Is Germany exploiting her apprentices? A new look at over-education

draft version

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April 4, 2005

Abstract

The comparatively high rate of over-education among German workers who were trained in the "dual system" can be attributed to a variety of reasons. While some of the over-educated workers will be the genuinely under-skilled, we suspect that over-education is to a certain extent due to a mechanism specific to the dual system. This mechanism results from a combination of asymmetric information with respect to actual abilities of a worker and "exploitation" of apprentices by firms made possible by low training cost: firms in specific occupations can gain from training if the productivity of the apprentice hired exceeds the wages paid to the apprentice. After the contracted years of training, these firms will prefer to hire new apprentices instead of keeping the trained ones as regular workers. Once an apprentice is on the labor market, he will however be considered a "lemon": due to asymmetric information, possible employers will assume that the apprentice was not offered a follow-up contract due to low performance during the apprenticeship. The trained worker will thus not be able to work in a job matching his training, but may have a comparative advantage in finding an unskilled job in comparison to unskilled workers, hence becoming over-educated (rather than unemployed). We test this theory indirectly using the GSOEP data; using panel data techniques to control for unobserved heterogeneity, we find that workers trained in the dual system do not differ from similar co-workers with respect to wages received and the risk to become unemployed. We do find however that being trained in the dual system increases the risk to become over-educated significantly. We interpret these estimates as indication that our theory adds to explaining the causes for over education in Germany.

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1 Introduction

There exists a vast theoretical and empirical literature concerned with job mismatch, i.e. a mismatch of the educational attainment of workers in comparison with the requirements of their job. The phenomenon has been scrutinized in almost every aspect, as a recent paper by Sloane (2003) shows. One of the questions for which he recommends more attention relates to the large differences in mismatch observed in different countries, which possibly arises from country specific characteristics and institutions. While Germany does not particularly stand apart from other countries with respect to the size of the phenomenon, and is fairly comparable to countries as the UK and Portugal in such as it also has a more important share of over-educated rather than under-educated workers, it exhibits one puzzling characteristic: Over-education is especially large for workers who were trained in the "dual system", i.e. received vocational training working as apprentice in a firm. Using the GSOEP,[1] we find that on average around 25% of these workers are over-educated, compared to about 15% of workers trained in vocational schools and 10% of academically trained workers. This observation comes quite unexpected, considering the reputation of Germanys famous dual system of apprenticeships; this system combines practical training in firms with State-financed courses in vocational schools and has received much attention in the literature in particular because firms bear an important share of training cost. Acemoglu and Pischke (2000) find, for instance, that firms can profit so much from being able to employ workers who they have trained themselves, that the investment in the apprentice can be recovered. This finding should in fact imply that a large share of workers remains in the original training firm; this hypothesis clearly conflicts with the observation of such a large share of over-educated workers since these are most likely not working in their original training firm, implying that the investment of the firms was unsuccessful. Bauer (2002) as well Büchel and Pollmann-Schult (2001) suggest that over-education in Germany stems from low innate abilities of workers rather than from real overskilling. Büchel and Pollmann-Schult even suggest that the lowest type of secondary school diploma is in fact a sign of these low innate abilities. Since a substantial share of workers holds this type of school diploma, this would imply that firms did hire apprentices despite recognizing the low abilities of their apprentices at the time the apprenticeship contracts were signed. While this reasoning can explain the large share of over educated-workers, it cannot be reconciled with the findings of Acemoglu and Pischke. Firms would not hire apprentices and invest into their education without planning to employ them later on to reap the benefits of training. If low ability could be observed in the form of the secondary school diploma, we should not find any of these students

[1] The German Socio-Economic Panel. We use a balanced sample from 1996-2001.

being hired as apprentices.

In this paper we try to explain the paradox arising from the large amounts of apparently unsuccessful investments made by firms, and the phenomenon of the high rate of over-education among Germanys vocationally trained. Our main finding is that the dual system itself creates over-educated individuals as part of its output. This is possible due to low training costs which induces firms to hire apprentices as cheap labor rather than as investment. While we cannot exclude the possibility that a share of over-educated individuals does indeed fall into the category of low skilled workers, who only appear to be over-educated, some do not, and are thus victims of the training system. Before discussing the institutional setting and its implications in detail, Section 2 explains shortly the functioning of the German educational system and recent empirical trends and developments. Section 3 discusses shortly the common theories explaining over-education in general as presented e.g. by Borghans and de Grip (1999) and specifically for the German labor market along the lines of Franz and Soskice (1995). In section 4 we explain the alternative mechanisms we believe to be responsible for over-education, and in sections 5 we present empirical evidence supporting these theories.

2 The German Educational System

In order to understand the main points made in this paper, it is crucial to have an idea of how the German educational system works. This section therefore describes shortly its main features and also shows the extent of the problem of over-education in relation to different educational levels. The German educational system is characterized by a very early and strong sorting of students. Students can choose between three types of secondary schools after four years of primary school. In general, teachers recommend the school type fitting best individuals' profiles and academic capabilities. The highest secondary school type, the *Gymnasium*, leads to the *Abitur*, which grants access to universities and technical colleges. It requires in general 9 years of schooling; in some federal States *(Länder)* such as in Eastern Germany it is however possible to receive the *Abitur* already after 8 years of secondary school. The lowest secondary school type, the *Hauptschule* (5 years) as well as the intermediate type, the *Realschule* (6 years) traditionally lead to apprenticeships or other vocational training. In the 1970s, a second intermediate school type was created, the *Fachgymnasium*; it often exists only from grade 10 on, giving *Realschule* graduates the possibility to continue their education 3 up to grade 12, thus gaining access to technical colleges *(Fachhochschule)*. Vocational training, and particularly apprenticeships in the famous dual system, is the most important type of post-secondary training in Germany. Around 60% of all students continue

their education there, and of these, almost 80% are completely or partially trained in the dual system. This system is based on a co-operation between firms and the States Governments. Students apply to the firm in which they want to be trained, and have to be selected and hired like any other employee. The firms then provide practical training; in addition, the apprentices visit vocational schools provided for by the States. The content of the training programme is the outcome of a negotiation process between public authorities, business and labor representatives. The chambers of trade and industry administer final exams for each profession, and high qualification requirements exist for instructors. The costs of the training are shared by all participants: firms forego working power of the instructors, the Government finances the vocational schools and the apprentice himself accepts low wages. The wages are collectively bargained and are around 40-45% of an unskilled worker's entry wage (Buechtemann, Schupp and Soloff, 1993). An apprenticeship can take between 2 and 3.5 years, depending on the secondary diploma of the apprentice and the occupation in which he is trained. The range of occupations in which apprenticeships are offered range from small artisan firms to huge industrial enterprizes. Apart from the apprenticeships described above, there is also the possibility to visit vocational schools, usually for a duration of 3 years. These schools are either State financed or ask tuition fees; they do not pay wages to their students and do not involve private businesses in training. In practice, educational careers are not as predetermined as the educational set-up may imply. There is some mobility between secondary school types, and students who have graduated from the Gymnasium increasingly participate in vocational training. In addition, after the completion of an apprenticeship, students are allowed to study a subject related to their vocational training at a technical college. To give an impression of the actual importance of each diploma type in general and with respect to vocational training particularly, Figures 1 and 2 show the changes since 1970 with respect to secondary diploma received in general, as well as the share of each diploma type in vocational training.[2]

While the share of students receiving the highest possible secondary diploma *(Abitur)* in total approximately doubled in Germany between 1970 and 2000, the share of students with *Abitur* in vocational training increased 15-fold. The share of students with an intermediate secondary diploma also increased more than proportionally, and only the share of participants holding the lowest type of secondary diploma has dropped proportionally both in total and in vocational training. At the same time, the total share of vocationally trained workers has stayed stable, at around 60% of the working force. Even though one might expect intuitively to encounter especially

[2]Figures 1 and 2 use BiBB data from the Berufsbildungsbericht 2003, kindly provided by Rainer Werner. High secondary stands for (Fach) Gymnasium, intermediate secondary stands for Realschule, and low secondary stands for Hauptschule.

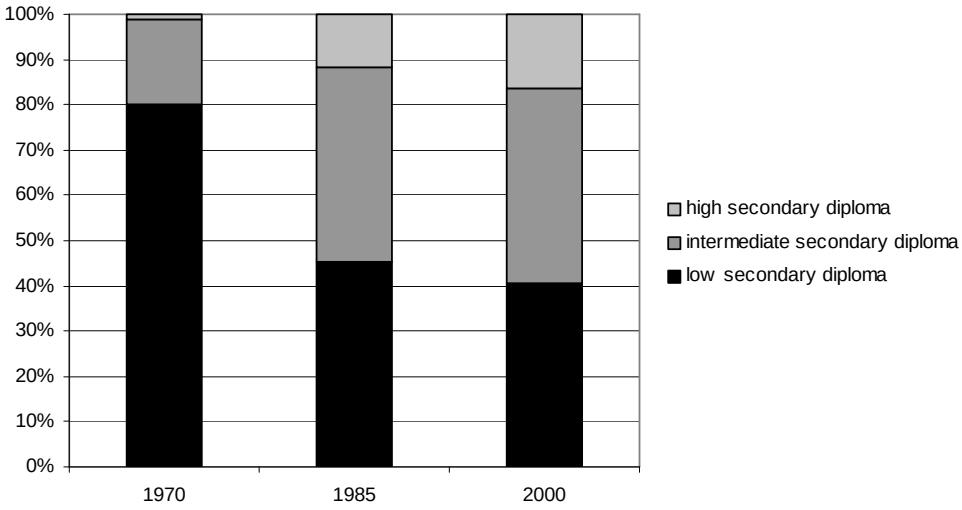

Figure 1: *Changes in secondary diploma received since 1970*

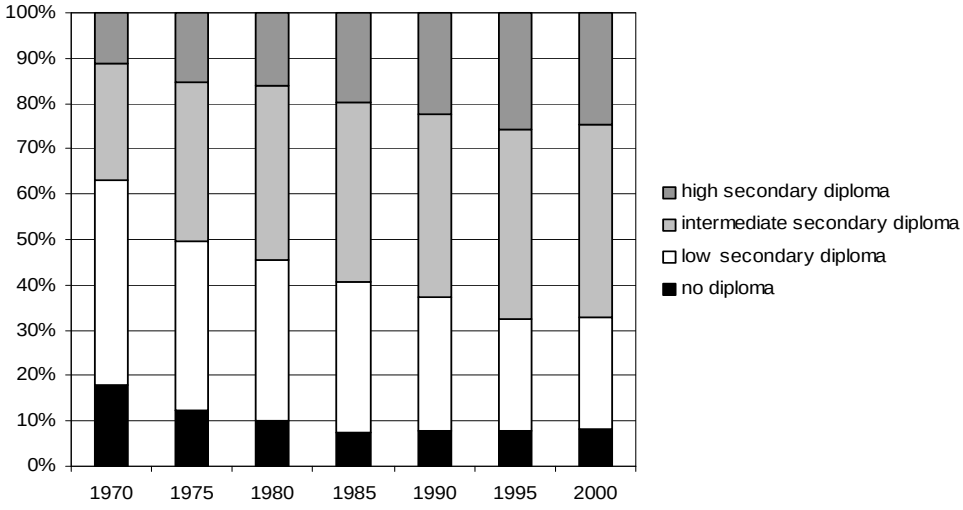

Figure 2: *Changes in secondary education in vocational training since 1984*

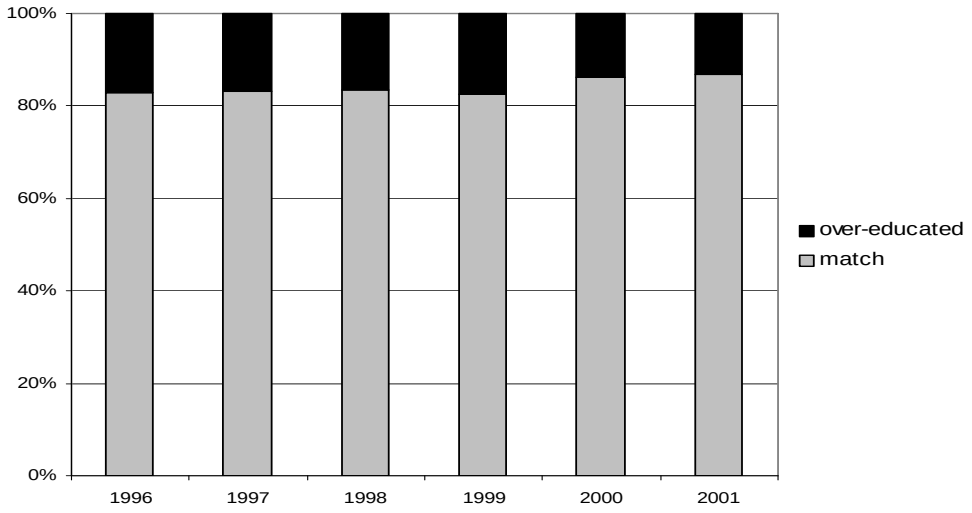

Figure 3: *Incidence of over-education 1996-2001*

low levels of over-education amongst vocationally trained, considering the involvement of the future employers, the vocationally trained persons make up an important share of Germanys over-educated. While on average little above 20% of all workers are over-educated see Figure 3 more than 30% of the workers trained in the dual system are working on the unskilled level see Figure 4 and hence are definitely over-educated.[3] Witte and Kalleberg (1995), also using GSOEP data, find additionally that only about 50% of vocationally trained Germans are actually working in the occupation they were trained for. In the next section we therefore briefly discuss possible explanations for this phenomenon. First, we draw on the literature giving general explanations why over-education may be observed before moving on to a theoretical model that explicitly explains the functioning of the dual system, and how over-education may arise in it.

3 Common explanations for over-education

The phenomenon of over-education which we observed for vocationally trained workers can at first glance nicely be explained by two theories, which are both compatible with human capital theory (Borghans and de Grip, 1999). The first possibility is that of bumping down, or skill bumping: Over-education may emerge due to downward pressure of higher educated individuals. In

[3]Unless specified differently, all data is taken from the GSOEP. The Annex gives an overview of the variables used as well as their means. The over-education variable is based on the question What degree do you need to work in your current job? in comparison to the highest educational level reported.

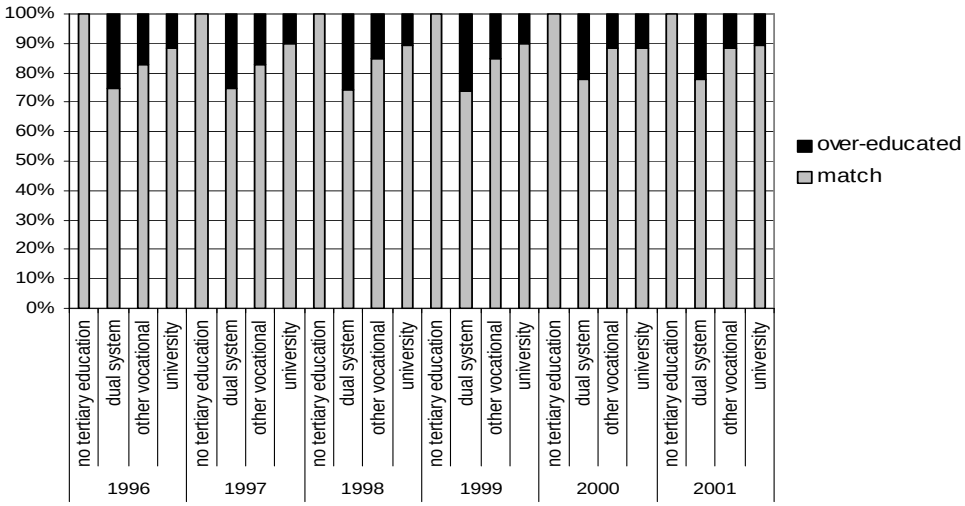

Figure 4: *Incidence of over-education per educational level*

this particular case it would mean that academically educated workers are working on the vocational level, taking away the jobs of vocationally trained workers, and thus bumping them down into unskilled jobs. The second possibility is upgrading, implying that jobs that used to be unskilled or vocational have been upgraded due to technological change and in fact now require higher skilled workers, although there is no specific vocational training available.[4] This might be due to two distinct reasons: attractive work opportunities on the unskilled level have arisen, which actually require vocationally trained workers, or skill obsolescence on the vocational level might be responsible for the phenomenon of over-education. We evaluate both possibilities, bumping down as well as upgrading. Bumping down can occur for different reasons, e.g. a change in demand and/or supply of skills, or as a result of job competition. Whatever the underlying reasons for bumping down, the data should show that higher skilled (i.e. higher educated) workers systematically take over jobs from lower skilled workers, which in turn have to work on the unskilled level and may crowd out unskilled workers completely. If the high level of over-education on the vocational level is due to bumping down, we should find a high number of over-educated academic workers, i.e. trained in either technical college or university but working in vocational jobs. Table 1[5] shows that this is clearly not the case. Only about

[4]Euwals and Winkelmann (2001) argue that apprentices acquire a large amount of industry-specific skills, rather than firm-specific skills, and are therefore valuable in different jobs within the same industry. Upgraded jobs, formerly requiring no education, could therefore very well be matched with vocationally trained workers from the same industry.

[5]Obviously, workers can also be under-educated for the jobs they are doing; we ignore this possibility since it does not affect our argument and count everyone who is not over-

Table 1: *Distribution of workers over required and actual education*

		required education		
		unskilled	vocational	academic
actual	unskilled	2373	-	-
education	vocational	**2480**	9829	-
	academic	148	**168**	2642

1/2 of the few overeducated academic workers work on the vocational level, and this translates into 168 cases in our sample. This has to be compared to a total of 20% of over-educated vocationally trained workers working on the unskilled level, which amounts to 2480 cases. Thus, bumping down cannot be the reason for over-education of vocationally trained workers.[6]

The second theory which could explain over-education is upgrading. This would imply that due to technological change, job requirements have risen and now higher skilled workers than before are necessary to fill jobs. A case perceived as over-education in the data could then actually constitute a good match. In the German case, two possibilities of upgrading could apply. The first one is that vocational jobs themselves have been upgraded, so that firms now need better apprentices from higher secondary school types in order to train successfully, and that (older) workers' skills have become obsolescent such that they have to work in unskilled jobs. A second possibility is that formerly unskilled jobs have been upgraded and now require vocationally trained workers. Both possibilities seem reasonable. However, in a previous working paper version[7] we cannot find any evidence for the hypothesis that vocational jobs were upgraded and resulted in obsolescence of skills or that the over-educated vocationally trained workers are more likely to work in an upgraded job than unskilled, but correctly matched workers. They conclude that even if upgrading has taken place at the unskilled level or at the vocational level, it is certainly not responsible for the large amount of over-education found.

A third, and quite prominent explanation for over-education can be directly derived from the model by Franz and Soskice (1995) who intend to explain why firms train apprentices in the first place. They identify two different mechanisms which both by themselves can explain why firms train, but have even more explanatory power when combined. The resulting explanation of over-education is actually a by-product of their analysis. The first part of the model Franz and Soskice present is a simple comparison of the profit a firm can make from either training an apprentice and employ-

educated as correctly matched.

[6]Note however that bumping down and crowding out of unskilled workers due to over-educated vocationally trained workers is likely to exist, in line with the reasoning by Muysken et al. (2003), though it is not subject of discussion in this paper.

[7]see Kiiver and Muysken, 2004

ing him after the training, or hiring an 'outsider' who still has to acquire firm specific skills. Under the assumption that firm-specific skills are necessary pre-requisites for the use of marketable skills and that 'outsiders' work unproductively for a certain amount of time, they show that if the cost of training an outsider is large enough and the significance of firm-specific skills is important enough, firms will train apprentices instead of hiring external workers. From that perspective, over-education is a temporary phenomenon.

The second part of the model developed by Franz and Soskice is based on the assumption that asymmetric information exists with respect to the abilities of students (both future apprentices and workers) as well as with respect to externally hired workers, who have been apprentices in other firms. There are two types of workers: the good ones, with high abilities and the lemons, with low abilities. A firm has trained a certain amount of apprentices, of which a share turns out to be a lemons. These lemons have to leave the firm, and of the remaining good apprentices a share will leave the firm for other reasons than low abilities. Next to former apprentices, who have high abilities and hence high productivity, the firm will hire external workers. Of these workers, a share turns out to be lemons as well. Knowing this process, firms first decide how many apprentices to train. They know the proportions of lemons in the population, but can identify the apprentices as lemons only *after* the training decision is made. Since training is assumed to require no time, but the payment of a lump sum, firms next decide how many and which apprentices to keep, and how many workers will be hired externally. The apprentices know at that point whether they have been offered to work in the training firm, and the chances of getting a job at a different firm. Those who are offered a job then decide to leave the firm or to stay. Only after these decisions are made, production starts. Obviously, the optimal decision of the firms depends on the quit-rate of good apprentices. In equilibrium, firms decide to train enough apprentices such that no external hiring is necessary. They implicitly assume a zero quit rate of good apprentices, to whom they will offer contracts, while letting all lemons go. The apprentices will find out that there are no job openings at other firms, and will thus indeed stay at the training firm, even in case of strong preferences to change jobs. While Franz and Soskice say nothing about what happens to the lemons who did not get a job in the training firm, the implications of the equilibrium are clear: whether the lemon is unemployed or working at the unskilled level, he will never get a job on the vocational level. Thus, over-education according to this model is no market failure, since no over-skilling is taking place: apparently over-educated apprentices are in fact lemons. Büchel and Pollmann-Schult (2001) suggest with their empirical results that over-educated workers on the vocational level in Germany are indeed over-educated due to their low abilities. They argue that the best apprenticeship places, i.e. the ones offering the highest wages, go to the students holding the highest secondary diplomas with the best grades. The

students who enter an apprenticeship at the bottom of the job queue are accordingly the ones holding the lowest type of secondary diploma. Büchel and Pollmann-Schult (2001) find that these students have an actual skill deficit and will ultimately become over-educated. Over-educated workers on the unskilled level are thus working on an appropriate level. This shows up in the data as over-education, but actually implies a correct match since the unobserved low skills of the workers correspond to the job level of unskilled jobs. According to Bchel and Pollmann-Schult, social factors like the stability of the parental home and the educational level of the parents strongly influence skills, and skill deficits, of students. They show that these social factors are no longer significant when regressing on over-education, however, once secondary diplomas are included. They thus conclude that low secondary diplomas are an observable sign of low innate skills, and that apparently over-educated workers are in fact lemons. While we find similar evidence with regard to the existence of a job queue (Kiiver and Muysken, 2004) we doubt the conclusions drawn regarding the observability of low skills, and the subsequent over-education. If low skills were in fact observable, or if low secondary diplomas were at least a good indication of low skills, firms would not invest in these students since the risk of not being able to profit from the investment would be too large. We therefore explore in the next section an alternative explanation, which can explain how over-education arises as feature of the apprenticeship system.

4 Systemic failure: exploitation and stigmatisation

In our view the over-education explanation pointed at by Franz and Soskice (1995) is a direct result of the single-period nature of the model. This feature forces them to assume that the number of apprentices who quit will be equal to the number of external workers hired. That is, the firm cannot decide to start training new apprentices instead, since no difference is made between the time of training and the time when the apprentice is working as a fully efficient worker. However, when expanding the time horizon, it becomes possible for a firm to decide either to hire externally, or to train again when lemons are fired at the end of the training period and some good apprentices leave for personal reasons or due to preferences.

We derive two important implications from that:[8] In the above analysis we assumed that the profit from employing a fully trained worker will always be larger than the profit when training during the first time period. While this argument always has to be true for externally hired workers, since they receive the same wage in the first period as in the second, it is not as clear-cut

[8]See previous working paper version for a mathematical extension of the Franz and Soskice model.

for apprentices. Their cost are lower than the cost of a fully trained worker, but depending on the skills they have to learn they might be very quickly able to work as efficiently as any other trained worker. It is therefore possible that a firms profit is not negative, as usually assumed to be the case, but zero or even positive. If thus the benefit from the apprentices work outweighs the cost of training sufficiently, there is a point when training actually becomes more profitable than employing trained workers. As a result, firms will use apprentices as cheap labor rather than as investment and accordingly not offer them a regular working contract after the training period.

Once trained workers are however let go by their training firm, they will be perceived as lemons by other firms which could possibly hire them. Thus, workers who were initially exploited as cheap labor by their training firms are additionally stigmatized as lemons even though they might not have low abilities.

There is some support for this hypothesis in the the BiBB[9] (2002) reports negative average costs for parts of the service industry. Acemoglu and Pischke (1999) report that variable cost of training could be negative under the assumption that skilled workers' wages are significantly lower than their marginal products. According to Steedman (1993), costs of training can be negative especially in small, artisan firms. Most importantly, Lempert (1990) argues that apprenticeship places are sometimes in fact created for the sole purpose of profiting from the cheap labor the apprentices provide, without having the intention to hire these apprentices after their final examinations at all. These observations give credence to the notion that under several circumstances the conditions described above will be fulfilled. In addition, the yearly survey of training *(Berufsbildungsbericht)* by the BMBF[10] from 1998 shows that firms report that 38% of apprentices who were not hired after the termination of the apprenticeship contract were not hired since no skilled workers were needed at that point in time. This confirms the idea that firms may have hired these apprentices not as an investment but as cheap labor.

While this descriptive evidence points out that the combined theory of 'exploitation' and resulting 'stigmatization' might be able to explain overeducation to a certain degree, testing it directly against the 'lemon' explanation is difficult: we would require data about the direct and indirect costs of training, the abilities, productivity and wages of apprentices and possibly the reasons of firms to take on new apprentices instead of keeping trained ones as skilled workers. Instead, we chose a different strategy which uses the available information.

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5 The empirical evidence

In this section we are trying to develop a method which allows us to see whether our theory is a candidate to explain over-education. If over-education was in fact only due to low unobserved abilities, we should find no impact of having been trained in the dual system on the probability of being over-educated when controlling for personal characteristics as well as unobserved heterogeneity. As additional check we compare the risk of being over-educated with the risk of being unemployed, and we consider the wages received. The hypothesis is that we should find an effect of being trained in the dual system only for over-education, but not for unemployment or for wages, since the mechanism described earlier should have no impact on either one of these variables if we control for unobserved heterogeneity.

5.1 The equations estimated

We estimate thus the following equations:

$$P(overed = 1) = \beta_0 + \beta_1 yeduc + \beta_2 duals + \beta_3 haupt + \beta_4 X + \mu + \eta \quad (1)$$

$$P(unemployed = 1) = \beta_0 + \beta_1 yeduc + \beta_2 duals + \beta_3 haupt + \beta_4 X + \mu + \eta \quad (2)$$

$$lnwage = \beta_0 + \beta_1 yeduc + \beta_2 duals + \beta_3 haupt + \beta_4 X + \mu + \eta \quad (3)$$

where the following variable definitions apply:

yeduc years of education as reported in the GSOEP data;

duals dummy=1 if worker was trained in dual system;

haupt dummy=1 if worker has lowest secondary diploma, (*Hauptschule*;

X vector of control variables: age, experience, federal state, year of survey, gender, marital status, firm size;

μ unobserved individual error.

For reasons of simplicity we estimate equations (1) and (2) as linear probability; a possible extension would be to compare the estimates found here to logit/probit regressions. In order to control for unobserved heterogeneity we use fixed effects and Hausman-Taylor panel methods, and for comparison we also estimate the same equations with OLS.[11]

[11]The OLS regressions were done with a sample including only vocationally trained workers (dual system and vocational schools) in order to decrease the bias by the omitted variable 'ability'.

5.2 The data used

We use a balanced panel spanning the years 1996 up to and including 2001; we selected only workers between 19 and 65 who had been trained in West Germany and who were at least working half-time (i.e. 18 hours) in order to be counted as working, and only workers with official unemployment status as unemployed. Workers still in training were specifically omitted in order to avoid counting apprentices during their apprenticeships as workers, which could significantly bias the wage regression. For the regressions on over-education and wages, we selected only workers working during all years included in the panel. Over-education was determined by comparing the highest education received with the answer given to the question which type of training was required for the job currently working in. In addition, the worker had to answer the question "Are you working in the occupation trained for?" with "No" to be counted as over-educated.[12] Years of education were used as provided in the GSOEP, but individuals were selected only if changes in years of education were logic, i.e. increasing over time. The same is true for the variable 'duals'; only individuals who previously reported no education and increasing years of education were counted in case of change of status w.r.t. 'duals'. For the dummy variable 'haupt', indicating holders of the lowest type of secondary school diploma we found that variation was usually illogic (e.g. reporting first a higher type of diploma), so we included only individuals who indicated the lowest diploma type in at least 4 of the 6 years considered in the sample or in none of the years at all and then fixed the dummy for the whole period.

5.3 The regression results

Table 2 reports the estimates of the coefficients for years of education (yeduc), the dummy for training in the dual system (duals) and the dummy for holding the lowest type of secondary school diploma (haupt). The OLS results cannot give a clear indication of whether or not over-education is due to the exploitation/stigmatisation theory or low abilities: while having been trained in the dual system appears to increase the odds of being over-educated even if controlling for years of education and the type of secondary education received, it is not clear whether this effect is due to low abilities or not. In addition, we find that holding the lowest diploma type significantly adds to the chances of being over-education, which is in line with previous evidence.

The results for the panel estimates prove to be more interesting: whether we use fixed effects to control for unobserved heterogeneity or the Hausman-

[12] The regression results are robust to the definition of over-education. Using the comparison of actual and required education only results in almost identical estimates.

Taylor estimator,[13] we find in both cases that having been trained in the dual system increases the likelihood of being over-educated. Also the coefficients of the other two variables are informative; in the Hausman-Taylor case we see that holding a low secondary diploma is no longer important for the chance of being over-educated once ability is accounted for. While this results shows that holding this type of diploma is in fact a sign of low ability, it also points out that this cannot account for over-education by itself. The positive effect of years on education on the chance of being over-educated might seem counterintuitive at first glance; we suspect however that this result is due to the fact that all else equal and independently of ability, having more years of education increases the total range of accessible jobs; the positive coefficient could thus indicate a trade-off between working at an inadequate level and having no job at all.[14]

Table 2: Comparison of coefficients : regression on over-education

Variable	*OLS*	*FE*	*HT*
yeduc	-0.024**	0.047**	0.048**
duals	0.056**	0.072**	0.072**
haupt	0.055**	omitted	-0.001

Significance levels $*$: 5% $**$: 1%

Table 3 as well as Table 4 confirm the results of the regression on over-education. We find that having been trained in the dual system has no causal effect on the chance of being unemployed or on wages received once ability is controlled for; we interpret these estimation results as indication that our theory of exploitation and stigmatization adds to the understanding of the large incidence of over-education in Germany

Table 3: Comparison of coefficients : regression on unemployment

Variable	*OLS*	*FE*	*HT*
yeduc	-0.004**	0.002	0.002
duals	0.005	-0.003	-0.003
haupt	0.007	omitted	-0.460**

Significance levels $*$: 5% $**$: 1%

[13] This estimator uses the time averages of exogenous time-varying variables as instruments for the time-invariant endogenous regressors while time-varying endogenous variables are instrumented by their own means

[14] This result would imply that some bumping down is taking place, see also previous footnote.

Table 4: Comparison of coefficients : regression on wages

Variable	*OLS*	*FE*	*HT*
yeduc	0.051**	0.003	0.003
duals	-0.011*	0.006	0.005
haupt	-0.018**	omitted	-0.243*

Significance levels $*$: 5% $**$: 1%

6 Tentative conclusions and policy suggestions

In Germany, over-education on the vocational level - and since it accounts for about 90% of total over-education, in general - has its roots to a certain extent in the educational and the apprenticeship system itself. While some of the over-educated workers are over-educated due to their low innate abilities, another group exists which has been trained in firms who could profit from the apprentices such as to enjoy a net benefit from training. They are overeducated since these firms train continuously in order to profit from the cheap labor provided by the apprentice instead of training to hire the worker afterwards. These workers who have to leave training firm after the completion of the apprenticeship are in addition stigmatized as low ability workers - 'lemons' - since other firms will assume that they were not offered to stay in the training firm due to low abilities. Low secondary diploma holders are especially at risk of becoming over-educated. The increased participation of high secondary diploma holders exerts, via job competition, pressure on low secondary diploma holders, and bumps them down into the least attractive apprenticeships where exploitation is likely, and the probability of leaving a firm is high due to initial mismatch in job ambitions and actual jobs. Two distinct problems have to be tackled by policy: the first one concerns the problem of stigmatisation, and the second one the available amount of high quality apprenticeships. With respect to the problem of stigmatisation, there are few direct methods to alleviate the problem. However, any measures that would make it cheaper for a firm to try an external worker for a certain amount in time, for lower than ordinary wages, could induce firms to take applicants into account they would not have considered before. During the trial period the firms can then find out themselves whether an applicant is qualified, or a real lemon. The success of such a scheme would strongly depend on the availability of any jobs in the first place. Moreover it could backfire if firms decided to offer less high quality apprenticeships because they could find qualified workers on the market at lower cost. However, reducing the cost of training for firms in order to induce firms to offer more high quality apprenticeships would obviously work the other way around. Apart from robbing already skilled workers of any chance to get an appropriate job, firms that had previously trained at a small net cost might

make net benefits, and decide to take advantage of that situation. Subsidies on training might therefore have the exact opposite effect than the one that was intended; instead of creating high quality apprenticeships for the previously exploited, it could create rather more exploiting apprenticeship places. Rather than messing with the existing incentives for firms, the incentives for students to participate in the system should be tackled. Making German universities more attractive places could lure any student capable of attaining a high secondary diploma away from the currently so attractive apprenticeships. The queue of students in line for an apprenticeship place would decrease, allowing entry of lower secondary diploma holders and reducing the number of students who would have to get trained in exploiting apprenticeships at the bottom of the queue. While this paper has discussed over-education resulting from vocational training, part of the solution to the problem lies in the low attractiveness of university education. Policy aimed at improving this aspect of vocational training in Germany should keep this connection in mind in order to achieve the desired results.

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A Appendix

Table 5: Variable description

Variable	Definition
oe	dummy equal to one if worker is over-educated
lfs1	dummy equal to one if worker is unemployed
lnwage	natural logarithm of net hourly wage
yeduc	years of education
duals	dummy equal to one if worker was trained in dual system
haupt	dummy equal to one for lowest secondary school diploma
female	dummy equal to one if worker is female
married	dummy equal to one if worker is married
curexp	years worked in current firm
curexp2	years worked in current firm squared
age	age of worker in years
age2	age of worker squared
small	dummy equal to one if firm has less than 20 employees
medium	dummy equal to one if firm has between 20 and 200 employees

Table 6: Summary statistics working sample, total sample

Variable	**Mean**	**Std. Dev.**	**N**
oe	0.154	0.361	15738
lnwage	3.164	0.394	15738
yeduc	12.101	2.631	15738
duals	0.453	0.498	15738
haupt	0.252	0.434	15738
female	0.394	0.489	15738
married	0.725	0.447	15738
curexp	10.916	9.125	15738
curexp2	202.418	297.279	15738
age	41.345	9.250	15738
age2	1794.997	782.562	15738
small	0.184	0.388	15738
medium	0.289	0.453	15738
oe	0.159	0.365	17640
lfs1	0.031	0.172	17640
yeduc	12.012	2.593	17640
duals	0.464	0.499	17640
haupt	0.259	0.438	17640
female	0.39	0.488	17640
married	0.718	0.45	17640
age	41.36	9.377	17640
age2	1798.56	792.639	17640

Table 7: OLS regressions on wages (1), unemployment status (2) and over-education status (3)

Variable	**OLS (1)**	**OLS (2)**	**OLS (3)**
female	-0.124**	-0.006	-0.030**
	(0.005)	(0.003)	(0.007)
married	0.022**	-0.014**	0.011
	(0.006)	(0.004)	(0.008)
curexp	0.015**		-0.010**
	(0.001)		(0.001)
curexp2	-0.000**		0.000
	(0.000)		(0.000)
age	0.023**	-0.006**	0.014**
	(0.002)	(0.001)	(0.003)
age2	-0.000**	0.000**	-0.000**
	(0.000)	(0.000)	(0.000)
small	-0.239**		-0.044**
	(0.007)		(0.009)
medium	-0.104**		-0.011
	(0.006)		(0.008)
yeduc	0.051**	-0.004**	-0.024**
	(0.002)	(0.001)	(0.002)
duals	-0.011*	0.005	0.056**
	(0.006)	(0.003)	(0.007)
haupt	-0.018**	0.007	0.055**
	(0.007)	(0.004)	(0.009)
Constant	1.801**	0.228**	0.164*
	(0.054)	(0.031)	(0.072)
Observations	12849	13266	12849
R-squared	0.42	0.03	0.06

Significance levels $*$: 5% $**$: 1%

Standard errors in brackets

State and year dummies are omitted

Table 8: Hausman-Taylor regressions on wages (1), unemployment status (2) and over-education status (3)

Variable	**HT (1)**	**HT (2)**	**HT (3)**
female	-0.190**	-0.028**	0.002
	(0.016)	(0.009)	(0.015)
married	-0.001	-0.004	0.032**
	(0.008)	(0.006)	(0.009)
curexp	0.004**		-0.002
	(0.001)		(0.001)
curexp2	-0.000**		0.000
	(0.000)		(0.000)
age	0.048**	-0.018**	-0.000
	(0.003)	(0.002)	(0.004)
age2	-0.001**	0.000**	0.000
	(0.000)	(0.000)	(0.000)
small	-0.090**		-0.015
	(0.008)		(0.010)
medium	-0.031**		-0.003
	(0.006)		(0.007)
yeduc	0.003	0.002	0.048**
	(0.002)	(0.002)	(0.003)
duals	0.005	-0.003	0.072**
	(0.005)	(0.005)	(0.007)
haupt	-0.243*	-0.460**	-0.001
	(0.111)	(0.105)	(0.124)
Constant	1.911**	0.429**	-0.476**
	(0.075)	(0.058)	(0.090)
Observations	15738	17640	15738
Number of individuals	2623	2940	2623

Significance levels $*$: 5% $**$: 1%

Standard errors in brackets

State and year dummies are omitted

Table 9: Fixed effects regressions on wages (1), unemployment status (2) and over-education status (3)

Variable	**FE (1)**	**FE (2)**	**FE (3)**
female	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
married	-0.002	0.001	0.038**
	(0.009)	(0.007)	(0.011)
curexp	0.004**		-0.001
	(0.001)		(0.001)
curexp2	-0.000**		0.000
	(0.000)		(0.000)
age	0.070**	-0.025**	-0.010*
	(0.004)	(0.003)	(0.005)
age2	-0.001**	0.000**	0.000
	(0.000)	(0.000)	(0.000)
small	-0.058**		-0.029*
	(0.009)		(0.011)
medium	-0.015*		-0.010
	(0.006)		(0.008)
yeduc	0.003	0.002	0.047**
	(0.002)	(0.002)	(0.003)
duals	0.006	-0.003	0.072**
	(0.005)	(0.004)	(0.007)
haupt	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Constant	1.091**	0.506**	-0.065
	(0.088)	(0.072)	(0.116)
Observations	15738	17640	15738
Number of cases	2623	2940	2623
R-squared	0.11	0.02	0.04

Significance levels $*$: 5% $**$: 1%

Standard errors in brackets

State and year dummies are omitted