Working Paper No. 2

Premature Apprenticeship Terminations: An Economic Analysis

Donata Bessey, Uschi Backes-Gellner

Universität Zürich
ISU – Institut für Strategie und Unternehmensökonomik

UNIVERSITÄT BERN

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Donata Bessey and Uschi Backes-Gellner
University of Zurich
Institute for Strategy and Business Economics (ISU) and
Swiss Leading House Economics of Education:
Firm Behavior and Training Policies

August 2007

Abstract

This paper presents empirical evidence on premature terminations of apprenticeship contracts in Germany. Our novel approach uses human capital theory with a regional component as a clear-cut framework for the analysis. It derives testable hypotheses on individual decisions to finish an investment in human capital, namely, their apprenticeship training. Using a German data set, we find some evidence for the appropriateness of our theory, especially with respect to the short-term cost of an apprenticeship. Regional impact factors also seem to have a decisive impact on the decision to drop out from vocational training. We conclude that economic incentives, also long-term ones, seem to play a decisive role in individuals' decisions whether to finish their training or not.

JEL classification: J 24, I 21, J 42
Keywords: Apprenticeship training, human capital, regional labor markets

Work in progress - comments welcome. Please do not cite or quote. This study is partly funded by the Swiss Federal Office for Professional Education and Technology through its "Leading House on the Economics of Education: Firm Behaviour and Training Policies". We thank Klaus Schöngen for providing us with the data set "Vertragslösungen 2002 - Strukturen und Gründe" of the German Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung). We thank Tobias Caluori, Ines Pelger and Christian Pfeifer for helpful comments, as well as participants of HUI 2007 and SMYE 2007. Franziska Schoch has provided most efficient research assistance.

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1 Motivation for the Project

Firm-provided apprenticeship training is still one of the most important ways of entering the labor market for youths in the German-speaking countries. In Germany, for example, 58 % of all school leavers started an apprenticeship in 2005, and during the last years, their school-to-training transition became more difficult: the market for apprenticeship places could not manage to escape the general trend of an economic downturn in Germany. This resulted in a certain scarcity of available places, especially in less prosperous regions. At the same time, about 20% of youths decide not to complete their apprenticeship, but opt for the premature termination of their apprenticeship contract. This is puzzling, given the fact that more education leads to a higher income and a lower risk of unemployment and should therefore be preferred. On a non-monetary level, an early apprenticeship termination is a difficult experience and a strain for the apprentices and for their in-firm instructors.

Yet, the termination of an apprenticeship contract does not necessarily mean that the former apprentice will stop any educational attainment afterwards. Basically, there are three different possibilities for the terminating youths: they can change (to another firm within the same training occupation or to another one), they can go back to school or to university (if they have a school leaving certificate that allows them to enter universities or polytechnics, that is, *Abitur*, *Fachabitur* or *FH-Reife*) or they can drop out from the educational system and either work as unskilled workers or end up unemployed. This approach is based on previous work, e.g. in several articles by Neuenschwander (1996, 1998, 1999). We call the different choices *changing*, *upgrading* and *dropping out*, respectively.

While the first two groups (the "changers" and the "upgraders") are rather unproblematic, the last group ("dropouts") runs higher risks in several fields of their daily life, the first one being the labor market. In Germany, the unemployment rate for unskilled workers more than quadrupled between 1975 and 1998 (from 6.1% to 25.8%, Reinberg 1999). Increasing qualification requirements and technical progress give dismal prospects to the unskilled and low-skilled labor force. Additionally, integration into the global economy leads to a lowered demand for unskilled labor (Gutachten 2006). Empirical studies for the UK and the USA (e.g., Fabbri et al. 2003) seem to suggest that openness increases the elasticity of labor demand, probably especially for low-skilled labor.[1] Besides, wages for unskilled workers are considerably

[1]There are two possible reasons for this phenomenon: more trade leads to more competitive goods markets, and multinational firms' global production networks enable them to shift their production abroad more easily. The results are higher unemployment rates

lower.
The second field where dropouts possibly run more risks is health-related behavior. Studies from a psychological background seem to suggest that jobless dropouts (but not the working ones, who have a structure in their daily life), also the changers with a long-term break who are still looking for a job, consume significantly more often legal and illegal drugs and show deviant behavior (Neuenschwander 1998).[2] A newer study with more respondents (Stalder and Schmid 2006) also found that youths with an apprenticeship contract termination smoked significantly more and had a significantly less positive attitude towards life.
As training is provided by firms, they also have to bear the consequences of individuals' decisions to drop out. Investments into the training of their apprentices can amount to substantial sums, and in a long-term perspective, some instructors in firms even think about reducing or going completely out of their training activities (Stalder and Schmid 2006). A back-of-the-envelope calculation for Switzerland by the same authors stated the direct cost of one prematurely terminated apprenticeship at about 20,000 Swiss francs[3].
From a policy perspective, dropouts can cause higher costs in several fields. Some examples are missing training places due to reduced firm-provided training, higher costs due to higher unemployment rates of unskilled workers later on and higher health costs because of the riskier behavior of dropouts. In fact, Oreopoulos (2007) finds that the welfare loss from dropping out from compulsory school is large and probably not outweighed by lower costs because of the dropout decision. Hence, there should be a pronounced interest in understanding the reasons why people drop out from apprenticeship training.
The existing literature on the topic of apprenticeship dropouts is quite small and we add to it in two ways.[4] Firstly, we provide a simple economic theory model based on human capital theory that we enriched with a regional component. By doing so, we can derive testable implications for individual- and regional-level incentives for individuals to drop out. Secondly, we provide

on inflexible labor markets (as the German one) for low-skilled workers.It seems that more flexible labor markets tend to end up with higher inequality in labor incomes. Barba Navaretti et al. (2003) use European panel data and also find that in a given country, foreign-owned enterprises adjust their employment systematically faster than domestic ones.

[2]However, the sample sizes are quite small and the analyses feature just correlations, so the direction of causality remains unclear.

[3]This includes the cost of schooling and in-firm training.

[4]There exists quite an extensive literature for school dropouts, but the institutional structure of apprenticeship training is quite different and the results are not readily comparable.

econometric evidence using a new data set. Former work with the data set included only descriptive statistics.
The remainder of our paper is organized as follows. Part 2 presents the main institutional features of the German educational system with a special emphasis on apprenticeship training, and part 3 provides a brief literature review, mainly from psychological studies, because there are no economic analyses of the topic. Part 4 provides a theoretical framework for our empirical analysis and derives testable implications. Part 5 introduces the data set that we used, while part 6 presents empirical evidence. Part 7 concludes and sketches an agenda for future research on the topic.

2 Institutional Background

In Germany's federal system, education is within the responsibility of federal states. However, the states' educational systems share many similar features that we briefly present in this section.
The German schooling system tracks pupils into three different schools after 4 or 6 years of primary school. The lower secondary school (*Hauptschule*) lasts 5 years and was intended to prepare its pupils for blue-collar jobs, e.g., in crafts, while the middle secondary school (*Realschule*) lasts 6 years and was intended as a preparation for white-collar jobs, e.g., in administration. The upper secondary school (*Gymnasium*) lasts either 8 or 9 years. It is the only type of school whose graduates are allowed to study at a university. However, there are also various possibilities to gain a Fachabitur (that allows its holders to study only in a certain field) or Fachhochschulreife (in order to study at a polytechnic) outside the Gymnasium. The degree of mobility across the different tracks varies across the federal states.
After their graduation, the youths who want to continue their education can either study at universities or polytechnics (*Fachhochschulen*), enter dual apprenticeship training or go to full-time vocational schools (*Berufsfachschule*). These schools exist, inter alia, for training in technical, health-related or business-related occupations. Some examples are chemical-technical assistants, or nurses.[5]
The focus of this work is on dropouts from *dual vocational training* that is provided voluntarily by firms. It consists of in-firm training at the workplace and classes at a vocational school (*Berufsschule*). At the moment, there are nearly 350 state-approved apprenticeships. They last between 2 and 3.5 years. With respect to the composition of skills provided to their graduates,

[5]There is of course also the possibility to enter the labor market directly after school without apprenticeship training.

Winkelmann (1996) and Korpi and Mertens (2003) both find evidence for the importance of general, transferable skills from an apprenticeship as compared to firm-specific human capital.
Apprentices earn a small wage paid by their training firms, and youths get their training place either on their own initiative or through the intermediation of the local employment agency or other institutions. In order to meet excess demand for apprenticeship places, there also exist full-time vocational schools for occupations that are typically offered in dual vocational training (*ausserbetriebliche Ausbildung*). Their importance relative to the number of all apprentices varies remarkably across federal states. This is also due to the fact that the regional unemployment rates vary substantially. While only 4.8 % of all apprentices in the west of Germany got their training in a full-time vocational school of this type, 32 % in the East did so. This type of apprenticeship is somehow stigmatized, because typically only youths who did not manage to find a place in a firm have to rely on it. The result is a higher number of unemployed graduates of such a program, compared to the ones who graduated from regular apprenticeship training. See, for example, Berger (2006).

3 Literature Review

Previous research on the topic of dropouts from dual vocational training is quite scarce. The following section summarizes the scarce existing descriptive evidence that seems to underline the importance of various matching-related problems.
The ex-apprentices' prior level of schooling seems to play an important role for changing and dropout decisions where all studies report that youths with a higher level of previous schooling are less likely to drop out (as opposed to staying within the educational system) and less likely to change (as opposed to staying within their chosen occupation), see, for example, Alda (2003). The importance of schooling can be due to two reasons: on the one hand, longer schooling should be associated with more ability and hence lead to less schooling problems, which can subsequently lead to the decision to quit the training because of high non-monetary costs. On the other hand, more schooling seems to lead to better decision-making abilities (Cutler and Lleras-Muney 2006), so there are probably less matching problems and resulting dropout decisions. Additionally, youths with more prior schooling have in general a larger set of choices available, so they are probably less often forced to start an apprenticeship just because it was the only offer that they got. This probably also leads to better matches.

Most terminations take place during an early stage of the apprenticeship training, and this also seems to be an indicator for matching problems: many youths say that they did not have enough information about their training firm (Stalder and Schmid 2006). Interestingly, the same authors also find very different termination percentages for different standards of the apprenticeship: more demanding training occupations showed considerably lower rates of termination. Probably there is a positive self-selection of more able and better informed future apprentices into the more demanding top-notch occupations. This points again into the direction of better decision-making story for more able youths.

A bad working atmosphere, especially clashes with the instructor and/or colleagues rank among the most frequently cited reasons for a termination on firm level (Schöngen 2003, Neuenschwander et al. 1996, Stalder and Schmid 2006). This provides more evidence for matching-related problems: apprentices want to change if the perceived costs are lower in another firm or occupation, hence, in a better match.

Neuenschwander (1999) also finds that there are many dropouts in fields where there are abundant employment opportunities for unskilled workers. The short-term financial gains seem to lead the apprentices to not taking into account long-term implications of their decision. This can be seen as a hint towards the importance of time preference in education-related decision making. Also, this finding underlines the importances of incentives that can have adverse impacts on educational outcomes.

With respect to gender, there is mixed evidence in the studies that we are aware of. The results are more consistent for youths with a migration background: they seem to fare worse than natives in the apprenticeship training system. Neuenschwander (1999) finds that apprentices without native citizenship are more likely to drop out, Stalder and Schmid (2006) find that natives are significantly more likely to continue their education, and Schöngen (2003) reports that less ex-apprentices with a migration background are still planning to continue their education.

A study on behalf of the WHKT, an association of chambers of craft (Westdeutscher Handwerkskammertag 2002), found that one third of terminating youths started an apprenticeship in a job which was not their first choice. Among the most important reasons were a lack of apprenticeship places in their region and insufficient school performance. This result can be seen as a hint towards the importance of local labor market conditions.

Terminations of apprenticeship contracts are a complex phenomenon. However, the importance of decision-making abilities, resulting matching problems and economic incentives, for example adverse local labor market conditions, seems to be confirmed by all the presented results.

A point that all the presented literature has in common is the fact that they all lack an (economic) theory-based approach. In the following section, we provide theoretical explanations for the different paths that we identified earlier on, and we derive testable hypotheses.

4 Human Capital and Regional Labor Markets

The economic theory of human capital as pioneered by Becker (1962) suggests that a rational agent will invest in education (as in any other asset) only if it yields a positive net present value. Future costs and earnings streams can be discounted in order to make different alternatives comparable and to identify the optimal one. For an identical cost structure, rational agents should always prefer the higher earnings (and lower risk of unemployment) resulting from a finished apprenticeship training.
In order to keep things simple, we decided to use a time-continuous model of investment in human capital. As we only have a data set of people who have already entered apprenticeship training, we assume that they decide whether to continue their education or not (and not whether to invest at all). We assume that apprentices decide once, that they pursue at the maximum one apprenticeship (which means that this is not a dynamic optimization problem) and that there is no uncertainty about future returns and costs of education. The following baseline model is taken from Johnes (1993), and we extended it to incorporate regional differences.
Let C_i denote the cost of a marginal education unit in time period i, and R_i the return associated with it. t is the duration of the individual's education, and T is the end of the individual's working life (e.g., his retirement). $i = 0$ is the base period where the individual decides whether to continue or not, and r denotes the interest rate used for calculation. A rational agent should then keep investing in education up to the point where his marginal return of education equals the marginal cost:

$$\int_0^t C_i e^{-ri} di = \int_t^T R_i e^{-ri} di \tag{1}$$

The net present value of the decision to keep investing in education is then given by

$$NPV = \int_t^T R_i e^{-ri} di - \int_0^t C_i e^{-ri} di \tag{2}$$

Ceteris paribus, the optimality condition implies that the investment will increase with the duration of the individual's working life (the time span be-

tween t and T) and with the returns to education, R. The level of education that the individual chooses decreases with the cost of education C and with the interest rate r, because a higher interest rate means that the individual is more impatient and values the later returns lower. These values can of course differ for different individuals.

Additionally, we assume a limited geographical mobility of apprentices. This restriction is quite mild and backed by empirical evidence: most apprentices do not move. See, for example, the federal government's report on vocational education 2003 (Berufsbildungsbericht 2003): only 10 % of apprentices in a survey moved for their apprenticeship training. This assumption implies that apprentices' decisions whether to complete their training or not depend also on their region of origin: individuals from economically more prosperous regions probably have a larger set of possible choices and end up in better matches because more firms offer more apprenticeship places. They also have more possibilities to work as an unskilled laborer. Consequently, apprentices' choices should depend on the set of options available after they have entered apprenticeship training.

Wheeler (2001) shows in a matching model that larger labor markets lead to better matching between workers and firms due to lower search costs. This leads to higher productivity, higher inequality (in pay between different skill groups) and higher expected returns to skill under certain assumptions. Hence, apprentices in bigger labor markets should have more incentives to complete their training (ceteris paribus) than their counterparts in areas where the labor market is smaller. Of course, there is asymmetric information about the characteristics of an apprenticeship place and an occupation, and youths can only fully learn about these after they have started their training. We incorporate the results of this model by introducing a weighting factor μ_g to the returns in the standard human capital model. g denotes different regions, and we assume $\mu_g \in [0, 1]$. It is therefore possible that an apprenticeship does not have any returns, for example if the apprentice does not manage to find a job in his or her occupation.

There should also be differences with respect to the costs of an apprenticeship, but the reason is less intuitive. While the requirements for apprenticeship training are standardized and identical across Germany, the quality of matches should differ in different labor markets. Standard matching theory gives results about an individual's optimal reservation wage that can also be interpreted in terms of the quality of the match for an apprenticeship. In particular, it suggests that candidates' reservation quality (as the lowest quality apprenticeship offer that they are willing to accept) should increase in the availability of alternatives and their expected probability of getting an appropriate offer, and it should decrease in search costs and in individual's

time preference. Therefore, individuals should accept offers of lower quality (i.e., worse matches) in an apprenticeship market with higher search costs and asymmetric information. They realize the true costs of an apprenticeship within a bad match only ex post after they have learned about its characteristics. Due to the probably worse quality of matches in smaller labor markets, we also include a weighting factor $\lambda_g \in [1, 1+\alpha]$. If $\lambda = 1$, then the apprentices occurs just the standard costs of an apprenticeship because he is in a good match. α is assumed to be positive and captures the additional costs due to a bad match.

As our data set contains only individuals who have already started an apprenticeship, we cannot analyze incentives to invest in an apprenticeship at all. However, we can analyze the decision to complete an apprenticeship or not after individuals have learned about characteristics of their occupation and workplace. Applied to this decision, we get the following possible outcomes in terms of a binary decision:

$$apprenticeship = \begin{cases} 0 & \text{if} \quad \lambda_g \int_0^t C_i e^{-ri} di > \mu_g \int_t^T R_i e^{-ri} di \\ 1 & \text{if} \quad \lambda_g \int_0^t C_i e^{-ri} di \leq \mu_g \int_t^T R_i e^{-ri} di \end{cases} \tag{3}$$

Hence, an individual should have incentives to complete apprenticeship training if the remaining discounted costs do not exceed discounted earnings.

These inequalities can explain the decision of a dropout, but not the decisions of changers and upgraders. While dropouts could have costs so high or benefits so low that they prefer not to complete their apprenticeship, the changers and upgraders seem to be better off with a completed apprenticeship, which means that the NPV of their investment decision should be positive in general. However, it can be the case that they are even better off in another firm and/or in another occupation and that they realize this fact after they have learned about relevant characteristics. Better firm-worker-matches should then lead to higher returns or lower costs of an apprenticeship. Topel and Ward (1992) point out that searching a good match is important especially for young workers who do not have good information on their own comparative advantage in the labor market. Intensive job shopping can be completely rational as a form of learning about this advantage.

Let j and k denote different training firms and occupations, respectively. The apprentice i should then leave the training firm or/and his occupation if it turns out after entering apprenticeship training that the NPV in another firm is higher...

$$NPV_{1k}^i \geq NPV_{2k}^i \tag{4}$$

if it is higher in another occupation...

$$NPV^i_{j1} \geq NPV^i_{j2} \tag{5}$$

or both:

$$NPV^i_{11} \geq NPV^i_{22} \tag{6}$$

We derive the following testable implications from our model. Classical human capital theory predicts that investments in human capital should increase with its return, decrease with its cost, and with a higher level of preference for current over future utility. We therefore expect that respondents who have realized after starting it that they have high costs and low benefits of a completed apprenticeship will be more likely to drop out, as well as the ones who have a high valuation for current utility.
With respect to regional characteristics, we expect more incentives to complete an apprenticeship in thicker labor markets, where workers will find better-matching employers and hence earn higher wages.
We also expect more dropouts in thinner apprenticeship markets where apprentices have to accept worse offers than in thicker ones, and consequently occur higher costs of their apprenticeship training due to the bad quality of their match.
For changers and upgraders, we expect different impact factors. Determinants of their decision should vary for the ones who changed the training firm compared to those who changed their occupation.[6].
The next section presents our data sources and some descriptive statistics.

5 Data Set and Descriptive Statistics

Our empirical analysis of dropout and changing behavior of apprentices is based on a survey of the German Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung) in 2002, "Vertragslösungen 2002 - Strukturen und Gründe". 9000 questionnaires were sent out to youths who had dissolved their apprenticeship contract in 2001/2002. 2323 questionnaires were returned, but only a smaller number could be used for this work, e.g. because vital information was missing. As the focus of this research is on dropout decisions, we also excluded the youths whose apprenticeship contract was terminated before they started their apprenticeship.
The data set contains extensive information on the reasons for the youths' decision to terminate their apprenticeship, divided into questions about job-related, firm-related, school-related and personal reasons. Further questions

[6]However, small firms, especially in crafts, offer in general just training in one occupation, so people have to change even if they do not want to

included information on the current status of the former apprentices, on their educational background, on the year in which they terminated their contract, on respondents' gender and if they have a migration background. On the firm-level side, only the size of the firm is known. The data set does not contain information on the industry sector of the training firm, but on the occupation in which the youths terminated their apprenticeship contract and (if they changed) on their new occupation.
The data set included information on the regional provenance of respondents that enabled us to add information on the regions of origin, so that each individual was also assigned regional-level characteristics from Germany's regional statistics and from the federal employment agency's statistics.
The following section presents some interesting descriptive features of the data set. We provide complete summary statistics in Appendix A.
Timing and destination of terminations of apprenticeship contracts are similar to previous studies. A majority of contracts was terminated during the first year of the apprenticeship (63%). Late terminations (3rd and 4th year) are quite uncommon, but this is also due to the fact that only a small number of training jobs lasts 3.5 years. Nearly 80 % of all youths decided to continue their education, but one fifth decided to quit the educational system and work as unskilled workers or were unemployed.
A closer look reveals more interesting results: female teenagers drop out from the training system less often. This lower level is outweighed by a higher percentage of changers among the girls, while the level of upgraders is similar for both sexes.

Table 1: Destination by Gender

	males	females
changers	68.53%	75.06%
upgraders	7.24%	6.91%
dropouts	24.23%	18.02%
n	842	810

A well-known result shows up for the previous level of schooling: the higher it is, the lower is the youths' risk of dropping out from the schooling system. While 40 % of teenagers without any school-leaving certificate dropped out, only 7% of the ones holding an Abitur did so. Inversely, they chose much more often to upgrade, probably also due to the fact that they are the only ones who can enter university directly.

Table 2: Destination by prior level of schooling

	abi	fachabi	real	haupt	none
changers	62.41%	76.12%	77.40%	68.98%	57.14%
upgraders	30.50%	16.42%	6.72%	2.86%	3.17%
dropouts	7.09%	7.46%	15.88%	28.16%	39.68%
n	141	67	655	735	63

Finally, a look at the destination of terminating youths depending on the timing of their termination of contract shows that the early terminations seem to be less problematic than the late ones: while only 16% of the terminations during probation time led to a dropout, 37% of the terminations during the third year did so. This result is mirrored by the development of changing behavior, which decreases heavily for the later terminations. These later terminations of apprenticeship contracts seem to lead to more problems, maybe due to orientation problems.

Table 3: Destination by Timing

	probation	first year	second year	third year	fourth year
changers	74.22 %	72.46 %	72.66 %	57.14 %	38.46 %
upgraders	9.76 %	8.60 %	4.077 %	2.26 %	0 %
dropouts	16.02 %	18.95 %	23.26 %	40.60 %	61.54 %
n	543	570	417	133	13

As already mentioned, the data set allows for the regional identification of respondents. Patterns of behavior across the regions vary remarkably, but neither according to the type of chamber (chamber of commerce vs. chamber of crafts) nor according to the location (east vs. west, north vs. south). The following table summarizes the inter-regional differences.

Table 4: Destination by Region of Origin

	Kiel	Leipzig	Krefeld	Freiburg	Frankfurt/O.	Darmstadt	Flensburg
changers	68.05%	78.69%	59.26%	75.31%	72.28%	60.00%	79.27%
upgraders	6.02%	6.56%	14.20%	12.96%	4.95%	11.11%	6.22%
dropouts	25.94%	14.75%	26.54%	11.73%	22.77%	28.89%	16.58%
n	266	61	162	162	101	45	193
	Augsburg	Rostock	Osnabrück	Karlsruhe	Gera	Aachen	Sample
changers	77.19%	68.06%	77.89%	73.83%	81.25%	69.28%	71.60%
upgraders	5.61%	4.17%	2.11%	7.48%	6.25%	6.54%	7.28%
dropouts	17.19%	27.78%	20.00%	18.69%	12.50%	24.18%	21.12%
n	285	72	95	107	32	153	1676

Dropout rates are highest in Darmstadt and Rostock, while they are lowest in Freiburg and Gera. The size of regional labor markets could provide an explanation for the different dropout rates. We will test this hypothesis in the empirical part of our paper.

6 Estimation Strategy and Results

6.1 Method

The structure and available information of the data set offer the possibility to carry out different types of analyses. We started by carrying out simple probit and multinomial logit regressions for the decision to drop out from an apprenticeship.[7]

As the data set contains only youths who have dissolved their apprenticeship contract, we do not have a proper control group of successful apprentices. Instead, we had to work with several replacements. The first group that we used were changers and upgraders (who stayed within the educational system) and changers only. The fact that there is quite a substantial number of apprentices whose contract was terminated due to bankruptcy of their training firm enables us to treat them as another control group. If we assume that they would not have terminated their apprenticeship without the bankruptcy, we can construct a control group and compare results to the ones from the dropouts vs. changers estimations.

Moulton (1990) first pointed out the problem of within-group correlation that can lead to downward-biased standard errors when running regressions with individual- and aggregate-level regressors. As a starting point, we controlled for this problem using STATA 9's clustering option, clustering on the 13 chamber districts.

Our preferred estimation equation is given by

$$dropout_{ij} = \beta_1 x_{ij} + \beta_2 x_i + \beta_3 x_j + u_{ij} \tag{7}$$

where x_{ij} denotes individually and regionally different impact factors, such as the benefits of an apprenticeship, x_i individual-specific characteristics (e.g., the individual level of schooling). x_j is a vector of regional characteristics, e.g., the local unemployment rate, and u_{ij} is an error term that captures unobserved effects, and is possibly correlated within the regional groups. *dropout* is a binary variable that takes the value of 1 if the individual dropped out from vocational training and 0 else.

[7] At the moment, we are working on competing risks models, taking advantage of the time structure of apprenticeship terminations in the data set.

6.2 Selection and Construction of Variables

There are no direct measures of costs and benefits of completing an apprenticeship available in the data set. However, several questions in the questionnaire can be used as proxies for its direct and indirect costs and benefits in order to test our model's empirical implications. Three of the questions aim at capturing the perceived long-term benefits of an apprenticeship: they ask for the importance of bad employment prospects after the apprenticeship, bad income and bad career prospects, respectively. Exam nerves are a form of short-term indirect costs due to stress and perceived mental overstrain of school. Respondents were also asked directly for financial distress as a reason for termination of the apprenticeship contract. More than 30% of the ex-apprentices who named this reason were employed as unskilled workers afterwards, compared to only 12 % among those who did not have financial problems. This provides descriptive evidence for the possible importance of financial distress as a form of opportunity cost of an apprenticeship. We also included a measure for another form of non-monetary cost: being a girl in a male occupation or, vice versa, a boy in a female occupation that we measured as being trained in an occupation with on average more than 60% apprentices of the other gender. The higher cost could be due to the fact that youths without peers of the same sex lack peers or are more often the victims of bullying at work-related actions (see, for instance, Litzcke 2003). We expect all these variables to enter with a positive coefficient sign, meaning a higher probability of dropping out.

The prior level of schooling of respondents should also influence their costs of finishing an apprenticeship. Individuals with a higher level of prior schooling should have less problems in school and learn more easily, leading to lower costs of the apprenticeship. We included four dummies for respondents' school leaving certificates (from Hauptschule, Realschule, and Gymnasium, as well as the ones who hold a Fachabitur), using the ones without any certificate as a baseline category. We expect respondents with a higher school leaving certificate to drop out less often because they should incur lower costs for an apprenticeship. Possibly, they also had a larger set of choices for an apprenticeship available and consequently, they should end up in a better match. This should also lead to lower dropout rates, meaning an expected negative coefficient sign for higher levels of prior schooling.

Our model predicts higher incentives to invest in human capital in larger labor markets. The size of a labor market cannot be captured directly, but there are different measures that can be used in order to proxy it. As a spatial bound, we just took the size of the respective Chamber's area. The relative immobility of apprentices can be seen as a justification for this simplifying

assumption. On the supply side, we used various measures of population density. On the labor market demand side, we took different measures of local unemployment rate as a rough proxy. Additionally, the availability of public transport and traffic routes within each Chamber area should also influence the size of a local labor market. Commuting should be much easier in areas where there is a better transport network disposable because more jobs can be reached within reasonable time spans. We included the population accessible by public transport within one hour as a rough measure of transport smoothness. We expect these variables to enter our regressions with a negative coefficient sign.

As the descriptive results in earlier studies showed, various other variables could possibly influence dropout and changing decisions. Hence, we also included all the scarce information on socioeconomic status of respondents that was available (gender, migration background). Additionally, we included dummies for the year in which the apprenticeship was terminated. We also included four dummies for the field of training as a substitute for industry sector information: technical, business-related, crafts and "simple" (mostly in services) occupations because there seem to be differences in dropout behavior across the fields (see Alda 2003). As the only firm-related information, we included the available information on firm size (in four groups).

As a last group of regressors, we used information from the regional employment centers (*Arbeitsagenturen*) on the labour market for apprentices and on the numbers of youths taking part in labor market measures. The employment centers gather information on registered apprenticeship-seeking youths and on registered open apprenticeship places, and calculate a supply-demand ratio (the number of offered apprenticeship places per 100 apprenticeship seekers). However, as the employment centers can only use registered numbers for their calculations, these numbers do not give a complete picture of regional apprenticeship markets.[8] Many places are filled directly without the intermediation of the job centre and are therefore not included in the centres' statistics. As apprentices should end up in better matches when there are more options available, we expect a negative coefficient sign for this regressor.

Additionally, we included a measure that captures the incidence of non-firm-provided training in full-time vocational schools (*ausserbetriebliche Ausbildung*). It is an additional control for conditions on the local labor market for apprentices. We expect both variables to enter our regressions with a negative coefficient sign because matches should be better when there are more choices available or when firms can pick the best (and probably most

[8]See, for instance, Ulrich (2006) for a more complete discussion of the topic.

motivated) candidates for an apprenticeship.
Detailed information on all variables and data sources can be found in Appendix A.

6.3 Estimation Results

The following table displays results for our baseline regression, where we used changers and upgraders as a control group (Model 1). The second row (Model 2) gives results for the changers as a control group, while the third one (Model 3) uses the apprentices whose contract was terminated because of bankruptcy, assuming that they represent otherwise successful apprentices. We used a probit model and calculated marginal effects. Clustering-adjusted standard errors (using STATA's clustering option) are given in brackets. ***, **, and * denote significance levels of 1 %, 5%, and 10 %, respectively. Additional results for logit estimations of the same model are given in Appendix C.

Table 5: Baseline Regression Results

	Model 1	Model 2	Model 3
Boy in female job	-0.016	-0.027	0.068
	[0.029]	[0.031]	[0.049]
Girl in male job	0.057*	0.063*	0.061
	[0.030]	[0.033]	-0.084
Exam nerves	0.129*	0.132*	0.327***
	[0.086]	[0.087]	[0.048]
Financial distress	0.178***	0.184***	0.272***
	[0.050]	[0.052]	[0.042]
Bad prospects	-0.045	-0.041	0.066
	[0.06]	[0.07]	[0.219]
Bad income prospects	0.058	0.053	0.276***
	[0.048]	[0.05]	[0.096]
Bad career prospects	-0.051	-0.056	-0.065
	[0.052]	[0.062]	[0.177]
Regional unemployment rate	2.087***	2.358***	0.162
	[0.417]	[0.425]	[1.066]
Percentage in out-of-firm	-0.434***	-0.493***	-0.011
training	[0.091]	[0.091]	[0.334]
Population density	-0.014	-0.013	-0.104
	[0.023]	[0.024]	[0.064]
Supply-demand ratio on	-0.076***	-0.085***	-0.125**
the apprentice market	[0.023]	[0.025]	[0.060]
Transport smoothness	0.031	0.034*	0.108**
	[0.019]	[0.019]	[0.049]
Migration background	0.063	0.068	0.043
	[0.049]	[0.053]	[0.101]
Female	-0.067***	-0.08***	0.071
	[0.016]	[0.019]	[0.055]
n	1556	1443	572
LogL	-702.47268	-684.25346	-313.59713
Pseudo R^2	0.1131	0.1053	0.1959
Controls in all models	firm size	field, year	schooling

The coefficient signs on cost- and benefit-related regressors show some empirical evidence for the predictions of our theoretical model. With respect to respondents' prior level of schooling, we find the descriptive findings confirmed. Apprentices with a higher level of schooling are significantly more likely to stay within the educational system, either as apprentices in another firm or as full-time students again. This could be due to lower costs of learning, but also to a higher level of awareness for the future consequences of dropping out.
Being a girl in a male occupation (defined as having more than 60 % of male apprentices) increases the probability of dropping out significantly, while being a boy in a female occupation does not seem to be more costly. A candidate explanation would be that females react more sensitively to bullying at the workplace or they do not bully male colleagues in a female-dominated work environment. It is also possible that it is easier for youths to adapt to a female-dominated occupation and work environment.
Two other short-term cost measures show also relatively large and sgnificantly positive coefficient signs. Exam nerves, as a form of non-monetary cost, increase the probability of dropping out by nearly 13 percentage points evaluated at the mean. Financial distress, which can be seen as an opportunity cost of completing an apprenticeship (because of foregone earnings), increases it by nearly 18 percentage points.
Bad prospects (with respect to career, income or in general) do never show a significant impact on respondents' decisions. This could be seen as a hint towards myopic preferences: youths weigh those short-term costs much more than the possible long-term benefits of an apprenticeship training. To summarize these results, we can say that respondents seem to overestimate the short-term cost and to underestimate the long-term benefits of their apprenticeship.
The next variables aim at capturing the obvious regional differences across the sample. The regional unemployment rate shows a significantly positive impact on the probability of dropping out, which is quite a surprising result at first sight, but as predicted by our model: in a thinner labor market, there should be less incentives to invest in human capital if youths become aware of the bad situation after entering apprenticeship training. Given the impact of local labor market situation, a kind of long-term impact factor, it is surprising that the respondents' perceived prospects do not seem to play an important role for their decision to drop out from apprenticeship training. It could, however, be true that youths rely more on observed facts (such as unemployment rates) than on their own assessment of the situation. Our supply-side measure of population density does not show a significant impact. This is not really surprising because demand is probably a more decisive measure

for the size of a regional labor market. Results did not change if we used the youth unemployment rate and youth population density instead of the measures for the entire active population.
The supply-demand ratio (apprenticeship places available per 100 registered youths) shows a significantly negative coefficient sign. If there are more places available, there are probably better matches and youths are not forced to take a place because it is their only alternative. The result are less reasons to drop out and also better possibilities of changing.
The percentage of youths in non-firm provided vocational training (of all youths who take part in labor market measures of the employment offices) shows a significantly negative impact on the probability of dropping out. This effect could be due to a better quality of apprentices in general or of their matches with employers, a cream skimming effect: when apprenticeship places are scarce, probably only the most motivated school leavers will get a place within a firm, while the worse ones will have to rely on non-firm-provided vocational training. The result are less dropouts from dual training.
Interestingly, we find females significantly less likely to drop out completely if they decided to finish their apprenticeship contract. This result contrasts somehow with earlier work by Alda (2003) as well as with the descriptive results from Switzerland. In order to unravel possible additional gender differences, we ran separate regressions for males and females (see Appendix B, Table 10). Some striking differences between the sexes showed up: first of all, females' decisions to drop out do not seem to be driven by local labor market conditions or exam nerves. Recent psychological research seems to suggest that females' better performance throughout school and (partly) university seems to be due to their higher degree of self-control (see, for instance, Duckworth and Seligman 2006). This might be a candidate explanation for girls' lesser worries about school failure. Females' higher mobility after dual vocational training (see Seibert 2007) might provide an explanation for the finding that they do not seem to be affected by adverse local labor market conditions in their decision-making process.
However, females did care about bad prospects: while bad income prospects led them to dropping out more often, bad career prospects showed the opposite impact, meaning that they changed more often to another occupation or back to school. Females also seem to have more problems with late contract terminations: this finding seems to be driven exclusively by the females in the sample. But the results for the prior level of schooling are almost identical for both girls and boys.
The results for Model 3, the bankruptcy victims, look quite similar to the ones using our other control group, with two important exceptions. First of all, local labor market situation (measured as the regional unemployment

rate) does not show the expected negative coefficient sign anymore. This can be due to the fact that bankruptcies are a problem especially in regions with a weak economy and corresponding high unemployment rates. The second one is the fact that females are not less likely to drop out anymore. This could be due to the fact that more of the bankruptcy victims were trained in crafts and technical occupations where there are less female apprentices. Also, there are only 37.4% of girls in the sample of bankruptcy victims, compared to 48.9% in the entire sample.
The number of dropouts in the control group of bankruptcy victims is only 9.6%, compared to approximately 21% in the entire sample. This may serve as a descriptive hint that these apprentices in fact would have finished their training without the bankruptcy, what we have to assume in order to use them as a control group.
We now turn to another estimation result, mainly as a sensitivity analysis. As a dichotomization of possible outcomes cannot be an efficient estimation technique, we also estimated a multinomial logit model.[9] The model's desirable properties depend on the assumption of independence of irrelevant alternatives (the error terms need to be independent in order to make this assumption fulfilled). As maximum likelihood estimation relies crucially on a correctly specified model, we tested for the independence assumption using Hausman and McFadden's (1984) test. The null hypotheses that the assumption holds could not be rejected, so the ML estimator for the multinomial logit should be an appropriate choice.[10]
A table summarizing the main results for multinomial regressions can be found in Appendix B, Table 11. They confirm our previous results from the simple probit estimations for the dropouts. Results for the upgraders are as one would expect: as only holders of an Abitur are allowed to enter university, they are significantly more likely to end up in this category. Probably there are also youths who entered apprenticeship training in order to wait for a study place at university or at a polytechnic. The result that bad career prospects seem to matter for this group does also go well in line with the finding that most job changes occur during the early years of an individual's career. If individuals realize that they would be better off with a higher school-leaving diploma or with a university degree, it is of course completely rational to finish the apprenticeship and invest in another degree.

[9]Note, however, that estimation of binary logit models provides consistent estimates of parameters of the corresponding multinomial logit. See Begg and Gray (1984).

[10]The multinomial probit model is computationally difficult because a $j-1$-dimensional integral over a joint normal density needs to be evaluated, and proved to be computationally infeasible for our estimations. See for example Winkelmann and Boes (2005) for a more detailed discussion.

We now briefly discuss results for two different types of changers in more detail. Again, we carried out probit regressions for the apprentices who changed their job or occupation, using again the bankruptcy victims as a control group. Regression results can be found in Appendix C, Table 12.
For the apprentices who stayed within the same occupation but changed their firm, we find a high importance of clashes with the boss, non-training contents, and insufficient information. Interestingly, we find additional impact factors for the ones who changed their occupation. They also seem to be worried more by bad teaching in vocational school, and the prior level of schooling seems to matter more: the ones with the highest levels of prior schooling are less likely to change their occupation, probably due to their better decision-making abilities and resulting better matches. We also find female apprentices to be significantly more likely to change their training firm (staying in the same occupation), but not to change their occupation.

7 Conclusion

In the present paper, we provided a first analysis of individuals' incentives to invest in apprenticeship training as a form of education or, more generally, human capital. We included a spatial component to the classical human capital model and tested its implications empirically using a German data set and different estimation techniques.
The first major empirical result is that local labor market situation is among the most important individual-level determinants of the decision to drop out from an apprenticeship. If people learn about adverse regional labor market situation during their apprenticeship, it may cause incentives not to complete an apprenticeship, leading to a higher probability of dropping out. This result goes well in line with previous results highlighting the importance of regional impact factors. To cite just two examples: Mühlemann and Wolter (2006) have shown that firms' decisions to offer apprenticeship training are also driven by regional conditions, Riphahn (2002) has found that local labor market situation seems to play a decisive role for youths' school-to-work transitions in Germany. On that score, our work adds to the body of evidence that it does not only matter what you do, but also where you do it. See also, for example, Fernandez and Su (2004) for a more complete review of the topic.
Given the impact of local labor market situation, a long-term impact factor from an apprentice's perspective, it is surprising that the respondents' perceived prospects do not seem to play an important role for their decision to drop out from apprenticeship training. It could, however, be the case that

youths rely more on observed facts (such as unemployment rates) than on their own assessment of the situation.

The second major result is that perceived short-term costs seem to be much more important than perceived long-term benefits in youths' decision-making. This could be a hint that they perceive those costs much more than the possible long-term benefits of an apprenticeship training. It could also be seen as a hint towards myopic decision-making, implying hyperbolic discounting of future gains. In fact, Oreopoulos (2007) finds that the welfare loss from dropping out from compulsory school is large and probably not outweighed by lower costs because of the dropout decision.

In addition, substantial gender differences appear. Separate regressions for male and female respondents show that the results for exam nerves and regional labor market conditions seem to be driven exclusively by the males in the sample. These differences could also be interesting when it comes to designing programs in order to avoid dropouts, and they add to existing evidence on gender differences in educational decisions and the effectiveness of interventions. See, for example, Angrist et al. (2002).

In many aspects, these results are still preliminary and the present paper still is work in progress. There are two main construction sites where we are still working. The first one is the data set, where we try to incorporate the potential impact of financial incentives to drop out, measured as the wages for unskilled workers in the respective regions. The second one are our estimations, where we plan to estimate a competing risks model belonging to the class of hazard rate models. It has the advantage that it uses the available information on the timing of dropout decisions.

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A Data Sources and Descriptive Statistics

Table 6: Variables: Data Sources and Description

Name	Scale	Source
mig	1 = migration background	BiBB
female	1 = female	BiBB
boygirlsjob2	1 = boy in occupation with more than 60% females	BiBB
girlboysjob2	1 = girl in occupation with more than 60% males	BiBB
none	1 = no school leaving certificate	BiBB
haupt	1 = Hauptschule graduate	BiBB
real	1 = Realschule graduate	BiBB
fachabi	1 = Fachabitur holder	BiBB
abi	1 = Gymnasium graduate	BiBB
firstyear	1 = contract termination during first year of apprenticeship	BiBB
secondyear	1 = contract termination during second year of apprenticeship	BiBB
thirdyear	1 = contract termination during third year of apprenticeship	BiBB
fourthyear	1 = contract termination during fourth year of apprenticeship	BiBB
business	1 = contract termination in business-related occupation	BiBB
crafts	1 = contract termination in crafts occupation	BiBB
technical	1 = contract termination in technical occupation	BiBB
simple	1 = contract termination in simple (mostly service-related) occupation	BiBB
under10	1 = firm size under 10 employees	BiBB
betw1049	1 = firm size between 10 and 49 employees	BiBB
betw5099	1 = firm size between 50 and 99 employees	BiBB
betw100499	1 = firm size between 100 and 499 employees	BiBB
over500	1 = firm size over 500 employees	BiBB
badprospects	1 = bad prospects as a reason for termination	BiBB
badincomeprospects	1 = bad income prospects as a reason for termination	BiBB
badcareerpros	1 = bad career prospects as a reason for termination	BiBB
examnerves	1 = exam nerves as a reason for termination	BiBB
findistress	1 = financial distress as a reason for termination	BiBB
percbue	% of youths in full-time school for dually provided occupation	Federal Employment Agency
labmarket2001	population between 15-65/surface	Regional Statistics
supdem2001	supply-demand ratio on the labor market for apprentices	Federal Employment Agency
accpop	Accessible population with public transport within one hour	INKAR
unempl01	unemployment rate	Regional Statistics

Table 7: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
mig	0.0781	0.2684	0	1
female	0.4755	0.4995	0	1
boygirlsjob2	0.2230	0.4164	0	1
girlboysjob2	0.2042	0.4032	0	1
none	0.0344	0.1823	0	1
real	0.3980	0.4896	0	1
fachabi	0.0539	0.2259	0	1
abi	0.0822	0.2747	0	1
secondyear	0.2683	0.4432	0	1
thirdyear	0.0850	0.2790	0	1
fourthyear	0.0092	0.0953	0	1
business	0.2945	0.4559	0	1
crafts	0.2888	0.4533	0	1
technical	0.2352	0.4242	0	1
betw1049	0.3482	0.4765	0	1
betw5099	0.1003	0.3005	0	1
betw100499	0.0924	0.2897	0	1
over500	0.0651	0.2468	0	1
badprospects	0.0428	0.2024	0	1
badincomep s	0.0586	0.2348	0	1
badcareerp s	0.0412	0.1989	0	1
examnerves	0.0382	0.1917	0	1
findistress	0.0565	0.2310	0	1
percbue2	0.1546	0.1686	0.0208	0.6169
labmark 2001	1.8375	1.3607	0.5477	5.5550
supdem2001	0.0691	0.2241	0.0093	0.9213
accpop	2.6811	1.8675	0.5592	7.3763
unempl01	0.0896	0.0464	0.0468	0.2008

B Additional Estimation Results

Table 8: Baseline Estimation Equation, logit

	Model 1	Model 2	Model 3
Migration background	0.0631	0.0694	0.0391
	[0.0509]	[0.0545]	[0.1067]
Female	-0.0623***	-0.0762***	0.0709
	[0.0149]	[0.0174]	[0.0578]
boy in female job	-0.0168	-0.0271	0.0659
	[0.0276]	[0.0305]	[0.0514]
girl in male job	0.0522*	0.0586*	0.0583
	[0.0303]	[0.0332]	[0.0847]
school dropout	0.0775	0.0916	0.2876***
	[0.0773]	[0.0816]	[0.0757]
middle sec. school	-0.1051***	-0.1080***	-0.2428***
	[0.0271]	[0.0289]	[0.0607]
fachabi	-0.1510***	-0.1615***	-0.5244***
	[0.0129]	[0.0160]	[0.0452]
upper sec. school	-0.1569***	-0.1464***	-0.3620***
	[0.0182]	[0.0249]	[0.1139]
second year	0.0341*	0.0310	-0.1322**
	[0.0174]	[0.0192]	[0.0518]
third year	0.1847***	0.1865***	0.0247
	[0.0641]	[0.0661]	[0.0925]
fourth year	0.3761*	0.3695*	0.0267
	[0.2072]	[0.2034]	[0.1258]
business	0.0009	0.0045	-0.0914
	[0.0231]	[0.0247]	[0.0936]
crafts	-0.0398	-0.0441	-0.0977
	[0.0325]	[0.0365]	[0.0793]
technical	-0.0591**	-0.0639**	-0.1845***
	[0.0231]	[0.0258]	[0.0645]
betw.10-49	0.0442	0.0464	0.1194*
	[0.0290]	[0.0320]	[0.0668]
betw.50-99	0.0260	0.0385	0.1316**
	[0.0381]	[0.0427]	[0.0630]
betw.100-499	0.0571	0.0662	0.1509**
	[0.0406]	[0.0475]	[0.0604]
over 500	0.0746*	0.0773*	0.2331***
	[0.0502]	[0.0574]	[0.0897]
bad prospects	-0.0494	-0.0477	0.0686
	[0.0531]	[0.0628]	[0.2504]
bad income prospects	0.0569	0.0521	0.2786***
	[0.0513]	[0.0532]	[0.0906]
bad career prospects	-0.0431	-0.0470	-0.0508
	[0.0502]	[0.0605]	[0.1975]
exam nerves	0.1202	0.1261	0.3316***
	[0.0864]	[0.0877]	[0.0423]
fin. distress	0.1750***	0.1822***	0.2781***
	[0.0516]	[0.0540]	[0.0400]
percentage in out-of-firm	-0.4390***	-0.4996***	-0.0035
training	[0.0860]	[0.0865]	[0.3380]
population density	-0.0101	-0.0097	-0.1052
[active population]	[0.0205]	[0.0217]	[0.0702]
supply-demand ratio on	-0.0731***	-0.0827***	-0.1211*
the apprentice market	[0.0216]	[0.0238]	[0.0620]
transport smoothness	0.0001*	0.0318*	0.1114**
	[0.0000]	[0.0177]	[0.0529]
regional unemployment rate	2.0993***	2.3813***	0.1271
	[0.3834]	[0.3980]	[1.1112]
n	1556	1443	572
LogL	-702.43251	-684.31315	-313.39466
Pseudo R^2	0.1131	0.1052	0.1964
Robust standard errors in brackets			
* significant at 10%;	** significant at 5%;	*** significant at 1%	

Table 9: Baseline Estimation: Girls vs. Boys

	females	males
Migration background	0.018	0.1
	[0.060]	[0.079]
girl in male job /	0.050**	-0.022
boy in female job	[0.023]	[0.030]
school dropout	0.083	0.071
	[0.121]	[0.094]
middle sec. school	-0.101***	-0.114***
	[0.032]	[0.041]
fachabi	-0.146***	-0.155**
	[0.010]	[0.045]
upper sec. school	-0.135***	-0.174***
	[0.022]	[0.034]
second year	0.032	0.037
	[0.026]	[0.030]
third year	0.373***	0.078
	[0.107]	[0.053]
fourth year	0.564**	0.288
	[0.225]	[0.260]
business	-0.013	-0.002
	[0.025]	[0.043]
crafts	-0.016	-0.059
	[0.038]	[0.048]
technical	-0.088***	-0.052
	[0.019]	[0.044]
betw.10-49	0.065	0.023
	[0.049]	[0.038]
betw.50-99	-0.043	0.073
	[0.051]	[0.066]
betw.100-499	0.088	0.021
	[0.086]	[0.079]
over 500	0.057	0.068
	[0.045]	[0.063]
bad prospects	0.043	-0.082
	[0.118]	[0.059]
bad income prospects	0.153***	0.015
	[0.053]	[0.079]
bad career prospects	-0.115**	0.013
	[0.028]	[0.083]
exam nerves	0.058	0.149**
	[0.082]	[0.085]
fin.distress	0.189***	0.176***
	[0.087]	[0.054]
percentage in out-of-firm	0.002	-0.868***
training	[0.070]	[0.183]
population density	0.015	-0.044
(active population)	[0.025]	[0.028]
supply-demand ratio on	-0.044	-0.063**
the apprentice market	[0.029]	[0.030]
transport smoothness	0.009	0.055**
	[0.019]	[0.023]
regional unemployment rate	0.049	3.996***
	[0.400]	[0.697]
n	770	786
LogL	-299.24337	-386.73696
Pseudo R^2	0.1629	0.1008
Robust standard errors in brackets		
* significant at 10%;	** significant at 5%;	*** significant at 1%

Table 10: Baseline Estimation: Measure for Youth Labor Market

	Model 1	Model 2	Model 3
Migration background	0.066	0.071	0.056
	[0.048]	[0.052]	[0.102]
Female	-0.070***	-0.084***	0.056
	[0.016]	[0.019]	[0.061]
Boy in female job	-0.017	-0.028	0.056
	[0.029]	[0.031]	[0.055]
Girl in male job	0.060**	0.066**	0.067
	[0.030]	[0.033]	[0.081]
school dropout	0.084	0.095	0.291**
	[0.080]	[0.083]	[0.073]
middle sec. School	-0.110***	-0.112***	-0.233***
	[0.027]	[0.029]	[0.065]
fachabi	-0.161***	-0.171***	-0.525***
	[0.015]	[0.019]	[0.045]
upper sec. School	-0.162***	-0.149***	-0.368***
	[0.021]	[0.028]	[0.107]
second year	0.033*	0.029	-0.130***
	[0.018]	[0.019]	[0.048]
third year	0.190***	0.189***	0.031
	[0.062]	[0.063]	[0.086]
fourth year	0.353**	0.346**	0.038
	[0.195]	[0.192]	[0.129]
business	-0.005	0	-0.059
	[0.025]	[0.026]	[0.088]
crafts	-0.039	-0.042	-0.087
	[0.035]	[0.038]	[0.075]
technical	-0.059**	-0.064**	-0.172***
	[0.026]	[0.028]	[0.061]
betw.10-49	0.046	0.049	0.127*
	[0.030]	[0.033]	[0.066]
betw.50-99	0.028	0.042	0.144**
	[0.038]	[0.042]	[0.060]
betw.100-499	0.062	0.072*	0.151**
	[0.039]	[0.045]	[0.061]
over 500	0.075	0.081	0.252**
	[0.050]	[0.057]	[0.086]
bad prospects	-0.044	-0.04	0.084
	[0.059]	[0.069]	[0.211]
bad income prospects	0.061	0.056	0.265**
	[0.047]	[0.049]	[0.098]
bad career prospects	-0.054	-0.059	-0.078
	[0.052]	[0.062]	[0.178]
exam nerves	0.125*	0.128	0.309***
	[0.085]	[0.086]	[0.055]
financial distress	0.178***	0.184***	0.255***
	[0.052]	[0.054]	[0.043]
percentage in out-of-firm	-0.246***	-0.276***	-0.053
training	[0.067]	[0.067]	[0.244]
youth population	0	0	-0.003***
density	[0.000]	[0.000]	[0.001]
supply-demand ratio on	-0.049*	-0.054*	-0.134**
the apprentice market	[0.027]	[0.031]	[0.051]
transport smoothness	0.026*	0.028*	0.135***
	[0.015]	[0.016]	[0.037]
regional youth unemployment	3.323***	3.703***	2.083
rate	[0.578]	[0.551]	[2.371]
n	1556	1443	566
LogL	-702.04613	-683.92822	-307.12186
Pseudo R^2	0.1136	0.1057	0.2019
Robust standard errors in brackets			
* significant at 10%;	** significant at 5%;	*** significant at 1%	

Table 11: Multinomial Regression Results

	changer	upgrader	dropout
Migration background	-0.161	-0.016	0.14
	[0.268]	[0.532]	[0.508]
Female	0.737***	-0.052	0.286
	[0.216]	[0.254]	[0.221]
Boy in female occupation	0.17	-0.421	0.055
	[0.154]	[0.425]	[0.255]
Girl in male occupation	-0.178	0.025	0.172
	[0.246]	[0.335]	[0.32]
none	0.912*	1.31	1.534**
	[0.477]	[0.799]	[0.661]
real	-0.167	0.527**	-0.890***
	[0.163]	[0.257]	[0.269]
fachabitur	-1.005***	0.363	-2.437***
	[0.251]	[0.419]	[0.323]
abi	-0.253	2.061***	-1.611***
	[0.304]	[0.438]	[0.531]
Bad prospects	0.619	0.541	0.172
	[0.668]	[0.433]	[0.815]
Bad income prospects	1.217**	0.866	1.570**
	[0.621]	[0.753]	[0.678]
Bad career prospects	0.634	1.117**	0.345
	[0.474]	[0.559]	[0.616]
Exam nerves	1.031*	0.16	1.700***
	[0.547]	[1.462]	[0.583]
Financial distress	0.590*	0.484	1.533***
	[0.356]	[0.598]	[0.378]
percentage in out-of-firm	3.441*	2.434	0.361
training	[1.768]	[1.923]	[1.891]
population density	-0.395	-0.227	-0.466**
	[0.259]	[0.313]	[0.234]
supply-demand ratio	-0.089	-0.147	-0.572**
on apprentice market	[0.329]	[0.381]	[0.289]
transport smoothness	0.0003	0.0003	0.005***
	[0.0002]	[0.0002]	[0.0002]
local unemployment rate	-15.321**	-13.874	-1.224
	[6.284]	[8.54]	[6.31]
n	1825	1825	1825
LogL	-1672.5077		
Pseudo R^2	0.1144		
controls	firm size	field	year of termination

Table 12: Regression Results for Changers

	Model 1		Model 2
mig	0.0639***	mig	-0.0293
	[0.0520]		[0.0798]
female	0.1310	female	0.0705
	[0.0476]		[0.0538]
secondyear	-0.1162***	secondyear	-0.2955***
	[0.0376]		[0.0520]
thirdyear	-0.0303	thirdyear	-0.3458***
	[0.1061]		[0.1191]
fourthyear	-0.5039	business	0.0440
	[0.3268]		[0.0757]
business	-0.0204	crafts	-0.0380
	[0.0677]		[0.1021]
crafts	0.0415	technical	0.0225
	[0.0595]		[0.1045]
technical	-0.1523*	betw1049	0.0406
	[0.0918]		[0.0553]
betw1049	0.0504	betw5099	0.1084
	[0.0495]		[0.0375]
betw5099	0.0206	between100499	0.0530**
	[0.0536]		[0.0793]
between100499	0.0638	over500	0.2172
	[0.0726]		[0.0756]
over500	0.1189	nontraining	-0.0107*
	[0.1308]		[0.0982]
nontraining	0.1112	nontrainincont	0.2461
	[0.1078]		[0.0418]
nontrainincont	0.2278**	lowstand	0.0937***
	[0.0849]		[0.1068]
lowstand	0.1539*	highstand	0.0769
	[0.0774]		[0.0939]
highstand	-0.0675	clashboss	0.2819
	[0.1286]		[0.0591]
clashboss	0.4304***	clashcolleagues	0.0564***
	[0.0283]		[0.0830]
clashcolleagues	0.0515	wrongidea	0.3105***
	[0.0990]		[0.0351]
wrongidea	-0.0122	insuffinfo	0.0641
	[0.3206]		[0.1831]
insuffinfo	-0.7104**	badschoolcont	-0.1723
	[0.0845]		[0.2693]
badschoolcont	-0.3423	badteaching	0.2989***
	[0.5519]		[0.0410]
badteaching	0.0397	highstandschool	0.2404
	[0.3173]		[0.0934]
real	-0.0006	real	-0.0715
	[0.0698]		[0.0536]
fachabi	-0.1165	fachabi	-0.3129***
	[0.1005]		[0.0944]
abi	0.1091	abi	-0.1416*
	[0.0853]		[0.0854]
supdem01	-0.0028***	supdem01	-0.0018***
	[0.0004]		[0.0005]
n	534		563
LogL	-230.1734		-238.7859
Pseudo R^2	0.3510		0.3522