Swiss Leading House

Economics of Education · Firm Behaviour · Training Policies

Working Paper No. 13

What happened to the PISA 2000 participants five years later?

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January 26, 2008

Abstract

The transition from school-to-work has been a burning issue in most countries for the last decades. So far research on this topic has not been conclusive, and it is still not clear whether transition problems are just individual, linked to the type of education followed at upper-secondary level, or just a prolongation of problems arising from poor school performance during compulsory education. This paper uses a unique Swiss longitudinal data-set, which includes information on PISA 2000 scores and the pathways chosen after completing compulsory school. Descriptive results show that students in vocational training, who obtained lower PISA results, are significantly more likely to be in an inadequate employment situation two years after finishing vocational training. Further analysis shows, however, that it is the type of vocational training followed at upper-secondary level that is decisive for the success in the transition. Nevertheless, individual PISA scores have an indirect impact on the transition results, as they are an important factor explaining which pupils are more likely to get into an intellectually demanding vocational training and which ones are not.

JEL Classification: I2, J24

Keywords: PISA, Transition, Vocational training

1 Introduction

Characteristic of many industrialized countries is a high youth unemployment rate, even among those youngsters who have completed upper secondary education. Although research has shown that countries with a more vocational oriented upper secondary school system have, to a certain degree, less problems in the insertion of their youth into the labour market (see e.g. OECD 2000), the fact is that youth unemployment rates are still relatively high compared to those of adults also in these countries. The widespread difficulties of young people in finding stable and adequate employment may have many sources. The type of education, whether vocational or general, or the school performance at upper-secondary level may be factors contributing to the success or non-success in the transition into the labour market. However, it may also be that problems arise much earlier, for example in compulsory school. Büchel (2002), in a study covering several cohorts of Germans, found that in the past an apprenticeship at upper secondary level had an equalizing impact on the school-to-work transition, independently of the type of and performance at compulsory school, since after successfully completing an upper-secondary education, young people had equal chances of a smooth transition into the labour market. However he also found that for the most recent cohort, apprenticeship training has lost this equalizing capacity, i.e. compulsory school mattered when looking for the first job.

However, most of the other researchers analysing this topic (see Section 3), had only limited data at their disposal for the analyses of transition between upper secondary school and employment and therefore many questions have remained open. In this paper, thanks to a unique longitudinal data set which follows PISA 2000 participants until five years after leaving compulsory school, we are able to deepen the analysis made by Büchel and others in many respects. First, these data provide information on compulsory school competencies and the social background of pupils, and secondly, the longitudinal feature of the survey allows us to take into account events that lie between the end of compulsory school and the end of upper secondary education. With this information we attempt to evaluate more thoroughly the factors affecting the transition from upper secondary education into the labour market than previous research was able to do. In this respect our paper is a true extension of the existing literature.

The paper is structured in the following way. The next Section describes in the shortest possible way the key features of the Swiss educational system and the PISA 2000 results. Section 3 offers a short summary of a selection of papers in the rich transition literature that has been written in economics so far. As can be seen from this overview, due to different institutional settings or data sets available, most of the current literature is not directly comparable with our paper. We concentrate on the presentation of predominantly European papers as they are better comparable to the research work presented here. Section 4 presents the key hypotheses, Section 5 the data and descriptive results. Section 6 describes the econometric model and the results, and finally Section 7 concludes with a summary of our findings.

2 Swiss Education System and PISA 2000 results

Compulsory school in Switzerland comprises nine years: around 6 years primary school and three years lower secondary school. At the lower secondary school level there are different school-type models that vary from canton to canton or even within the canton. In the majority of them, pupils are sorted into different school tracks according to their intellectual abilities. There can be between two and four different tracks, but mostly three tracks are present: an upper-level school track (*Pro* or *Untergymnasium*), which teaches the more intellectually demanding courses; an intermediate-level school track (for example *Sekundarschule*), and finally one offering basic-level courses (for example *Realschule*). In some cantons there are also integrative tracks, in which pupils are sorted to one track or to the other depending on the subject, as well as cooperative tracks, in which all school tracks are in the same building in order to offer greater accessibility and permeability.[1]

The PISA assessment of 15 year olds generally takes place in the year pupils end their compulsory education. With respect to the year 2000 results, the average number of points achieved in reading in Switzerland was 494[2]. 20% of Swiss pupils achieved a level 1 or lower in the reading

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[1] The school system differs from canton to canton. For a thorough description of the Swiss education system and the particularities within the cantons visit www.edk.ch. See also SKBF (2006).

[2] The scale goes from 0 to 800. PISA classifies students in 5 levels of reading literacy. Those in level 5 (more than 625 points) can solve highly complex tasks whereas those in level 1 (335 to 407) can only perform the most basic tasks.

part, while 30% achieved levels 4 or 5. The pupils who achieved a level 4 or 5 were over-represented among those who attended an upper-level school track.[3]

After finishing lower secondary school, pupils have the possibility to follow different pathways. For a general education there is the *Gymnasium*, to which in many cantons only students who attended an upper-level school track have access. It lasts between 3 and 5 years, at the end of which the pupils are awarded the *gymnasiale Maturität* (university entrance diploma), which grants direct admission without any further tests to any Swiss university. Apart from the *Gymnasium*, there are the *Fachmittelschule*, or Specialized Schools, which offer a general education, but focusing more on certain vocational fields, such as social work, health, arts or music.

Depending on the canton and the language region between 20 and 50% of the school-leavers go to a full-time school (either *Gymnasium* or another full-time school option) and between 40 and 70% start a vocational training (see also Appendix A). Almost 90% of those taking up vocational training at upper-secondary level follow a dual apprenticeship. In a dual vocational education, student's training is done partly at a vocational school and partly in a firm, where they are employed and where they develop their practical skills. An apprentice needs a firm that is willing to hire him/her, and the willingness of firms to hire apprentices depends on the qualification structure of the company, the business cycle, demographics and other factors having an influence on the costs and benefits of training (see Wolter et al. 2006). Depending on the field, vocational education lasts between three and four years, at the end of which apprentices are awarded a nationally recognized certificate. Pupils following a vocational training also have the possibility to take a *Berufsmaturität* that allows them to continue studying at the tertiary level in a University of Applied Science.

Concerning the PISA performance, around 53% of PISA 2000 participants who obtained the highest scores (4 or 5) in the reading test chose to follow a general education while around 42% opted for a vocational training. The rest did not attend any kind of upper secondary or attended an intermediate alternative. 70% of the pupils with middle scores (2 or 3) enrolled in a vocational education, whereas only 19% of them continued in a general school.[4]

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[3]Bildungsmonitoring Schweiz - PISA 2000: Synthese und Empfehlungen. BFS; Schweizerische Konferenz der kantonalen Erziehungsdirektoren, 2000

[4]See Meyer (2003)

3 Previous Literature

The higher unemployment rates of young people compared to adults, their lower wages and in cases the longer transition periods between school and labour market have encouraged a rise in studies dealing with the education-to-work passage in different countries (e.g., Margolis et al., 2004[5],Gangl, 2000; Ryan, 2001; Bradley and Nguyen, 2004[6])[7]. The topic is of importance because of the consequences a bad start in the working life can have in the future career biography. For example a longer time to first job might negatively affect future employment probabilities (Heckman and Borjas, 1980; Margolis et al, 2004) or wages (Mroz and Savage, 1999; Gray, 2000).

The quality of the education-to-work transition can be evaluated in different ways. Many studies have analysed the duration until a student finds a job (Franz et al., 2000; Bonnal et al., 2002; Bratberg and Nilsen, 1998). Others have used as indicators of a successful transition the length of time the person remains in the first job, the reservation wage (Eckstein and Wolpin, 1995; Franz and Zimmermann, 2002), or whether the person finds a job immediately after education or he/she has a spell of unemployment (Winkelmann, 1996). Furthermore, in other studies a successful transition is defined adopting the concepts of the over- and under-qualification literature (Frank, 1978; Sloane, 2002). According to this someone has a successful transition when his/her skills match those required for the job found.

In 2000 the OECD published a report in which the transition from school to work was analysed for 14 countries. The findings show that the transition to working life is taking longer than in the past, but that the low initial qualification levels are the ones still provoking labour market disadvantages (see also Bratberg and Nilsen, 1998[8], or Riphahn, 1999[9]).

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[5]Margolis et al. (2004) evaluate, for France, Germany and the US, different measures of labour market success 5 to 20 years after the individual's labour market insertion.

[6]Bradley and Nguyen (2004) provide an extensive survey on the post-compulsory school transition literature, especially for the US and the UK.

[7]For a general theoretical background of the job search theory see Mortensen, 1986. He states that the longer a person searches, the better the chances of finding a more suitable job. On the other hand the risk of not finding a job at all increases, and the reservation wage decreases with the duration of the search.

[8]Bratberg and Nilsen (1998) use data of Norwegian individuals finishing education in 1989-91, and investigate the transition from school to work and the duration of the first job. They allow the search duration, the accepted wage, and the job duration to be connected in a system of simultaneous equations which is estimated by maximum likelihood.

[9]Riphahn (1999) analyses post-secondary school transitions. She uses German data and Multinomial logit models to estimate the transition into employment or non employment, controlling for individual, parent, and household characteristics, for those of the youth's region of residence and local labour

Moreover, transition is easier in countries where apprenticeships are the predominant form of upper-secondary school or in countries where school and work experience are more commonly combined, than in countries where a general upper secondary is the rule.[10] These OECD review results haven been confirmed by a number of scientific studies, showing that apprentices have better labour market chances, in terms of duration of search, unemployment spells and wages in comparison to people who choose another type of upper secondary education (Winkelmann, 1996; Bratberg and Nilsen, 1998; Ryan, 2001; van der Klaauw et al., 2004).

The studies evaluating the transition from upper-secondary education into the labour market[11] do not only compare the relative performance of vocational and general or academic education leavers (see e.g. Franz et al. 2000; Bonnal et al. 2002[12]). In systems with a tradition of apprenticeship training comparisons were also made between different types of apprenticeship training or among cohorts of vocational trainees over time. Concerning the types of apprenticeship training, the studies usually compared the transition among trainees from more or less intellectually demanding occupational fields (see Kühn and Zinn, 1998 or Büchel 2002[13]). These studies also consider the nationality of apprentices, whether the training was done following a dual or a school-based system (Bonnal et al., 2002, Margolis and Simonnet 2002), or the type of school apprentices had attended prior to apprenticeship training.

With respect to the latter, the type of school attended has an influence on labour market opportunities in the sense that having attended a lower secondary school track with more demanding intellectual standards facilitates the transition into employment independently of the vocational training field, either by shortening the time between education and employment, or by finding a job that matches the trainee skills (Franz et al, 2000; Büchel, 2002).

With respect to nationality, there are no undisputed results. Some studies show that there is

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[10]OECD (2000) From Initial Education to Working Life.

[11]For a survey on the vocational training-to-work literature see Winkelmann, 2006

[12]Bonnal et al (2002) analyse using French data from the Panel mesures jeunes the employment status of young people mainly comparing those who did an apprenticeship and those who only attended a vocational school. They estimate simultaneously the probability of choosing apprenticeship, of finding a job immediately, of finding a job in the firm where the apprenticeship was done and the unemployment duration.

[13]Büchel (2002) uses German data, from the BIBB/IAB employment survey for the years 1948 to 1992, to analyse the apprenticeship-to-work transitions. He applies a bivariate probit to estimate simultaneously the school-to-apprenticeship and the apprenticeship-to-employment transitions comparing the results for three different periods of time. He classifies a transition as successful when the person finds a job corresponding to his/her skills immediately after finishing the vocational training.

no difference between natives and foreigners concerning apprenticeship-to-work transitions when one controls for type of school attended or type of apprenticeship (Büchel and Neubäumer, 2001[14]; Pollmann-Schult and Büchel, 2002[15]). In other cases foreigners are penalized in the training-to-work transition even after controlling for these factors (Seibert, 2007).

A related characteristic is the social background, which can be represented by different indicators, such as household income, parental education, parental occupation or family cultural possessions. A higher-status parental occupation is often related to better labour market chances directly as well as indirectly since children from more educated parents usually acquire higher levels of intellectual skills and choose occupations with higher intellectual standards (Büchel and Weisshuhn, 1995; Franz et al, 2000).

To our knowledge there are no studies that evaluate the possible influence of performance during compulsory school, with the help of data on school competencies, on the education-to-work transition. This fact makes our study of special significance.

4 Hypotheses

The goal of this paper is to investigate whether compulsory school achievements, measured by the performance in the PISA assessment tests, might have repercussions five years later when looking for the first job, or whether a successful transition into the labour market depends more on the type of education pupils followed at the upper secondary level and their performance in it. Theoretically, the transition success could depend on one of the two explanations or on both at the same time.

On the one hand, the effect of school performance on the later school-to-work transition might be a direct one. Better competencies acquired during school could still have a direct influence on the labour market entry. Either because the measured school performance at the end of compulsory school captures some measure of intrinsic ability, or because competencies acquired

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[14]Büchel and Neubumer (2001) evaluate with data from the BIBB/IAB survey for the years 1991/1992 the employment status of apprentices immediately after completing the training and five years later.

[15]Pollmann-Schult and Büchel (2002) analyse the length of time a person stays in an inadequate occupation using a duration model. In order to do this they use data collected by the Max-Planck Institute for Education Research which contains information from the time the person entered the labour market until the data collection point.

during the last year at school simply still matter five years later.

On the other hand, school performance can also influence the future career path indirectly and this might be due to at least two reasons. First, pupils with better compulsory school scores might have better chances in the upper secondary school level and in turn this might grant access to better job opportunities. In our case, the higher compulsory-school grades might grant admittance to vocational training with a higher intellectual level and this might facilitate the finding of a more adequate job later (see e.g. Büchel, 2002).

Secondly, a better school performance at the end of compulsory schools may lay the fundaments of a better school performance at the upper secondary level, which may lead to better scores in the final exams of apprenticeship training and this in turn could lead to better employment prospects.

5   Data and Descriptive Results

In order to analyse the effect of PISA on the school-to-work transition we use Swiss data from the PISA survey 2000, and from 5 waves of the Transitions from Education to Employment Survey (TREE). The TREE data come from a longitudinal survey of all participants of the PISA 2000 survey [16] and it collects information on educational and occupational choices and outcomes during the post-compulsory school period up to the age of 22. This paper makes use of the first five waves that were available to the authors at the time of their research. The special feature of our data set is the possibility of linking the student's achievements in the PISA tests and the educational and occupational choices made in the following five years. Hence, we have information on whether the school-leaver chose an academic or vocational path, whether he/she finished it successfully, and whether he/she found an adequate job or got into tertiary education.

We chose to analyse only the compulsory school leavers who followed a vocational education path, because only for this group we have information on performance during the upper secondary level as well as information on labour market entrance. This is by no means limiting since,

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[16]The TREE data covers all ninth-graders in the PISA survey 2000 (national sample). Switzerland added this national sample of ninth-graders to the PISA study, as the PISA study only covers 15 year old pupils, independent of the grade they are in. This means also that in our sample of ninth-graders we have pupils of different age (For example older pupils that had repeated school grades or had entered school at a later age and younger pupils who had skipped school years). As age can be a proxy for some otherwise unobservable abilities, we choose to control for age in all our regressions.

as reported in Section 2, this group constitutes the biggest fraction of upper secondary school attendants in Switzerland.

From the 6343 TREE participants interviewed in 2001, we just kept those who started a three-year vocational training or apprenticeship immediately after finishing school. From this sub-sample we had information on the school-to-work transition of those who in 2004 had successfully completed their apprenticeship training.[17] The final sample consists of 700 people, which after deleting observations with missing values reduced to 642 observations. For this group of people we have information about the labour market status 1 3/4 years after finishing vocational education. For details on how the sample was constructed see Appendix B, Figure B1.

The main question in this study is whether compulsory school achievements influence the probability of finding an adequate job. We classify people who finished upper secondary level, in this case vocational training, as adequately employed if: the occupation, in which they are currently working, requires a specific vocational training diploma or if the occupation in which they are working matches the occupation in which they were trained. Finally we consider respondents as adequately employed if their job requires an apprenticeship with the same intellectual standards (even though there is strictly speaking a horizontal mismatch). The group of inadequate employed includes all people who work in an occupation for which no specific education is required and also those who were unemployed at the time of the survey.

As indicator of compulsory school performance we use the score of the PISA assessment test in reading.[18] From the initial PISA survey we also got information about the type of lower secondary school pupils attended. We use this information interacted with gender, as there might be gender specific effects of the school-level attended on lower secondary level on the school-to-work transition. Additionally we have information on the family and socio-economic background. The variables having an influence on school outcomes and therefore used in our analysis are the

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[17]We just include respondents who started a three years apprenticeship, because those who had started a four-year apprenticeship had just finished their training in 2005 and therefore information about their labour market status is not as informative as for those who had finished a year earlier. For example many men having finished their four year apprenticeship training go to compulsory military service, etc.

[18]PISA 2000 focused on reading literacy even though it also tested other subjects such as math and natural sciences. We chose to analyze the score in reading because our sample includes only those students who did a three year vocational training, and for the most representative fields within the three year vocational training, such as business or office clerk, good reading literacy seems to be one of the most important competences.

socio-economic status, measured in a composite index (SEI), the language spoken at home (the dummy *foreign language* equals one if the language spoken at home does not correspond to the language of the PISA assessment), the migration status (the dummy variable *immigrant* equals to one if both parents were born outside Switzerland) and finally some information about the region of residence. For a complete list of the variables used and their description see Appendix B, Table B2.

In order to create our final sample, we first had to select those people who finished their apprenticeship successfully within the minimal duration of 3 years. The variable *successful* takes the value one for people who successfully finished the vocational training and zero for those who changed or abandoned their initial training place and those who had to repeat a year in their training.

As shown in previous studies, the intellectual level of the vocational education can have an influence on the labour market prospects, independent of all other factors (see e.g. Büchel, 2000). In the TREE data the different occupations are classified into six categories of intellectual level (Stalder, 2005). Some of this classification is not undisputed and separation into six categories did not seem suitable for our purposes.[19] Therefore we reduced the categories to two.

In order to account for the student's performance during the vocational training we include the score in the final exams of apprenticeship training or vocational school. We also controlled for the type of vocational education by separating those who had done a dual apprenticeship training and those who had followed a school based vocational education. The dual apprenticeship training is firm-based and much of the learning takes place at the workplace, whereas in school-based vocational training even the practical competencies are learned almost exclusively at school. Short spells of some weeks or months in firms only serve the goal to acquire some work experience.

Table A1, Appendix A, shows the descriptive results. Out of the 642 respondents in our final sample, almost 77% found an adequate job within 1 3/4 years after finishing upper secondary school. In our sample, the average score obtained in the PISA reading test is 502.8, which is statistically not different from the average for the whole sample of Swiss PISA participants

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[19]In such a detailed classification some of the categories just had one or two professions in it and therefore not enough observations for a valid analysis.

(494) in 2000. This means that the students in our sample are comparable to an average Swiss student. Vocational training graduates who found an adequate job had on average an almost 30 points higher PISA score than those who did not. The probability of finding an adequate job is approximately 15 percentage points higher for those who completed a higher-intellectual level apprenticeship. Moreover pupils who attended an upper level compulsory school track have a 10 percentage point greater chance of finding an adequate occupation than those who attended a lower level track. Finally, the socio-economic index of those who found an adequate job is significantly higher. These first descriptive results show a positive influence of the PISA score on the probability of having found a better job five years later. However, this correlation might be spurious as pupils with higher scores might be those in apprenticeships with higher-intellectual-levels and better final exam scores. Due to this we need to control for all possible influences using multivariate analysis.

——- Table A1 about here ——

6   Methods and Results

6.1   Methods

In order to analyse the hypothesis whether school performance has an effect on the probability of finding an adequate job we use the following model:

$$
\begin{aligned}
adequate^* &= \alpha_1\,PISA + \gamma\,hila + x_1\beta_1 + u_1 \\
adequate &= \begin{cases} 1 & \text{if } adequate^* > 0 \\ 0 & \text{otherwise} \end{cases}
\end{aligned}
\tag{1}
$$

where $adequate^*$ is a latent variable measuring the (unobserved) propensity to find an adequate job, $PISA$ is a variable that equals the number of points achieved in the PISA reading test, and $hila$ is a dummy variable that stands for apprenticeship with higher-intellectual level. The vector x_1 includes variables for school track, family background, region of residence, and proxies for performance during the apprenticeship. We do not observe the propensity to find an adequate job, but rather have a dummy variable indicating whether the job is adequate or not.

If we find that α_1 is significantly different from zero after controlling for the other regressors, then we will have evidence that compulsory school competences have a direct effect on future labour market chances. However if α_1 turns insignificant after controlling for higher-intellectual-level apprenticeship we would have reasons to suspect that the effect, if any, might be indirect through the type of apprenticeship chosen.

A first potential source of a bias might arise due to the possible endogeneity of the variable $hila$. We can consider the probability of starting an apprenticeship with higher intellectual standards as determined by the following latent model

$$
\begin{aligned}
hila^* &= \alpha_2\, PISA + x_2\beta_2 + u_2 \\
hila &= \begin{cases} 1 & \text{if } hila^* > 0 \\ 0 & \text{otherwise} \end{cases}
\end{aligned}
\tag{2}
$$

where x_2 includes variables such as a proxy for motivation, and dummy variables for school track. We assume that u_1 and u_2 are jointly normally distributed with correlation $\rho_{12} = COV(u_1, u_2)$.[20] If ρ_{12} is different from zero, then we need to consider both equations (1) and (2) together, because otherwise the parameters α_1, γ and β_1 cannot be estimated consistently.

Another potential source of bias in the coefficients is the fact that the sample was constructed based on the people who successfully finished their apprenticeship in three years. Therefore we might have a selection bias. We take this into account by using a binary model (based on a latent variable $successful^*$) for successful completion of training:

$$
\begin{aligned}
successful^* &= \alpha_3\, PISA + x_3\beta_3 + u_3 \\
successful &= \begin{cases} 1 & \text{if } successful^* > 0 \\ 0 & \text{otherwise} \end{cases}
\end{aligned}
\tag{3}
$$

where $successful = 1$ indicates successful completion, and x_3 comprises all variables which might affect the successful completion of the vocational training. Among those variables we include the occurrence of critical events during the first year of the vocational training. Our variable of interest, the PISA score, is also controlled for, as school performance may also have an influence on the probability of a successful completion of training in the minimal time.

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[20]Note that equations (1) and (2) are of a latent index structure and coefficients are only identified up to scale. We therefore normalize the error term variances to one such that the covariance is equal to the correlation.

In our analysis *adequate* is only observed if *successful* is equal to 1, and *adequate* is missing if *successful* is equal to 0. Furthermore, we assume that u_1 and u_3 are jointly normally distributed with correlation $\rho_{13} = COV(u_1, u_3)$, and unit variances due to identification. If ρ_{13} is different from zero, i.e., u_1 and u_3 are correlated, then failing to take this fact into consideration would produce a biased estimator of α_1, *gamma* and β_1 in equation (1).

Now that we specified the way in which selection and endogeneity enter the model, we can proceed with a consistent estimation of the model parameters. Due to the normality assumptions of the error terms, we estimate the complete model, equations (1), (2), and (3), simultaneously using a trivariate probit model.[21] Taking into account all possible outcomes, the log likelihood function we want to maximize has the form

$$logL = \sum_{i=1}^{n} d_{00} log p_{00} + d_{10} log p_{10} + d_{010} log p_{010} + d_{011} log p_{011} + d_{110} log p_{110} + d_{111} log p_{111}$$

where d are indicator variables for the different combination of outcomes; and the first subscript indicates the outcome of *hila*, the second subscript indicates the outcome of *successful*, and the third one (if relevant) indicates the outcome of *adequate*. The probabilities are given by

$$
\begin{aligned}
p_{00} &= Pr(hila = 0, successful = 0) \\
p_{10} &= Pr(hila = 1, successful = 0) \\
p_{010} &= Pr(hila = 0, successful = 1, adequate = 0) \\
p_{011} &= Pr(hila = 0, successful = 1, adequate = 1) \\
p_{110} &= Pr(hila = 1, successful = 1, adequate = 0) \\
p_{111} &= Pr(hila = 1, successful = 1, adequate = 1)
\end{aligned}
$$

These probabilities can be calculated by bivariate and trivariate normal cumulative density functions, e.g., following the approach outlined in Cappellari and Jenkins (2003).[22]

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[21]We also allow for a correlation between equations (2) and (3), denoted by ρ_{23}=Cov(u_2, u_3). For an introduction to multivariate models see Greene, 2003.

[22]This includes calculation of multidimensional integrals. We programmed the likelihood function in STATA in the ml model environment using the lf evaluator and applying the mdraws and mvnp modules provided by Cappellari and Jenkins (2003).

6.2 The effect of compulsory school performance on labour market opportunities

In this section we proceed to evaluate the results obtained using the data and methods presented in the previous sections.

The results in Table A2, Specification 1, show that a higher PISA score in reading influences the probability of finding an adequate job positively; one additional point in the PISA test increases the probability of a an easier transition by 0.09 percentage points[23]. This effect remains constant and positive even after we control for the final exam score in Specification 2. The effect of the final exam score is positive but not significant if we test the impact without additional control variables. However, the effect of PISA disappears when we include the type of apprenticeship in the regression (Specifications 3 and 4. A person who completed an intellectually more demanding vocational education has an approximately 14 percentage points higher probability of finding an adequate job. The result indicates that the PISA score has no direct effect on labour market opportunities but has instead an indirect effect through the type of vocational training started at the end of compulsory schooling. Those with better PISA results have a higher probability of finding an intellectually more demanding training occupation and therefore better chances of being adequately employed afterwards. These results remain stable when we control for other variables in Specification 5.

Furthermore, full-time vocational school trainees are less likely to get an adequate job compared to those having completed apprenticeship training. This result is in line with the findings of Bonnal et al. (2002) and Büchel (2002). The better performance of apprentices might be either due to the fact that they have acquired competencies that are more relevant on the labour market or the fact that they have constructed important work-related networks that help them finding a job easier.[24]

————- Table A2 about here ——

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[23]Marginal effects can be obtained from the authors on demand or calculated from Table A2.

[24]In Switzerland about one third of the apprentices stay in the training firm (Wolter et al., 2006) for at least one year after apprenticeship training.

After these results it would be interesting to find out, whether the impact of the type of vocational training on the transition success is indeed causal or the result of a selection process. Selection takes place in two ways. First, more able and talented pupils are selected into more demanding training occupations (endogeneity). Secondly, it might be that the less talented students in vocational education drop out more easily in demanding training occupations so that the success later in the transition into the labour market is not due to the type of training but the fact that those students from the more demanding training occupations that would have encountered problems are no longer in our sample (sample selection). Although we control for observable factors it may well be that unobservable traits and talents bias our results.

In Table A3, we present the results when we take both possible sources of bias into consideration by estimating a trivariate probit model. Panel A shows the regression results of the probability of finding an adequate job, Panel B shows the estimation results of the probability of starting a higher-intellectual standards apprenticeship, and Panel C shows the regression results of the probability of completing the apprenticeship successfully.

Results in Panel B show that, as expected, a higher score obtained in the PISA reading test increases the chances of a more intellectually demanding apprenticeship. As mentioned in Section 5, we use the score from the PISA reading literacy test as proxy for school performance. The type of school attended also plays an important role in determining the type of vocational training done. *Realschule* school-leavers (lower-level school track), male as well as females, are less likely to start a vocational training in more demanding fields. This shows that students with lower school-leave certificates are doubly penalized. First, they have lower chances of a smoother transition because of the type of vocational training done and secondly, there is a direct negative effect, at least for women, of the type of school on the probability of finding an adequate job. This result is similar to that in Büchel (2002).

As an additional explanatory variable we use a motivation index. This index was constructed in PISA to explain school performance and contains information on how often a pupil studies in order to achieve certain goals. As expected, a high value of this index increases the probability of finding a more intellectually demanding training occupation. We also control for whether the

respondent was older than 16 years old when he/she participated of the PISA assessment. Given that the PISA participants followed by TREE are all ninth-graders, an older age might indicate a later start at school or that the pupil repeated one grade and hence a lower school performance. The coefficient of the variable older than 16 shows that age has indeed a negative effect on the chances of getting into a more intellectually demanding vocational education. ρ_{12}, the correlation between the errors terms in equations 1 and 2, is in this case negative but highly insignificant.

In Panel C the dependent variable is the dummy measuring whether the training was completed successfully within three years. As an additional explanatory variable in Panel C we use critical events that occurred during the first year of vocational training, such as pregnancy, divorce of parents or death of a close person. These critical events significantly affect the chances of completing the education in the minimal time. The coefficient of the PISA score in reading, taken as proxy for school performance, is again positive, meaning that a higher score increases the probability of finishing successfully.

ρ_{13}, correlation between the error terms in the equations 1 and 3, is negative but again not statistically significant different from zero. This result indicates that there is only selection on observables. Given that both ρ_{12} and ρ_{13} are insignificant we have no indication that would make us assume that the coefficients presented in Table A2 are biased either by sample selection or endogeneity of the variable "higher-intellectual-level" of the training occupation.

——- Table A3 about here ——

To summarize, results in Table A2 show that there is no evidence of a direct influence of the compulsory school performance on the probability of finding an adequate job. However, in Table A3 we see that a higher PISA score significantly influences the probability of getting a vocational training with a higher-intellectual level, which in turn affects the probability of an easier transition positively, and that a higher PISA score also affects positively the probability of finishing the education within three years. The trivariate probit in Table A3 also shows that we have no reason to suspect that the coefficient of the variable "higher-intellectual-level" of the training occupation in Table A2 is biased and therefore we can assume that there is a causal impact

of this variable on the transition outcome. In other words if students were assigned randomly to the two types of vocational education, we would still expect a significant advantage of those students who had studied an intellectually more demanding profession.

Concerning other determinants, people with higher apprenticeship final score are more likely to have a smoother transition. At least for women, having attended an upper-level school track also improves the chances of finding an adequate job. The family background, represented by the socio-economic index, the mother tongue and the parents' origin seems to have no direct effect but an indirect through the school attended in lower secondary education and the type of education attended in upper secondary education.

7 Conclusions

The goal of this paper was to analyse what determines a successful transition between upper secondary school and employment. Specifically, we focused on the effects that a better compulsory school performance, measured by the PISA score in reading, might have on this transition.

In order to evaluate this, we use a unique Swiss data set which contains information from the PISA 2000 survey, and information from the longitudinal survey Transitions from Education to Employment (TREE; waves 2001 to 2005). This allows us to follow the individual from the last year in lower secondary school until five years later. In order to be able to measure the transition from school-to-work, we focused only on people who chose a three year vocational education at the upper secondary school level. In the context of Switzerland this choice makes sense for at least two reasons. First, vocational education is the type of education chosen by the large majority of school leavers at the end of compulsory schooling and secondly, average PISA scores show that these pupils are the most representative group of Swiss students.

Results show that compulsory school achievements measured by individual PISA results have no direct effect on the labour market transition five years later. However, there seems to be an indirect effect through the type of vocational education followed and the probability of dropping out of school at the upper secondary level. The results indicate, that higher PISA scores are associated with more intellectually demanding vocational training, and that at the same time

students who followed a vocational training with higher-intellectual demands are more likely to have a smoother education-to-work transition, meaning that they are more likely to find an adequate job. Using a trivariate probit, we did not find evidence of a possible sample selection and of endogeneity of the variable higher-intellectual level vocational training. This means that we can interpret the effect of the intellectual level of the vocational training occupation at upper secondary level as having a causal impact on the school-to-work transition. This implies that increased search activities for a more demanding vocational training as well as better school results both pay off for school-leavers if they take into account the better labour market perspectives that these types of training offer at the end of upper secondary education.

The results also imply that the PISA test is a reliable measure of school performance since the score obtained in the reading test seems to have an influence on the type of upper secondary school attended, in this case on the type of vocational training. Even though the firms or employers in charge of providing this training have no access to the candidate's PISA outcomes, i.e., they cannot base their decision to accept or to reject a potential trainee using the PISA score as argument. Therefore, if the PISA score were not a good proxy of school competencies, it should not have an influence on the type of apprenticeship for which the school-leaver applies and is accepted. In this context this paper is also an extension to the existing literature on PISA, as this literature so far concentrated almost exclusively on the question which factors affect the PISA results but not on the question whether PISA is a good explanatory variable for the individual future career in work or education.

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Appendix A: Results

Table A1: Descriptive Statistics

	Adequate	Inadequate	Total
PISA score in reading	509.298	482.153	502.787
	(5.156)	(8.625)	(4.537)
Higher-Intellectual-level	0.821	0.179	0.598
	(0.028)	(0.028)	(0.03)
Lower-Intellectual-level	0.669	0.331	0.402
	(0.049)	(0.049)	(0.03)
Upper-level School Track	0.796	0.204	0.721
	(0.0271)	(0.0271)	(0.029)
Lower-level School Track	0.704	0.296	0.279
	(0.056)	(0.056)	(0.029)
Socio-economic status index	-0.576	-0.344	-0.396
	(0.083)	(0.057)	(0.049)
Final score	4.819	4.733	4.799
	(0.023)	(0.039)	(0.020)
Full-time vocational school	0.701	0.299	0.096
	(0.075)	(0.075)	(0.015)
Dual Apprenticeship	0.777	0.223	0.904
	(0.027)	(0.027)	(0.015)
Female	0.796	0.204	0.508
	(0.028)	(0.028)	(0.03)
Male	0.742	0.258	0.492
	(0.043)	(0.043)	(0.03)
Total	0.769	0.231	
	(0.026)	(0.026)	
Number of observations	502	140	642

Standard errors in parentheses

Table A2: Probit model of the probability of finding an adequate job

	(1)	(2)	(3)	(4)	(5)
PISA score in reading/10	0.028	0.025	0.017	0.01	-0.002
	(0.011)*	(0.011)*	(0.013)	(0.013)	(0.015)
Final score		0.286		0.43	0.441
		(0.23)		(0.233)+	(0.248)+
Higher-intellectual-level			0.366	0.45	0.553
			(0.197)+	(0.200)*	(0.203)**
Full-time vocational school					-0.428
					(0.257)+
Upper-level school track*female					0.375
					(0.177)*
Lower level school track*female					-0.098
					(0.292)
Lower-level school track*male					0.386
					(0.337)
Older than 16					-0.085
					(0.208)
Socio-economic index					0.14
					(0.092)
Foreign language					-0.022
					(0.408)
Immigrant					-0.039
					(0.384)
Countryside					0.032
					(0.17)
French region					-0.233
					(0.192)
Italian region					-0.077
					(0.312)
Constant	-0.679	-1.895	-0.331	-2.08	-1.629
	(0.58)	(1.158)	(0.614)	(1.177)+	(1.358)
$\bar{x}'\beta$	0.872	0.986	0.901	0.756	-0.16
Observations	642	642	642	642	642

Standard errors in parentheses

**Significant at the 1%, *significant at the 5%, + significant at the 10%

Table A3: Probability of finding an adequate job controlling for sample selection and selection into an apprenticeship with higher intellectual standards

	Coefficient	Standard Error
(A)		
Adequate job (N=642)		
PISA score in reading	-0.0008	0.002
Final score	0.403	0.175*
Higher-intellectual-level	0.532	0.853
Full-time vocational school	-0.282	0.289
Upper-level school track*female	0.256	0.131*
Lower-level school track*female	-0.232	0.339
Lower-level school track*male	0.406	0.35
Older than 16	-0.122	0.183
Socio-economic index	0.087	0.084
Immigrant	-0.167	0.199
Foreign language	-0.001	0.22
Countryside	-0.076	0.14
French region	-0.287	0.197
Italian region	-0.176	0.285
Constant	-0.784	1.185
(B)		
Higher-intellectual-level (N=992)		
PISA score in reading	0.0054	0.001**
Upper-level school track*female	0.014	0.102
Lower-level school track*female	-0.732	0.136**
Lower-level school track*male	-0.904	0.154**
Motivation index	0.123	0.059*
Older than 16	-0.208	0.104*
Socio-economic index	0.155	0.057**
Immigrant	0.239	0.145
Foreign language	0.3	0.162+
Countryside	-0.332	0.095**
French region	0.173	0.104+
Italian region	0.482	0.157**
Constant	-1.98	0.395**

(C)		
Successful (N=992)		
PISA score in reading	0.005	0.001**
Higher-intellectual-level	-0.574	0.661
Events	-0.078	0.036*
Full-time vocational school	-0.687	0.146**
Upper-level school track*female	-0.021	0.099
Lower-level school track*female	-0.296	0.203
Lower-level school track*male	-0.36	0.223
Older than 16	-0.315	0.101**
Socio-economic index	0.023	0.069
Immigrant	-0.037	0.151
Foreign language	0.069	0.159
Countryside	0.11	0.136
French region	-0.483	0.154**
Italian region	-0.377	0.224+
Constant	-0.95	0.378**
ρ_{12}	-0.181	0.523
ρ_{13}	-0.245	0.615
ρ_{23}	0.56	0.381
**Significant at the 1%, *significant at the 5%, + significant at the 10%		

Appendix B: Sample and Variables
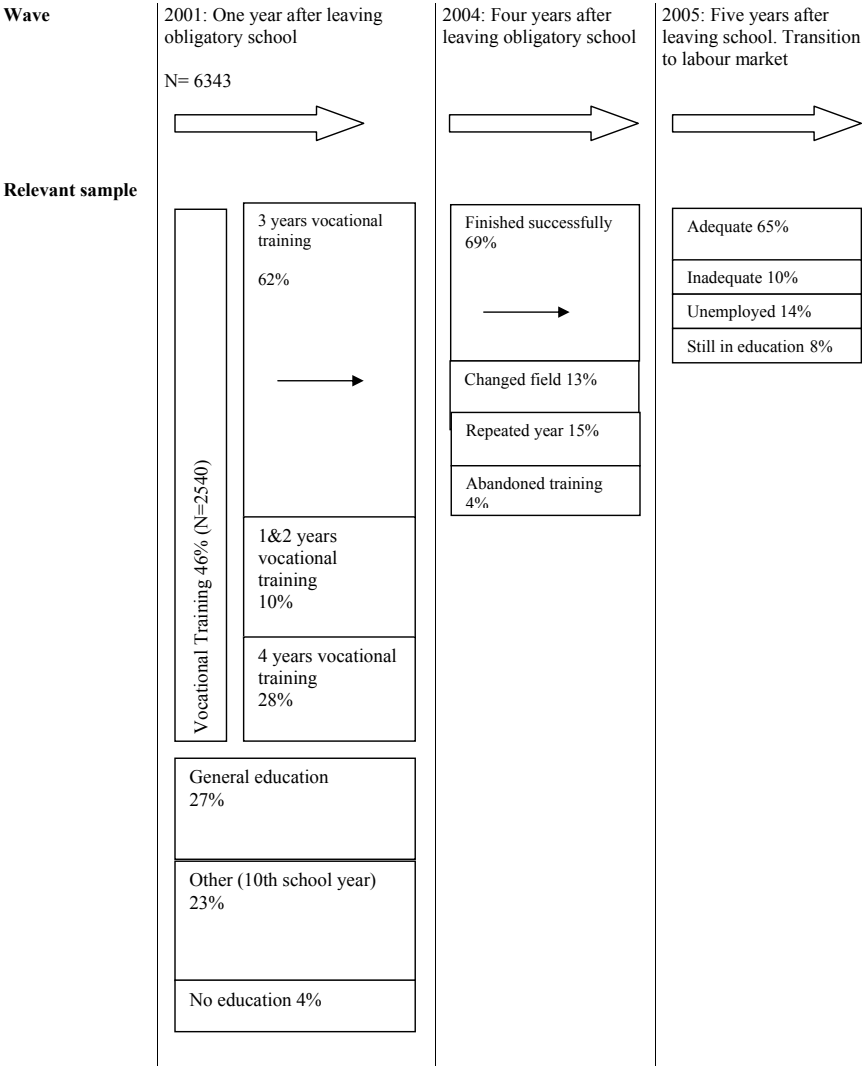
Figure B1: TREE sample

	2001: One year after leaving obligatory school N= 6343	2004: Four years after leaving obligatory school	2005: Five years after leaving school. Transition to labour market
Wave			

Relevant sample

Vocational Training 46% (N=2540)

3 years vocational training 62%

1&2 years vocational training 10%

4 years vocational training 28%

General education 27%

Other (10th school year) 23%

No education 4%

Finished successfully 69%

Changed field 13%

Repeated year 15%

Abandoned training 4%

Adequate 65%

Inadequate 10%

Unemployed 14%

Still in education 8%

26

Table B1: Variables' description

Variable	Description
Adequate	Dummy variable equal to one if the person found an adequate job 1 3/4 years after finishing the vocational training and zero else. (For a definition of what we consider adequate, see Section 5)
Successful	Dummy variable equal to one if the person finished the vocational training in three years without interruption
Higher-Intellectual-level	The classification of occupations into intellectual standards was done based on the 6 levels scale of Stalder (2005). We went one step further and re-classified them into 2 categories, higher and lower. We have 39 vocational training fields, from which 10 we consider high intellectual level.
Full-time vocational school	Dummy variable equal to one for people who choose an exclusively school-based vocational education and zero otherwise (dual apprenticeship).
Vocational Training final score	Vocational training final score which can lie between 4 and 6.
Socio-economic status	Index that takes into account parental education, parental occupation status and cultural proximity. The latter measured by for example number of books in the household.
Immigrant	Dummy variable equal to one if both parents are foreign born and zero otherwise.
Foreign language	Dummy variable equal to one if the language spoken at home does not match the language of the PISA assessment
Type of school	We created two dummy variables which we interact with gender. Upper-level school track is a binary variable equal to one if the person attended an advanced or intermediate courses school track (For example *Gymnasium* or *Sekundarschule*). Lower-level school track is a binary variable equal to one if the person attended a basic-courses school track (*Realschule*).
Score in reading	PISA score in reading which lies between 198 and 737.

...to be continued on next page

Events	Variable that can take values between 1 and 12 depending on the quantity of critical events the person had to face during the first year of vocational education.
Language Regions	We created three binary dummies each one corresponding to one language region: German, French and Italian.
Countryside	Dummy variable equal to one if the respondent lives in a rural area.
Instrumental Motivation	An index derived from students' answers on how often they study to increase their job opportunities, ensure a financially secure future, and get a good job (PISA 2000 Technical Report)
Older than 16	Dummy variable equal to one if the respondent was older than 16 years old in the year 2000.