2005, female teachers' earnings increase relative to other tertiary-educated females, from 8 percent to 19 percent, after which the advantage diminishes to about 13 percent. I also looked at differences between school types. On average, upper secondary teachers log net monthly earnings are about 5 percent higher compared to teachers at the lower secondary or elementary level. Somewhat surprisingly, female teachers earn less than their male counterparts, even when controlling for school type and the mentioned control variables. Nevertheless, gender earning gaps in teaching are smaller in comparison to other employment sectors. In sum, earnings in teaching compare favorable to those of tertiary-educated non-teachers, especially for women. In addition, no fall in relative teacher earnings is visible over

the past three decades. If anything, teacher earnings rise over time relative to other academic occupations. This picture stands in sharp contrast to the U.K. (Dolton, 2005) or U.S. (Bacolod, 2007; Hanushek & Rivkin, 2007), where relative teacher earnings are lower and have been declining over the past decades. In addition to the presented results, I analyzed absolute earnings trends and dispersions, which showed that earnings have not been declining in absolute terms either, and that earnings dispersions are greater in the comparison group. These additional analyses are displayed in the appendix.

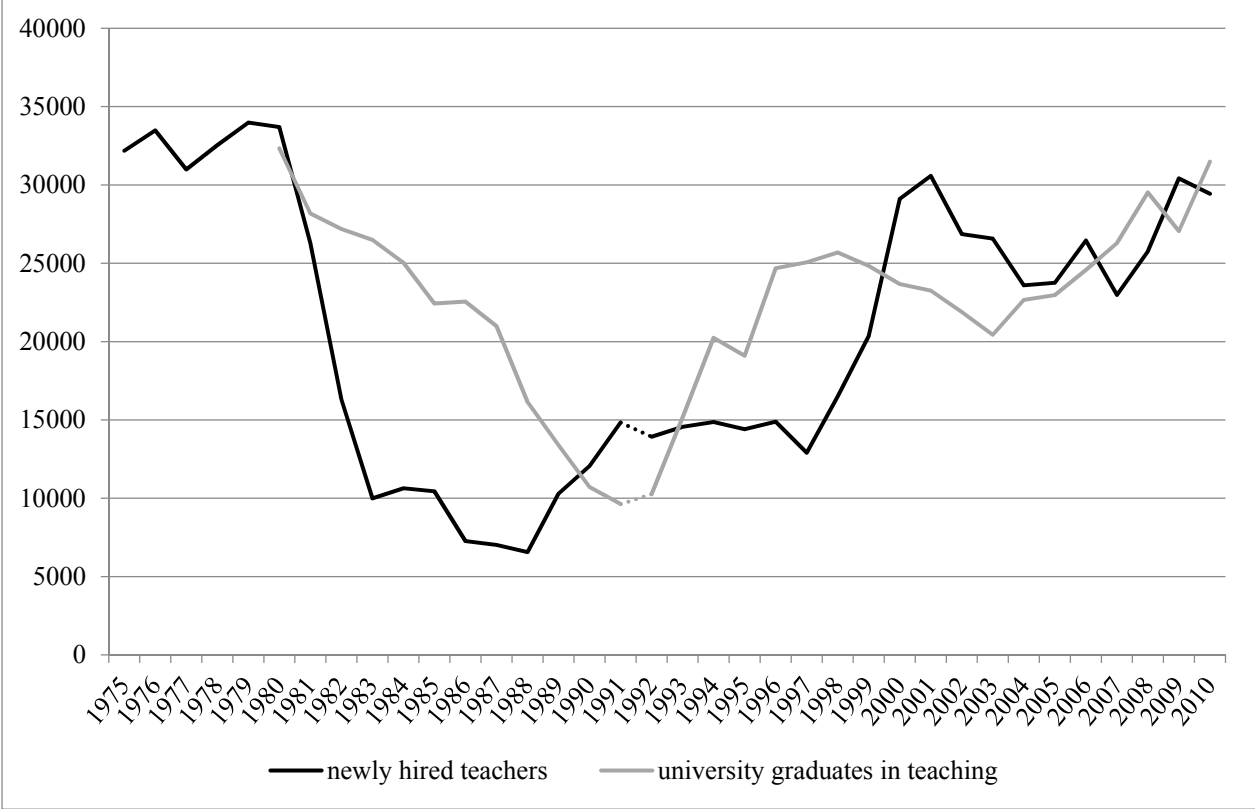
Of course, earnings are not the only important labor market return, which may influence the choice of profession. Out of many factors, such as working conditions, personal satisfaction or social prestige, risk of unemployment stands out as a decisive element in study or occupational decisions (Reisz & Stock, 2013). I am going to examine this element in the following section.

3.1.2 Supply, demand, and risk of unemployment

Between 1960 and 1980, an unprecedented expansion of new teacher positions occurred, because exceptionally large student cohorts (the “baby-boomers”) entered the education system, and because these students remained in the system longer than previous cohorts as a result of the educational expansion. This increased demand was met by an increasing number of high school graduates opting for teacher studies at university (see Lundgreen, 2013 chapt. 4 for more details). During the peak in 1974, 34 percent of all first-year students studied to become a teacher; among female first-year students the share rose up to striking 52 percent (Federal Statistical Office, 1975, own calculations). However, when these students entered the teacher labor market roughly 7 years later, not all of them were hired; teacher supply surpassed demand. Available teacher positions had been filled between 1960 and 1980, and only very few new positions were created after 1980, because student numbers dropped after the baby bust in the second half of the 1960s. From Lundgreen (2013, p. 114) it can be inferred that this is true for all school types. In response, but with a time lag, student teachers numbers dropped drastically (to reach a minimum of 7 percent in 1986). In accordance, the number of university graduates in teaching dropped, but some graduated from teaching despite poor hiring prospects. Especially for those entering the labor market in the mid-1980s, career prospects were poor. Teachers born between 1930 and 1950 and hired between 1960 and 1980 dominate the age structure in the teacher labor force; “like a wave” (Lundgreen, 2013, p. 110), they shift through the work force until their retirement between 1995 and 2015, and determine the hiring opportunities of the following teacher generations. Figure 2 illustrates the economic cycle in the teacher labor market: massive recruitment in the 1970s; hiring peak in 1980 followed by a dramatic drop until 1988, from 33 987 to 6 559. After that, a slight bettering and stagnation is visible until the mid-1990s, followed by an economic pick-up after 1997, when those hired between 1960 and 1980 (birth cohorts 1930 to 1950) were starting to retire. In anticipation of the slightly improving labor market prospects, the number of persons graduating from teaching began to rise again in the early 1990s. However, their number quickly exceeded those of the newly hired until the turn of the century. Thus, while their labor market prospects were somewhat better compared to the mid-1980s, the labor market situation was still difficult. Only for graduates from the late-1990s onwards, career

prospects seriously turned for the better. If a person graduated in 1999 and finished the preparatory training two years later, he/she would enter the labor market at a time where hiring numbers were beginning to exceed the supply.

Figure 2: Number of university graduates in teaching (1980-2010), and newly hired teachers (1975-2010)



Notes: Figures include East Germany as of 1992.

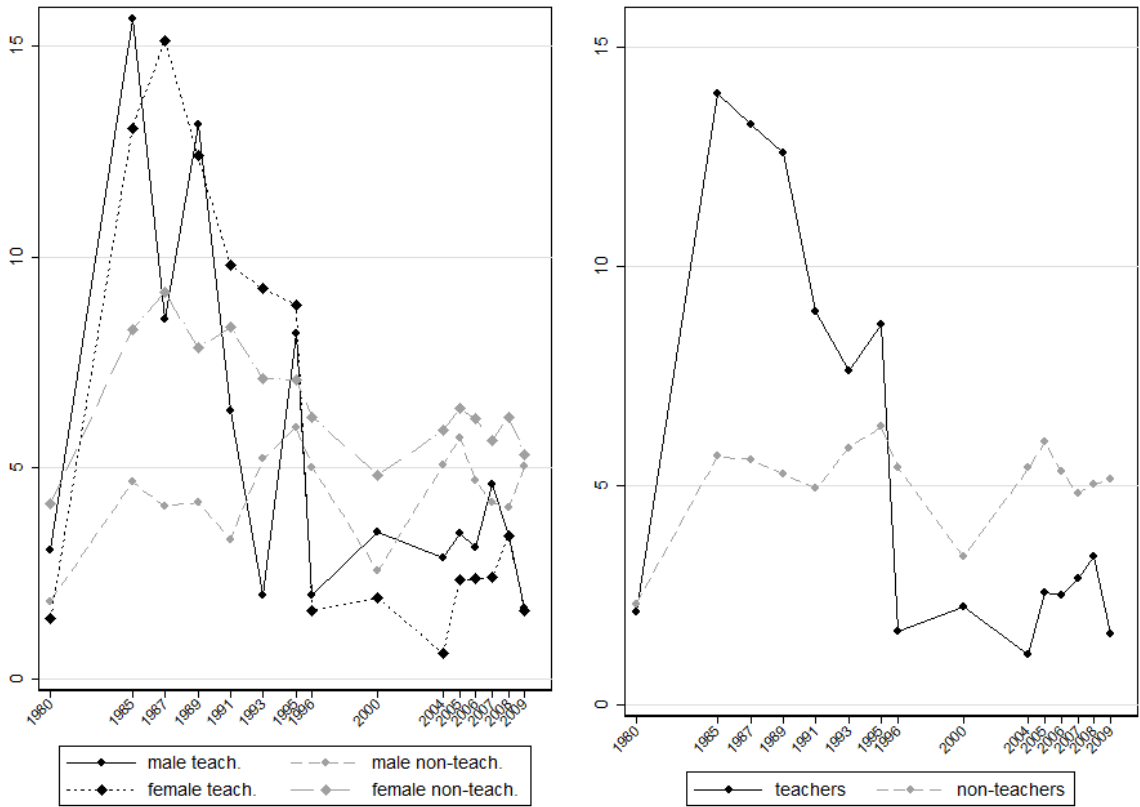
Sources: Standing Conference of the Ministers of Education and Cultural Affairs (2003, 2011) and Lundgreen (2013, p. 134), own depiction.

What are the implications of these changing hiring practices for the relative unemployment risks of new teachers? To answer this question, I calculate unemployment rates from Microcensus data for those who studied teaching and those who studied something else. I restrict the sample to persons aged 26-32 to approximate labor market entrants. Such an approximation becomes necessary, because the Microcensus provides only information on current or last occupation, not on first significant job or time point of labor market entry. The availability of field of study information is an important requirement to calculate unemployment rates for labor market entrants, because many of them have not yet worked in any job, which could otherwise serve as the basis to compare teachers and non-teachers.

Figure 3 shows the unemployment rates for labor market entrants who studied teaching, and for all other fields of study. The left panel of figure 4 shows the unemployment rates separately for men and women. Estimates for male teachers are fluctuating due to small sample sizes, and should be treated with caution. For example, in 1993 only 56 men aged 26-32 who studied teaching can be identified. If we ignore these random fluctuations, the overall trend looks similar for men and women. A clearer picture emerges, when I combine both

genders, as can be seen in the right panel. While unemployment rates in the comparison group is low and rather stable over time, unemployment rates in teaching increased substantially from 2 percent in 1980 to 14 percent in 1986. They remained high compared to other fields of study until 1995. In 1996 rates dropped to 2 percent, a proportion significantly lower than the proportion of unemployed in the comparison group (5 percent, $F(1;4396) = 16.58, p \leq 0.00$). In the following years, unemployment rates for persons with teaching degrees were 1/2 to 1/3 compared to persons with other tertiary degrees. Unemployment rates are in line with what one would suspect from looking at the hiring practices in teaching, as depicted in Figure 2.

Figure 3: Unemployment rates (in %) for labor market entrants with teaching degrees and labor market entrants with other tertiary degrees, 1980-2009.



Notes: Estimates based on persons aged 26-32 who are working or actively looking for a position. Estimates for male teachers should be treated with caution due to small sample sizes.

Source: Microcensus, different years, own calculations.

Overall, going into teaching was a very risky decision in the 1980s and mid-1990s. Only after that time, it became an occupation with smooth school-to-work transition and a low risk of being unemployed.

3.2 Changing pre-training characteristics of future teachers

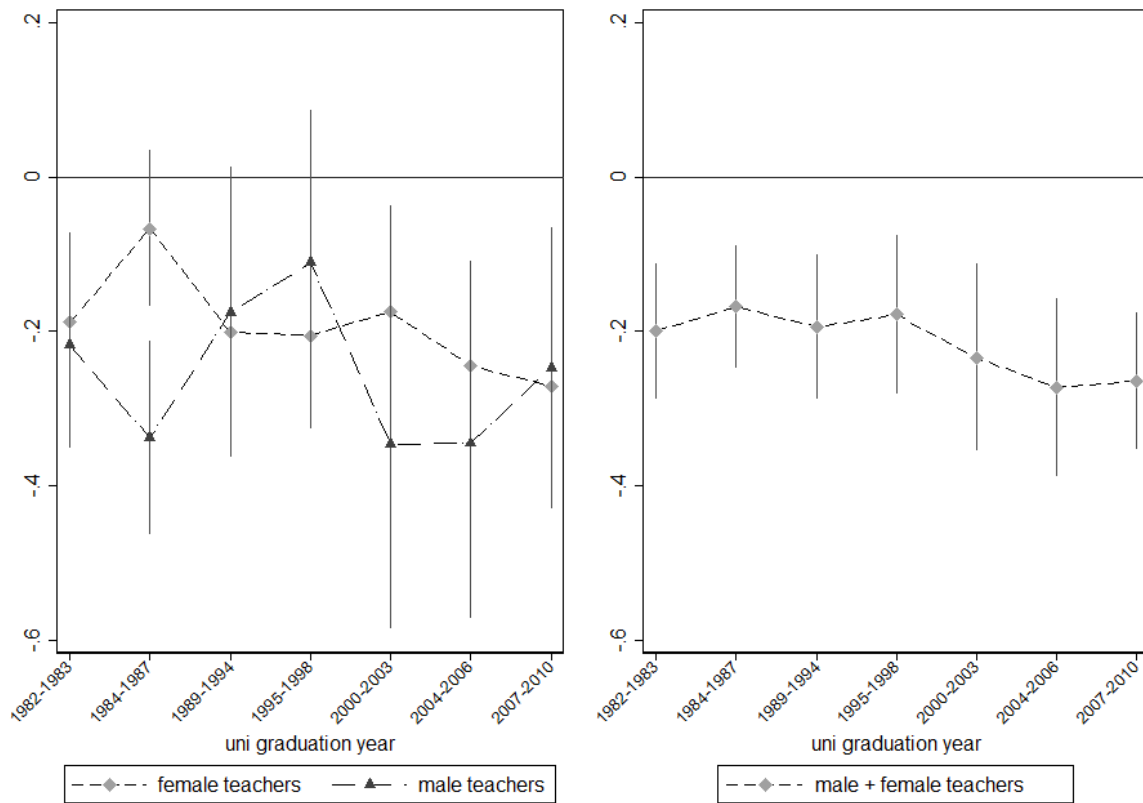
I now turn to the second research question of the paper: How have academic aptitude and motivational characteristics of applicants to the profession evolved over time, possibly in response to changing labor market returns?

3.2.1 *Academic aptitude*

As mentioned in section 1.2, increased earnings opportunities outside of teaching are believed to have detracted high-ability individuals from teaching in the U.S., Australia, and the U.K.. In West Germany, as I have shown above, relative earnings in teaching are stable over time, and even increased for females. Thus, I do not expect a detraction of high-ability individuals from teaching. Much rather, if the theoretical argument holds, academic ability of teachers should be stable over time, or even increase among female teacher graduates.

Figure 4 shows 'Abitur' GPA of student teachers relative to all other students in their graduate-cohort. In each graduate-cohort, GPA has been standardized in a way that the comparison group – non-teaching graduates – has a mean of 0 and a standard deviation of 1, indicated by a horizontal line at 0. The left panel of Figure 4 shows the relative GPA of future teachers separate by gender. A negative trend is visible among female teacher candidates, relative to other graduates, between 1984-1987 and 2007-2010, but the drop across cohorts is not statistically significant. For men, no clear picture emerges, which may simply be a result of small case numbers (between 237 and 62 male future teachers can be identified across cohorts). When men and women are combined, results are more clear-cut (see the right panel of Figure 4). In all years, future teachers' GPA is, on average, between .17 and .27 standard deviations below those of other graduates. This corresponds to .11 - .17 'Notenpunkte' on the German grading scale and has to be considered a rather small difference. From the figure, it looks like relative academic aptitude is declining over time; however, the decline is not significant for any pairwise comparison of future teacher cohort means. The same picture emerges when I use cohort-specific percentile rankings instead of standardized grades. The average percentile rank of those graduating from teaching fell from 46 to 43 over the observation period. In all years, teachers rank lower than other graduates, but they do not decline significantly over time.

Figure 4: ‘Abitur’ GPA of teacher graduates relative to other graduates



Source: Konstanz student surveys, different years, own calculations. Whiskers are 95%-confidence intervals.

It may well be, that looking at average effects hides important changes at the tails of the distribution, as shown by Corcoran et al. (2004). It would be informative to know if entry into the teaching profession changed for the best and the worst students (i.e. over the surface of the aptitude measure) within each cohort over time. To this end, I estimate 7 logit models (one for each cohort) where the probability of choosing teaching as a career (vs. some alternative) is assumed to be a function of GPA. Instead of entering GPA linearly into the model, I enter it as a set of cohort-standardized quintile dummies. Results (presented in the appendix) show that students from the tails of the academic aptitude distribution are relatively unaffected by labor market changes. Unlike the U.S., the probability to enter teaching for females or males coming from the top of the distribution does not fall over time.

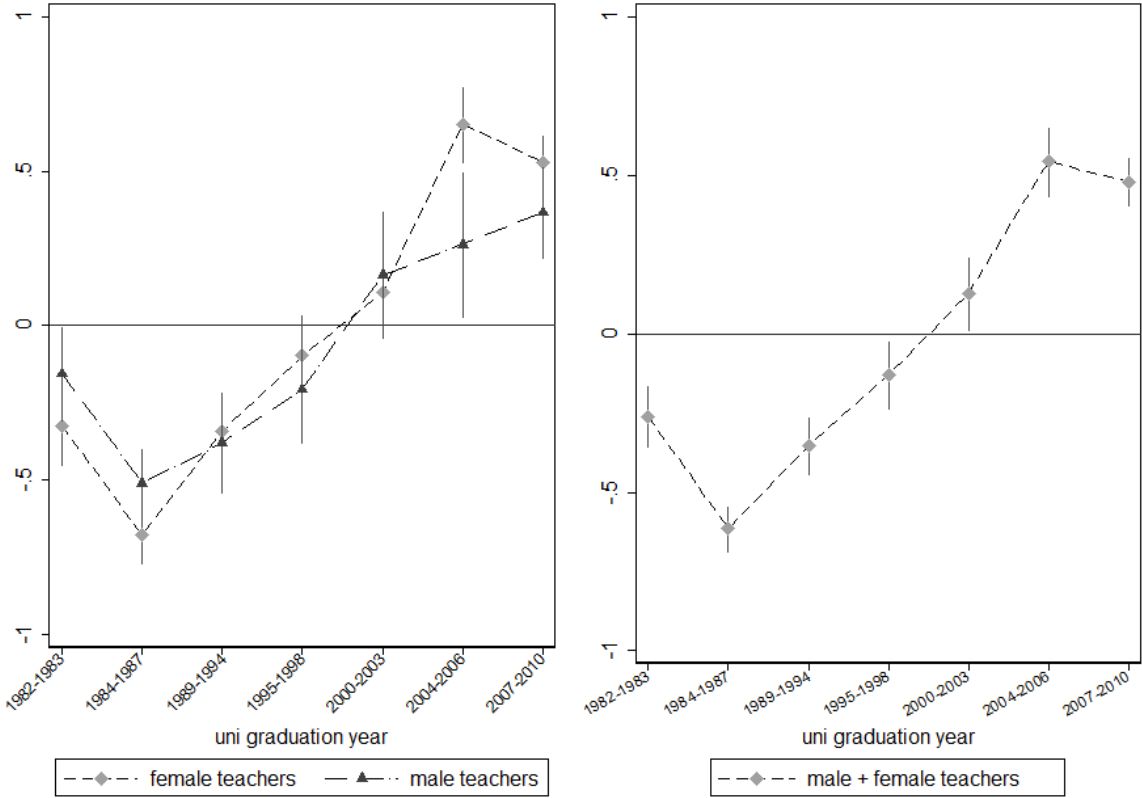
3.2.2 Motivations for choosing teaching as a career

In a next step, I turn to motivations for choosing teaching as a career. Who evaded into other fields of study during times of high unemployment, and who remained? Who was motivated to choose teaching, when labor market prospects turned for the better from the late-1990s onwards?

Figure 5 shows the mean *extrinsic job security motive* of student teachers relative to all other students in their graduate-cohort. Again, the comparison group is fixed at 0, indicated by a horizontal line. Trends for both genders are similar (see left panel of Figure 5). While any

causal inference is unfeasible in this descriptive study, the parallelism between objective unemployment risks and reported career choice motivation is striking. During the 1980s, when the teacher labor market was stringent, very few teacher candidates report that they chose teaching for job-security reasons. Teacher candidates graduating between 1984 and 1987 had a job security motivation of 0.61 standard deviations below the comparison group. Persons with high job security motivations evaded most strongly into other careers in the mid-1980s, and only few remained, who did not care too much about job security issues. When labor market prospects turned for the better from the late 1990s onwards, more people were attracted into teaching, and the number of graduates rose markedly, as shown in Figure 2, above. This had noticeable effects on the motivational composition of the applicant pool. Those with high extrinsic job security motivations became more likely to choose teaching over alternative careers, which lifted the mean substantially, to reach a high of 0.54 above the cohort-mean in the 2004-2006 graduate cohort.

Figure 5: Extrinsic job security motivations of teacher graduates relative to other graduates

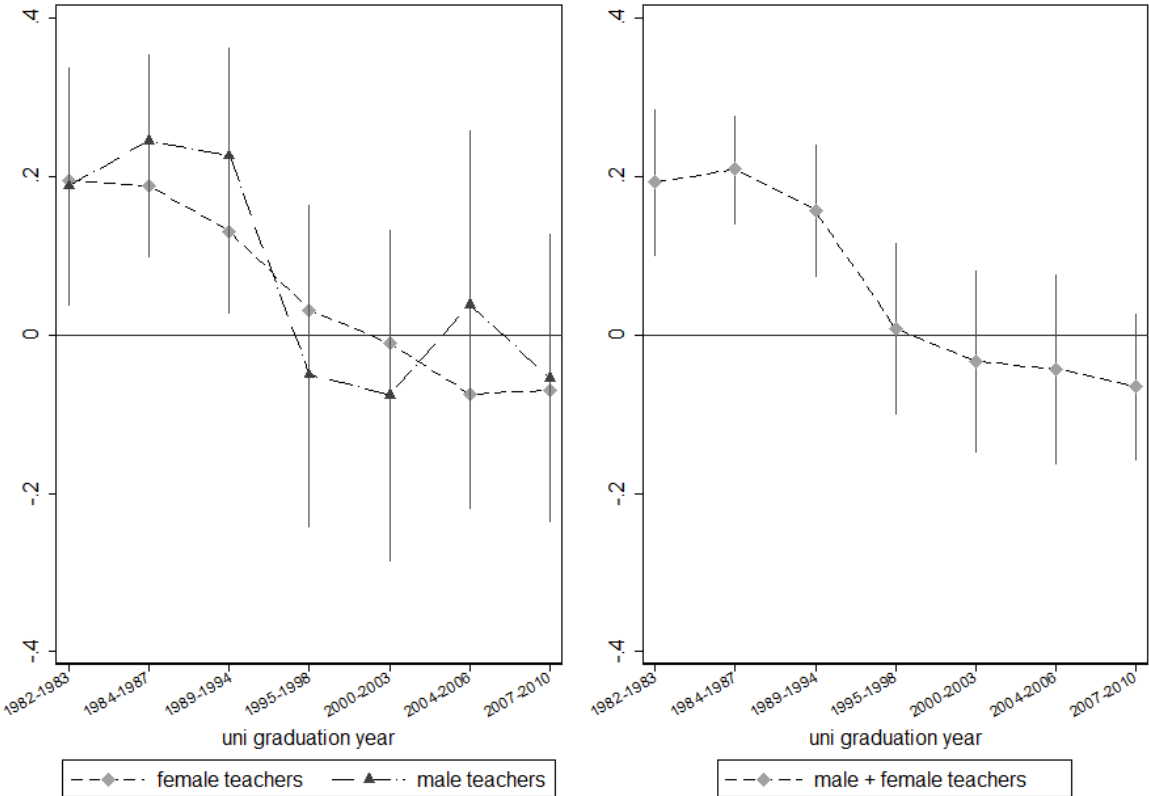


Source: Konstanz student surveys, different years, own calculations. Whiskers are 95%-confidence intervals.

Are Persons with high intrinsic motives unaffected by labor market shifts? In Figure 6, I display the importance of *intrinsic subject-related motivation* among teacher graduates, again relative to all other graduates. The first thing to notice is that the intrinsic measure is less responsive to labor market shifts (note the different y-axis scaling in Figures 5 and 6). Interestingly, teacher candidates had higher intrinsic subject-related motivations than their peers in other fields of study between 1982 and 1994, when labor market prospects were poor. Differences are rather small, however, with teacher candidates lying 0.21 standard deviations

above the comparison group in the 1984-1987 graduate-cohort. After that, teacher candidates relative subject-interest levels fell slightly below the comparison group, but non-significantly so (e.g. 2007-2010: $\text{diff.}=0.065$, $t=1.19$, $p=0.23$). The most obvious explanation for this trend is that the inflowing new teacher candidates with high job-security motivations have somewhat lower subject-interests than previous cohorts. This is in fact the case: pairwise correlations between job-security and subject-interest motivations are between $-.09$ and $-.19$ for all graduate-cohorts.

Figure 6: Intrinsic subject-related interest of teacher graduates relative to other graduates



Source: Konstanz student surveys, different years, own calculations. Whiskers are 95%-confidence intervals.

3.2.3 Joint consideration

The presented findings can be modeled and jointly tested in a regression framework. To this end, I estimate 7 logit models (one for each cohort) where the probability of choosing teaching as a career (vs. some alternative) is assumed to be a function of GPA, extrinsic job security motivation, and intrinsic subject-interest motivation. In the models, I control for confounders, i.e. variables that are potentially related to GPA or motivations as well as the career choice. These variables include parental education (a dummy indicating whether at least one parent has a tertiary degree), age, and federal state fixed effects. Table 3 shows coefficients from a joint model for males and females, controlling for gender. To make effects comparable across cohorts, I report average marginal effects (AME) which give the average percentage unit effect of a variable over all studied individuals. In the case of the dummy

variable gender, they give the average percentage unit difference in the probability to choose teaching between females and males (the reference category).⁴

Table 3: The probability to choose teaching (vs. some alternative) as a function of GPA, gender, and motivational profile

	1982-83	1984-87	1989-94	1995-98	2000-03	2004-06	2007-10
GPA	-0.044*** (0.011)	-0.020** (0.006)	-0.014** (0.005)	-0.019* (0.009)	-0.021* (0.009)	-0.024** (0.009)	-0.023** (0.008)
(extr.) job security	-0.030** (0.011)	-0.075*** (0.007)	-0.023*** (0.005)	-0.010 (0.008)	0.016+ (0.008)	0.067*** (0.009)	0.076*** (0.008)
(intr.) subj.-interest	0.032** (0.011)	0.014* (0.007)	0.009+ (0.005)	-0.005 (0.008)	-0.004 (0.008)	0.003 (0.009)	0.002 (0.007)
female	0.175*** (0.023)	0.106*** (0.013)	0.111*** (0.011)	0.145*** (0.017)	0.088*** (0.016)	0.108*** (0.017)	0.108*** (0.015)
age	-0.018*** (0.005)	-0.003 (0.003)	-0.009*** (0.002)	-0.007+ (0.003)	-0.002 (0.003)	0.001 (0.004)	0.008** (0.003)
parental educ.	-0.039 (0.024)	-0.032* (0.014)	-0.020+ (0.011)	-0.021 (0.016)	-0.064*** (0.016)	0.011 (0.018)	-0.018 (0.015)
pseudo R^2	0.100	0.125	0.106	0.068	0.072	0.137	0.108
N	1528	3570	3982	2052	1859	1609	2412

Notes: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Standard errors in parentheses. Displayed are AMEs. All models include federal state dummies (not shown). parental educ. = at least one parent has a tertiary degree. Source: Konstanz Student Surveys, different years, own calculations.

The results confirm the findings reported in the descriptive figures. Higher, i.e. better GPA is associated with a lower probability to graduate from teaching as opposed to another field of study in all cohorts. But again, there seems to be no clear trend over time. The strongest difference in AMEs is visible between the 1982-83 cohort (-0.044, 95 % C.I. [-0.066, -0.022]) and the 1989-94 cohort (-0.014, 95 % C.I. [-0.024, -0.0039]), but even here the confidence intervals overlap. Higher extrinsic job-security motivation is associated with a lower probability to graduate from teaching until 1989-94, after which the effect is reversed. A higher intrinsic subject-interest motivation is associated with a higher probability of graduating from teaching in the first three cohorts, after which group differences vanish. Note that females have a higher probability than males to choose teaching in all cohorts. Interestingly, however, females' compared to males' probability to choose teaching fell over cohorts. This does not mean that the share of females in teaching has been declining; quite the opposite is true (Neugebauer 2011, p. 236). The coefficients indicate that while the share of females in teaching has been rising, the share of females in alternative university study programs (the comparison group) has been rising more rapidly over the past three decades. This reduces the likelihood to enter teaching for females, conditional on entering university.

⁴ STATA's *margins, dydx* command was used for these calculations. Unlike OR or LnOR, AMEs circumvent scaling issues in non-linear models and make estimates comparable across cohorts.

4 Summary and Discussion

It is well known that career choices are influenced not only by features of the occupational tasks itself, but also by external conditions of the occupation, such as earnings and employment prospects. Despite recognition that such external conditions are fluctuating in many countries (Schleicher, 2011), and that many countries face teacher shortages in the years to come (UNESCO, 2013), little research exists on the impact of labor market conditions on who is motivated to choose teaching as a career. This study helps to fill this research gap by exploring the interplay between labor markets and self-selection processes. In light of current debates on teacher quality, it aims to contribute to the understanding of qualitative characteristics of the applicant pool of teacher candidates under different labor market conditions; conditions, which can arguably be influenced by policy makers. The study examines – for the first time – trends in earnings and unemployment risks in the teaching profession in West Germany relative to other academic occupations over the past three decades. It is also the first to describe trends in cognitive and motivational characteristics of teacher candidates relative to other university graduates, in order to examine whether the pool of teacher candidates has changed, possibly in response to shifts in labor market returns.

Several economists from the U.S., Australia, and the U.K. find that increased earnings opportunities outside of teaching have detracted high-ability individuals – especially women – from teaching. In contrast to these studies, I find no earnings decline over the past three decades in West Germany, especially not for women, who have even gained an earnings advantage over other university-educated women. Likewise, academic aptitude of teacher candidates compared to other university graduates has not declined. Overall, teacher graduates score between .17 and .27 standard deviations below the other university graduates, a significant but relatively small difference. In all cohorts, the probability to choose teaching is lower for persons scoring at the top quintile than for persons scoring at the bottom quintile. Why this is the case remains unclear, and calls for more research. One reason could be the higher earnings dispersion outside of teaching (Leigh & Ryan, 2008). Another reason could be greater prospects for promotion or a higher occupational prestige outside of teaching, which is attractive for persons with high GPAs.

So far, economic studies have concentrated on earnings and academic aptitude. This study complements such studies by acknowledging the fact that unemployment risks are another major labor market condition that affects career choice. The study shows that student teachers react very sensitively to fluctuations of employment prospects. Not only is the number of applicants substantially lower in times of high unemployment risks. Labor market prospects also seem to influence who self-selects into teacher training in terms of motivational characteristics. The study shows that intrinsic motivations draw individuals into the teaching profession, even when labor market conditions are difficult (for a similar finding from Hong Kong see Wong, Tang, & Cheng, 2014). However, the likelihood of extrinsically motivated persons to enter teaching is very low in times of high unemployment risks, but increases substantially after the mid-1990s, when career prospects are auspicious. Because newly attracted security-affine students have, on average, relatively low intrinsic motivations at the same time, the share of persons with high intrinsic motivations decreases somewhat over time. While causality is hard to establish, the close connection between labor market shifts and

motivational shifts strongly suggests that labor market conditions influence who is attracted by the profession. This finding is consistent with Jantzen's (1981) U.S. study. While Jantzen does not discuss labor market influences, he finds that intrinsic motivations were lower and extrinsic motivations were higher in times of teacher shortages, compared to the 1970s where the U.S. experienced teacher surpluses. This suggests that a link between labor market prospects and career choice motivations might be cross-national phenomenon; further research is needed to clarify this.

There are some limitations to this study. First, persons are surveyed shortly before graduating from university, and it remains unclear, whether they actually work as teachers in the future. Because there are no repeated longitudinal data sources, which follow different cohorts of teacher candidates into their job, this is the best possible solution. Second, motivations are self-reported. I cannot rule out the possibility that graduates report motivations in compliance with their already taken career decision. For example, it is possible, that respondents understate the importance of job security in times of high unemployment risks. Third, differences between upper secondary teacher candidates and other teacher candidates cannot be properly investigated with the available data, except for the first two cohorts (1982-83 and 1984-87), where the questionnaires permit such a separation. Studies with more recent cohorts have shown that students aiming to become upper secondary school teachers have better GPAs and higher subject-interest motivations than their peers who are aiming to become a teacher at the primary or lower secondary level (Neugebauer, 2013). I ran separate analyses for the first two cohorts. The findings are in line with Neugebauer (2013) and suggest that differences are rather stable across time. Those aiming to become a teacher at the lower secondary or primary level have worse 'Abitur' GPAs (0.44 SD) and lower subject-related motivations (0.24 SD) than those aiming to become an upper secondary teacher. Fourth, persons are attracted to teaching by other external rewards than earnings and employment security, such as occupational status, or general work environment. I was unable to measure these facets, and it is possible that they have changed over time and influenced the types of people attracted by the profession. Fifth, I focused my description on a limited set of indicators – academic aptitude and two career choice motivations. I chose these indicators, because they are available in different cohorts, are correlated with the study success of student teachers, and can arguably be influenced by labor market conditions. Certainly, there are other personal characteristics, and I do not know if they have changed over time in any systematic way. This calls for more research to investigate, for example, if altruistic and other intrinsic or extrinsic motivations have changed over time.

In Germany, the 'wave' of teachers hired between 1960 and 1980 (see section 3.1.2) is retiring, which has opened up excellent hiring opportunities for new teachers in recent years. This has attracted persons with above-average job security motivations and below-average subject-interests. Whether this is problematic remains ambiguous, and calls for more longitudinal research on the predictive value of career choice motivations. So far, existing research in the field suggests that this might be detrimental to producing teachers who are fully committed to the profession (e.g. Watt & Richardson, 2007).

Who are going to be the people filling vacant teaching positions in the future – and under what conditions? Currently, it looks like teacher labor market conditions are worsening

again for new teachers in West Germany (but not in East Germany). Student numbers are declining, which is why about one third of the retiring teachers does *not* have to be replaced. In their most recent forecast until 2025, the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (2013) estimates an oversupply of teachers in West Germany, especially for upper secondary schools. Against the overall trend, more teachers are needed for special types of students (vocational and special needs students). Nevertheless, persons who primarily seek job security will most likely evade into alternative occupations in the years to come. A recurring excess supply of new teacher candidates could be an opportunity, to make entry into the profession more selective. In the long run, however, policy makers must aim at interrupting the cyclical waves of teacher surpluses followed by shortages, which are apparent in many countries. This study illustrates how such waves can have negative consequences, not only for student teachers in excess cohorts, but possibly, also for future generations of students, because in times of teacher shortage candidates may be less committed to teaching than in times of teacher surplus.

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Appendix

A1. Additional earnings analysis

In the main text, I do not show control variables from the earnings regressions. I do this here, exemplarily for the most recent observation year.

Table A1: Effect of working as a teacher compared to any other occupation for tertiary-educated workers on personal log net monthly earnings, by gender (year 2009, control variables shown)

	men		women	
	β	(S.E.)	β	(S.E.)
teacher	-0.013	(0.014)	0.134***	(0.010)
age	0.082***	(0.004)	0.074***	(0.005)
age ²	-0.001***	(0.000)	-0.001***	(0.000)
married	0.216***	(0.007)	-0.017*	(0.009)
foreign citizen	-0.123***	(0.012)	-0.085***	(0.015)
working hours	0.077***	(0.002)	0.099***	(0.002)
<i>federal states:</i>				
Schleswig-Holst	-0.001	(0.018)	-0.034	(0.022)
Hamburg	-0.015	(0.018)	-0.016	(0.020)
Lower Saxony	-0.023 ⁺	(0.012)	-0.019	(0.015)
Bremen	-0.059 ⁺	(0.034)	-0.066 ⁺	(0.038)
North Rhine-Westph.	ref.		ref.	
Hesse	0.032**	(0.012)	0.026 ⁺	(0.015)
Rhineland-Palatinate	0.005	(0.015)	0.050**	(0.019)
Baden-Württemberg	0.048***	(0.010)	0.020	(0.013)
Bavaria	0.067***	(0.009)	0.035**	(0.012)
Saarland	-0.106***	(0.031)	0.010	(0.041)
Constant	5.168***	(0.083)	5.097***	(0.096)
R ²	0.30		0.27	
N	13818		9106	

Notes: ⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; standard errors in parenthesis. Working hours measured in 5 hour steps from 10-85 hours. Estimations based on employed persons, aged 26-56, with tertiary degrees who make a living primarily from their own employment and who work at least 10 hours per week.

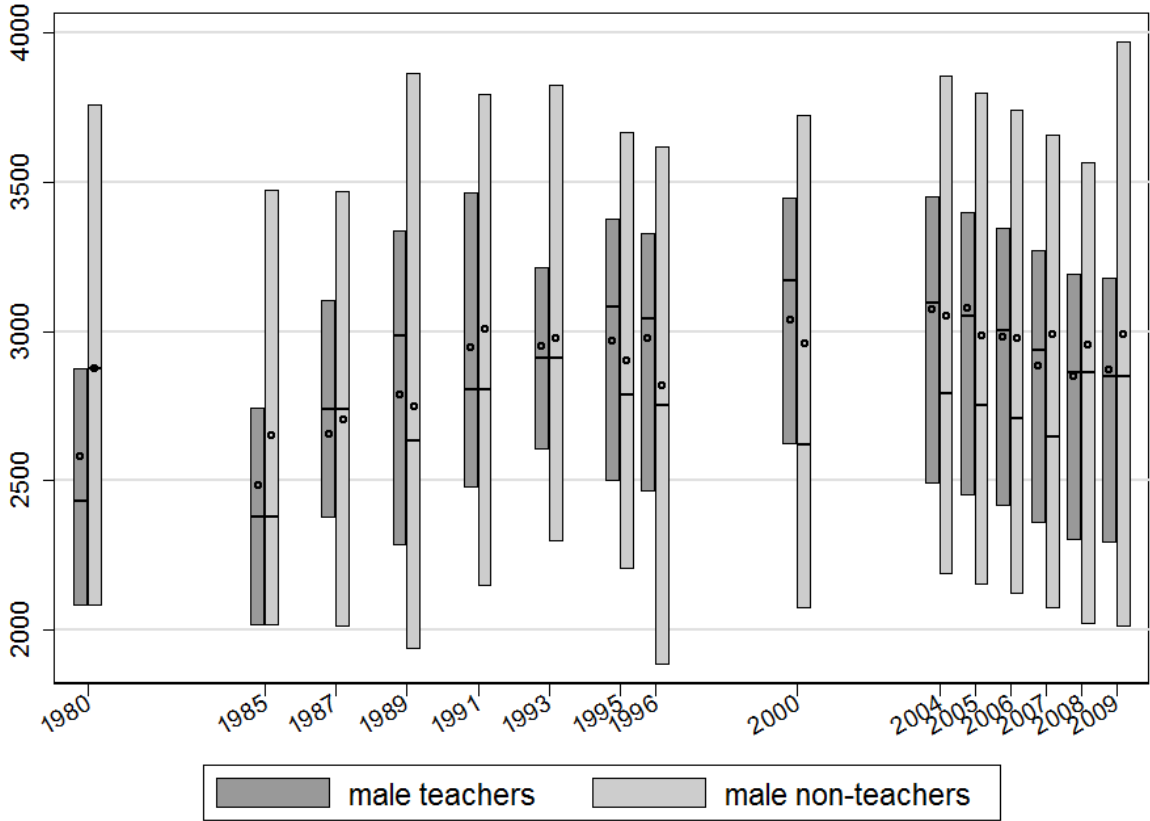
Source: Microcensus, different years, own calculations.

In the main text, I show relative earnings advantages/disadvantages of teachers. Here, I display *absolute* personal net monthly earnings (means and medians), as well as earnings *dispersions* (interquartile range), and earnings of part-time employees.

I begin with males working full-time. Again, the sample is restricted to persons aged 26-56 who make a living primarily from their own employment. The plotted boxes show the median incomes and the range between the upper and lower quartiles. Circles depict mean earnings. In 2009, the latest year for which data is available, median CPI-adjusted net monthly earnings for full-time male teachers as well as for the comparison group are 2850 Euros. This result is in line with OECD statistics, who, for 2010, report equal salaries of teachers and other full-time workers with tertiary degrees. Mean earnings differ by 118 Euros in favor of

the comparison group, which is driven by a higher earnings dispersion outside of teaching, especially towards higher earnings. This becomes more evident when looking at the quartiles. Persons at the 75th percentile of the non-teacher earnings distribution earn almost 800 Euros more than persons at the 75th percentile of the teacher earnings distribution. At the same time, non-teachers at the 25th percentile earn 281 Euros less than teachers scoring at the same percentile in their distribution. In short, male teachers in 2009 earn, on average, about as much as their tertiary educated counterparts outside of teaching, but those outside of teaching have a higher chance to achieve really high or low earnings.

Figure A1: Male personal net monthly earnings, 1980-2009



Notes: Estimations based on full-time employed males, aged 26-56, with tertiary degrees who make a living primarily from their own employment. Boxes show the median income and the range between the 25th- and 75th-percentile. Circles depict mean income (5%-trimmed). Income is CPI-adjusted (base year = 2005) and converted into Euros prior to 2002. The somewhat odd-looking monotone decline between 2004 and 2009 is caused by the fact that earnings are measured in intervals, and that they are CPI-adjusted. Those at the 25th- and 75th-percentile fall into the same intervals between 2004 and 2009, and CPI-adjustment reduces these values at a constant rate. For example, teachers at the 75th percentile fall into a category with a mean of 3400 Euros in 2005. They also fall into the 3400 category in 2006, but CPI-adjustment reduces this value by a factor of 0.984 (=3346 Euros).

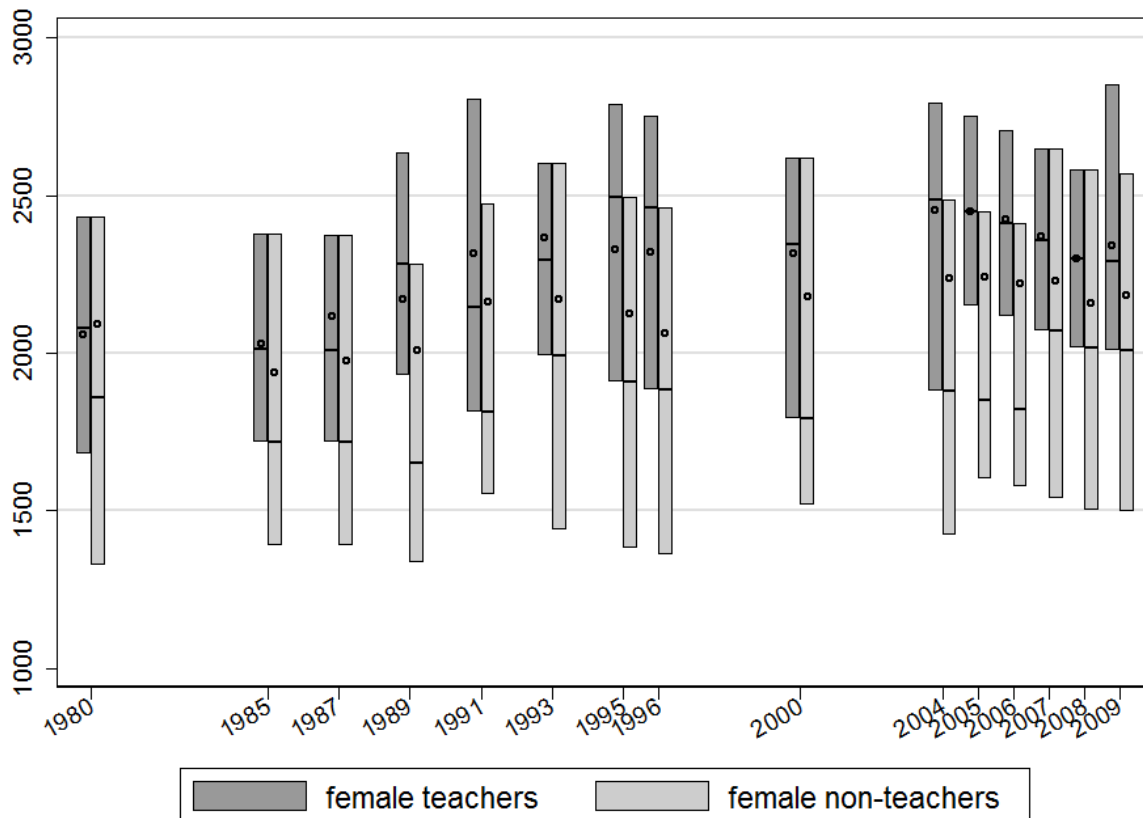
Source: *Microcensus*, different years, own calculations.

But how have teachers’ earnings developed over the past three decades, relative to earnings outside of teaching? The earnings distributions look more similar than different over the course of time. In all years except 1980, male teachers’ median earnings are at least as high as those of the comparison group, and are higher between 1995 and 2007. Non-teachers at the

75th percentile earn more than teachers at the 75th percentile in all years, and less at the 25th percentile except for 1980 and 1985. No relative earnings decline in teaching is apparent. Averaging over the observation period, male teachers' median earnings are 2 percent higher than those of the comparison group.

For females, the same measures are depicted in Figure A2.

Figure A2: Female personal net monthly earnings, 1980-2009



Notes: Boxes show the median income and the range between the 25th- and 75th percentile. Circles depict mean income (5%-trimmed). Estimations based on full-time employed females, aged 26-56, with tertiary degrees who make a living primarily from their own employment. Income is CPI-adjusted (base year = 2005) and converted into Euros prior to 2002.

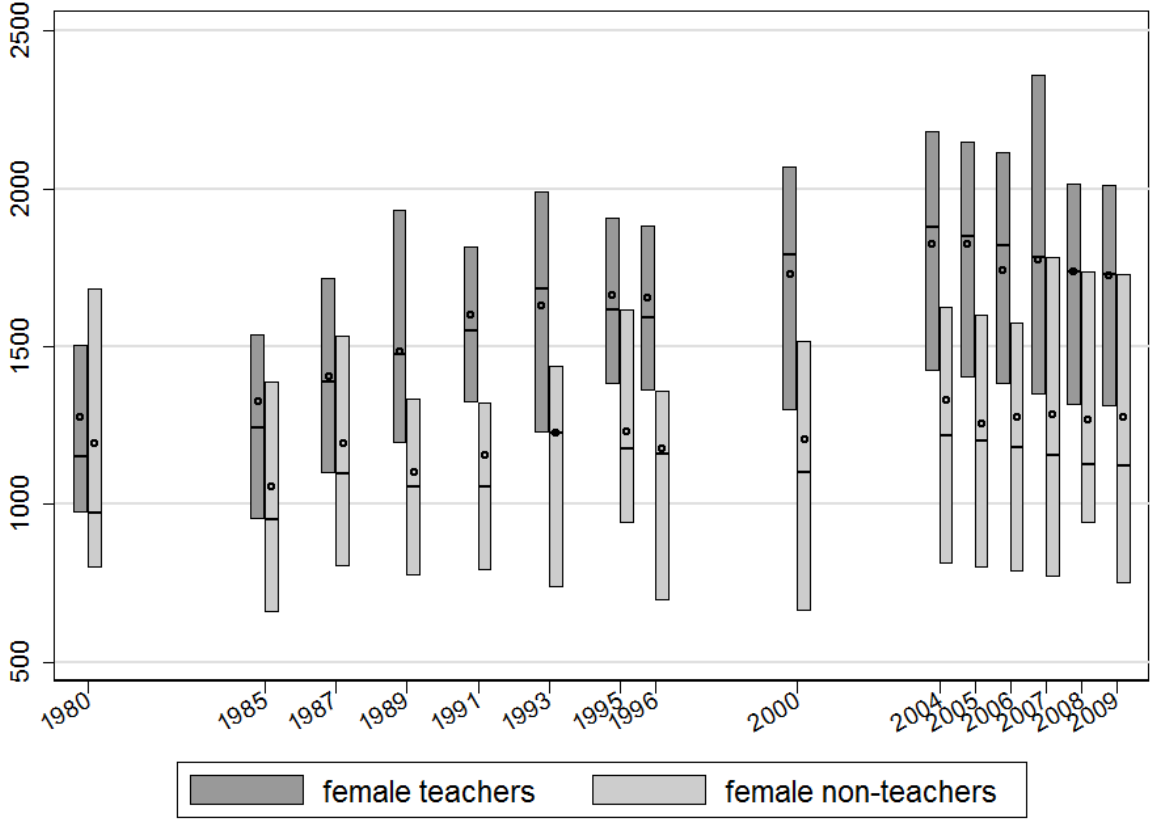
Source: Microcensus, different years, own calculations.

In all years except for 1980, both measures of central tendency show a clear advantage of female teachers compared to tertiary educated females outside of teaching. For example, in 2009, mean earnings are 2339 Euros for female teachers and 2184 Euros for the comparison group; median earnings are 2290 Euros and 2009 Euros, respectively. On average, female teachers median earnings are 22 percent higher than those of tertiary-educated women working full-time outside of teaching. Unlike men, women at the 75th percentile of the non-teaching earnings distribution never earn more than the women at the 75th percentile in teaching. Over time, female teachers seem to gain some further advantage over other females. A comparison across both figures shows that while male teachers earn more than female teachers (partially because more of them work in higher secondary schools where earnings are higher), the gender earnings gap in school is smaller than outside of the teaching profession.

For women working part-time, teaching is even more profitable relative to non-teaching occupations and earning advantages are increasing over the years, until 2004. Female teachers' median earnings were 18 percent higher in 1980, but 54 percent higher in 2009. Part-time is defined as working between 10 and 34 hours per week. Over the years, between 16 and 47 per cent of female teachers work in part-time. The increase in earnings advantages for female part-time teachers is *not* caused by an increase in working hours among part-time teachers. On average, mean working hours are 22.0 for teachers and 22.8 for non-teachers.

Among males, between 4-14 per cent work in part-time, most of them at the beginning of their career, when they are unable to get hold of a full-time position. The limited number of observations precludes any meaningful assessment of part-time male teacher earnings.

Figure A3: Female personal net monthly earnings working *part-time*, 1980-2009



Notes: Boxes show the median income and the range between the 25- and 75 percentile. Circles depict mean income (5%-trimmed). Income is CPI-adjusted (base year = 2005) and converted into Euros prior to 2002.

Estimations based on part-time employed females, aged 26-56, with tertiary degrees who make a living primarily from their own employment.

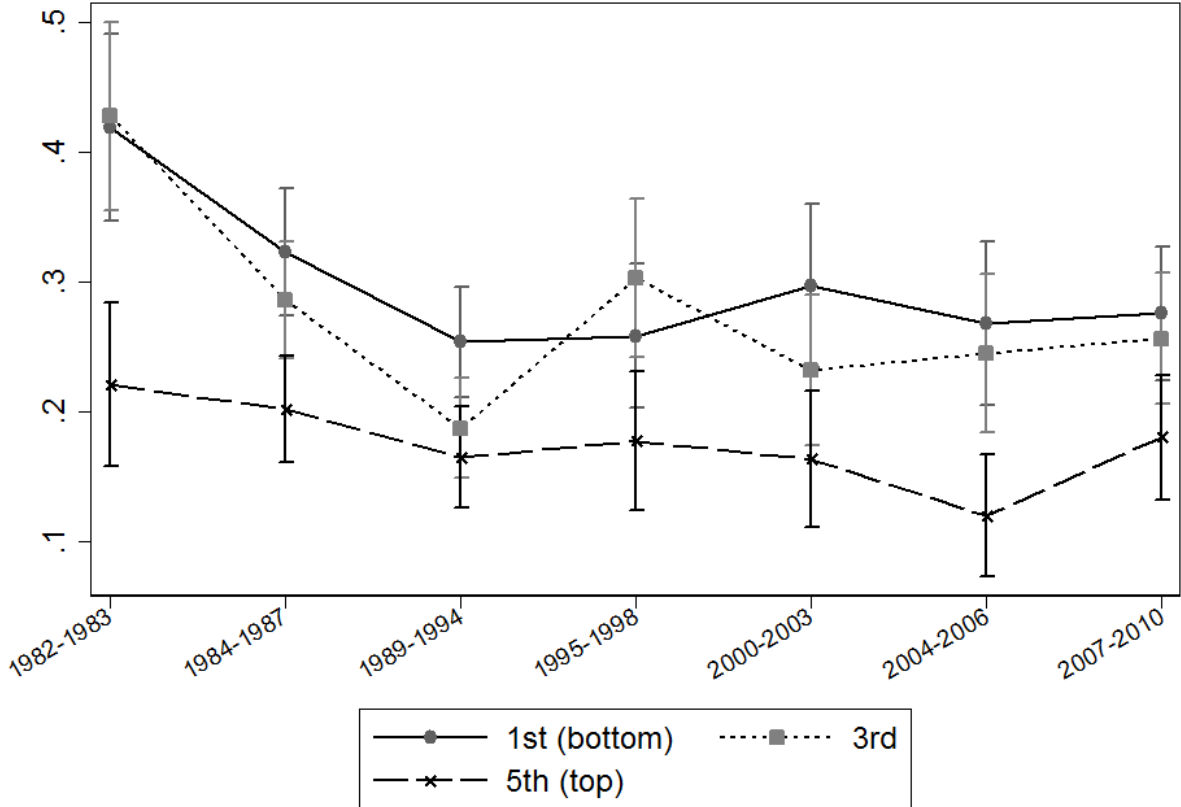
Source: *Microcensus*, different years, own calculations.

A2 Entry into teaching for the best and worst students

It may well be, that looking at average effects hides important changes at the tails of the distribution, as shown by Corcoran et al. (2004). It would be informative to know if entry into the teaching profession changed for the best and the worst students (i.e. over the surface of the

apptitude measure) within each cohort over time. To this end, I estimate 7 logit models (one for each cohort) where the probability of choosing teaching as a career (vs. some alternative) is assumed to be a function of GPA. Instead of entering GPA linearly into the model, I enter it as a set of cohort-standardized quintile dummies. To make results more tangible, I calculate predicted probabilities of choosing teaching by performance quintile. In Figure A4, I show these probabilities for females coming from the 1st (bottom), 3rd and 5th (top) quintile, with other covariates set to their mean and parental education background fixed to non-tertiary (the pattern looks similar for males, but probability levels are, of course, substantially lower). In all cohorts, females from the bottom 20 percent of the GPA distribution have a higher probability to choose teaching than those from the top 20 percent. During the recession on the teacher labor market in the 1980s, probabilities to choose teaching decreased for all groups, but most strongly for those coming from the middle 20 percent of the aptitude distribution. The best female students seem to be relatively unaffected by labor market changes. Thus, unlike the U.S., the probability to enter teaching for females coming from the top of the aptitude distribution does not fall over time.

Figure A4: Predicted probabilities to choose teaching for females, by GPA quintile



Notes: whiskers show 95 % confidence intervals.
 Source: Konstanz Student Surveys, different years, own calculations.