IT TAKES THREE TO TANGO IN EMPLOYMENT: MATCHING VOCATIONAL EDUCATION ORGANISATIONS, STUDENTS AND COMPANIES IN LABOUR MARKETS.

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ABSTRACT: We examine the determinants of labour market status after the initial vocational basic education (ISCED 3) by use of unique linked register data on students, their parents, teachers, educational organisations and business companies in Finland. We distinguish between four outcomes: 1) employment 2) further studies 3) non-employment and 4) drop-out. The explanatory factors are classified into three main groups: the characteristics of 1) the educational organisation and their institutions, 2) the students and 3) the local business conditions. Teaching expenditures do not matter but teachers' skills do. Parental background plays a central role. Local business development matters for boys.

Keywords: Education production, vocational education, employability, further studies, regional development, drop-out

JEL-codes: H52, I21, J23, J24

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1 Introduction

Over the past few decades, a large number of empirical studies have been conducted to examine how the increasing supply of educated workers affects the economic growth of the nation or the returns on educational investments reaped by the individual and the whole society (e.g. Krueger and Lindahl, 2001). Also the literature studying firms' demand for educated workers has expanded (Hornstein et al., 2006). A third strand of the literature focuses on education production. These analyses provide an opportunity to take a closer look at the quality aspect of education, which arguably is a foil for the vantage points of the supply of and demand for education. This paper aims to contribute to this body of literature by using an extensive set of linked register data on students, educational organisations and their institutions as well as companies. These data offer a unique opportunity to study empirically how various quantitative and qualitative aspects of the resources used in the educational organisations (and in their institutions/establishments) affect the probability of a student entering into employment or further studies rather than into non-employment upon graduation from initial vocational education. We also evaluate the performance indicator system currently used in Finland as one of the decision-making tools for distributing a proportion of statutory core funding to vocational education providers. The Finnish system for initial vocational education is briefly described in Appendix 1.

Our study departs from the prevalent main strand of the literature in two important respects. Firstly, the educational outcome is here gauged on the basis of employability (or further education ability) rather than test scores. Measures that describe students' post-school performance are probably more relevant in the context of vocational education, which is primarily aimed at producing skilled labour (and pushing students into further studies). Earnings are another alternative to measuring performance. However, with wages determined

through collective bargaining, as is the case for most European employees with a vocational education, employability is likely to be a more relevant measure of the performance of the education production system (Piekkola and Snellman, 2005). Thus our sample is not truncated by putting aside the students with no earnings at the tails of the distribution, either because of further studies (the most successful ones) or because of unemployment (the most unsuccessful ones). Secondly, with our rich data set we are able to carefully examine and control for various important aspects such as the effects of a broad set of student characteristics or local business conditions on the students' propensity to become employed or to pursue further studies.

Our main findings are the following. Teaching expenditures do not seem to matter but teachers' skills do. The student's characteristics and performance in comprehensive school play an important role in directing his or her choices. Parental background has strong effects even after careful control for the other factors. Local business conditions affect the outcomes of boys but little of girls. The official quality evaluations implemented by the Finnish Ministry of Education seem to pay attention especially to those aspects of initial vocational education production that are important for providing the students with capabilities for further education but less so for their employability. Finally, the performance indicator ("tulosrahoitusmittari") currently used in Finland as one of the decision-making tools for distributing funds to initial vocational education organisations does not predict well the students' propensity of employment or further studies.

The rest of the paper is structured as follows. Section 2 provides a review of the theoretical underpinnings for our study. Section 3 describes the empirical framework and the data used. In Section 4 we present the results of our empirical analysis. Section 5 concludes.

2 Relevant previous literature

The Coleman et al. (1966) report is commonly seen as the starting point for empirical research on educational production functions. This line of research explores the determinants of educational outcomes, generally measured by test scores. Traditionally examined resource variables include per-pupil expenditure, class size, and measurable teacher characteristics such as teacher education and experience. Since the Coleman et al. report the research in the area has expanded rapidly.[1]

Hanushek (1986; 1997) concluded in his quantitative summary on the US dominated literature that school resources do not appear to be important for student performance. Hanushek's conclusion has been disputed in more recent studies using different methods of meta-analysis (Hedges, 1994; Krueger, 2003). Krueger (1999) also critiqued the validity of the studies in Hanushek's review as the summarised estimates are likely to suffer not least from an omitted-variables problem. Students are normally assigned to schools or classes non-randomly due to, for example, student selection practices or family choice of neighbourhoods. Moreover, the factors (of students or schools) determining resource allocation that are unobserved by the researchers typically correlate with student achievement. Traditional research on educational resources has generally ignored the impact of such omitted variables while in recent years much attention has been drawn to dealing with this particular problem (Webbink, 2005).

One way to overcome this endogeneity problem is to make use of experimental data or natural experiments (e.g. Angrist and Lavy, 1999; Krueger, 1999; Hoxby, 2000). Such data are seldom available, though. Recent studies have also benefited from improved panel data sets which have enabled the inclusion of more variables to control for student characteristics, as well as the removal of fixed student, teacher and school effects (e.g. Häkkinen et al., 2003; Rivkin et al., 2005).

Traditionally the education production research literature has used test scores or earnings to measure the educational output. Only a few studies have examined school performance by use of various educational outcome measures. For example, some studies have analysed the effects of school resources on the probability of unemployment (Dolton and Vignoles, 1999), of graduation (Dustmann et al., 2002) or of continuing in education (Krueger and Whitmore, 2001).

Although there appear to be differences in the effects of schools and teachers on the students' performance, the research on education production functions has so far failed to produce convincing evidence on the sources of this variation. Even when positive effects of resource variables are detected, the estimated impacts are rather small.

3 Empirical setting and data

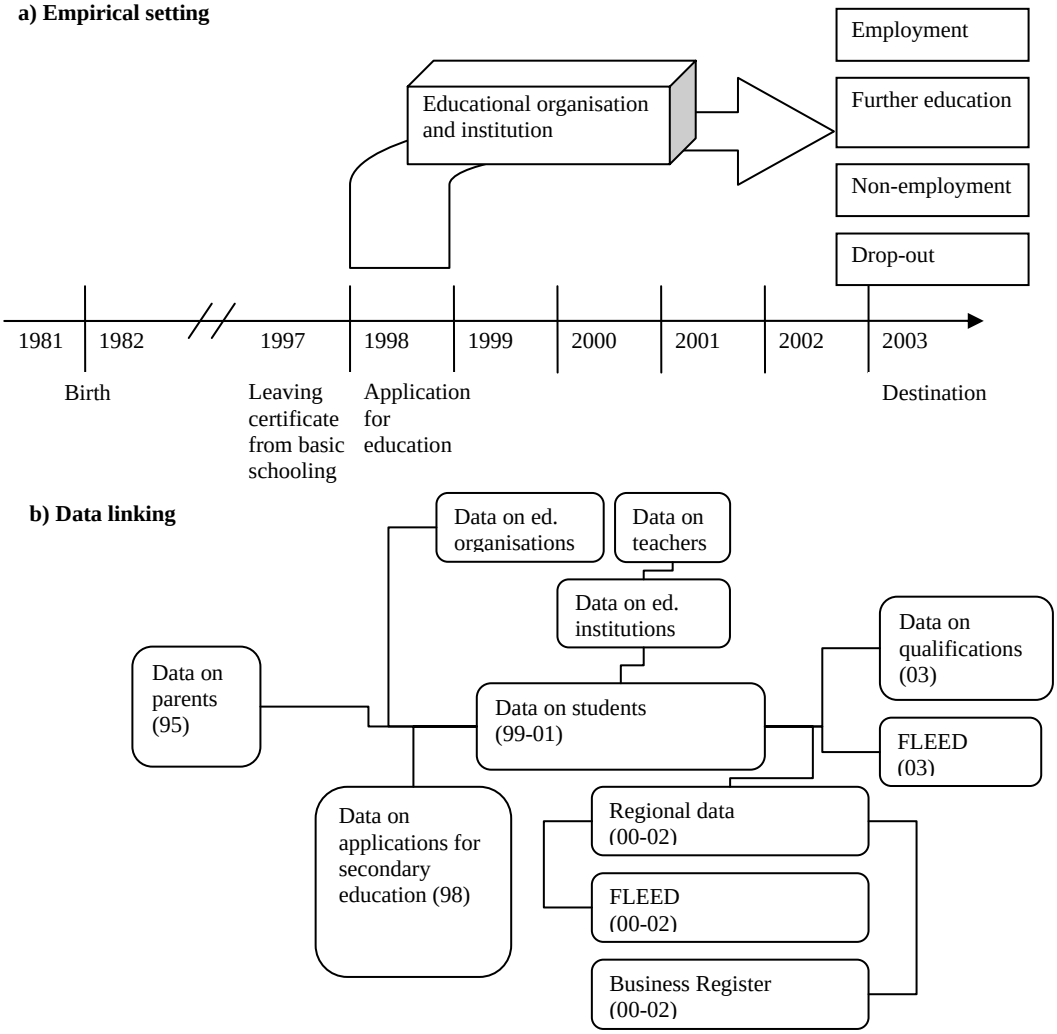
With our longitudinal data set we are able to trace a student's way *through* upper secondary vocational initial education, and follow his or her *transition* into later labour market states (see Figure 1). Our data allow us to explore the influence of the student's social background and individual characteristics, the effect of educational expenditures and teachers' characteristics, and the impact of the prevailing local business conditions on the student's post-education destinations.

We use a rich data set that is constructed by linking register information on individuals, educational organisations (i.e. education providers) and their institutions (i.e. establishments) as well as local business conditions of industry and commerce. The data concerning students, teachers and local business conditions comes from Statistics Finland. Using data on applications for secondary education in the nation-wide joint application system ("yhteishaku"), we have constructed our initial sample based on persons born in 1982 (primary age group) or 1981 and who applied for secondary education in autumn 1997 or

spring 1998 (i.e. when they were 15–16 year old). The files on applications for secondary education include personal information on the date of birth, sex and the average grade in comprehensive (primary) school.

Using annual data on students, we trace those students who were registered in initial vocational education in 1999 and 2000. The student data include information on the main field (“koulutusala”) and sub-field (“opintoala”) of education (for detailed description of the fields of study, see Appendix 2). To obtain reliable estimates we control in detail for the sub-field of education. There are 30 sub-fields of education initially, but for computational reasons we have dropped sub-fields with less than 100 student observations. As a consequence, eight sub-fields and only 261 students were excluded from the analysis. This left us with an estimation sample of 17,553 students.

Figure 1. Empirical setting and linking of data



Using the code of the educational institution, we are able to link institution-specific information on the average characteristics of the teachers (age, university degree and formal competence) calculated from person-level data on teachers in educational institutions for the years 1999-2001. In order to take into account possible switches of the students between the places of study, the institution-specific information has been linked to the students on the basis of the student's educational institution in each year and only then have we calculated for each student the averages over the period 1999-2001. The use of 3-year averages can be

justified on the basis of both validity (the vocational education typically takes about three years) and reliability (information for a single year may sometimes be inaccurate).

Furthermore, we have acquired background information on the educational organisations for 1999 to 2001 from the Educational Expenditure Registers of the National Board of Education. The expenditure register covers information on all VET (vocational education and training) providers in Finland. *Teaching expenditures* contain teachers' salaries, teaching materials, and other teaching-related costs. *Work-life expenditures* include all the costs of students' on-the-job-learning (the compensation paid to employers and the costs of supervising). *Teacher training expenditures* comprise expenses aimed at developing the skills of teachers and other staff members. *Career teaching expenditures* include student services which help students with career planning and job applications as well as recruiting services for firms. *Teaching hours* contain all the hours spent on teaching or instructing students. We also have information on whether the educational organisation has applied for and received an award for high quality operations (quality award, "laatupalkinto") or an award for good conduct on the basis of performance indicators (see Appendix 1). The data on educational organisations have been linked to students based on their educational organisation and main field of education (7 main fields) in each year. As explanatory variables we use the person-level averages over the period 1999-2001.

Since these students should, in principle, have started to look for job opportunities (or places of further education) by 2001, we have calculated regional characteristics describing employment growth and retirements[2] in regions over the period 2000-2002 based on the Business Register and the Finnish Longitudinal Employer-Employee Data (FLEED) of Statistics Finland. We define the geographical area as the student's municipality of residence, including all adjoining municipalities, in 2000. A typical area consists of 5 to 10 municipalities that lie within travel-to-work distance from the place of residence.[3] As a

robustness check, estimations were also done by measuring the local factors alternatively on the basis of the location of vocational education in 2000.

The individual-level data in FLEED is mainly based on Employment Statistics of Statistics Finland. In principle, these data allow us to trace the background characteristics and employment histories of all Finns aged 16 to 70 who lived in Finland between 1988 and 2003. Using the firm code of the employer or the establishment code of the workplace the person-level data can be linked to various business data sets, including the Business Register. In the FLEED data, the students are traced up to 2003 for which year the schooling outcomes are observed a) on the basis of the students' main activity during this particular year or b) by using information on the situation at the end of the year. In our base models we have used the former outcome measures and in the robustness checks the latter way of defining the outcome. In addition, our data allow us to identify an individual's parents and their characteristics. In this study we use information on the father's or mother's education and annual income in 1995, depending on which one of the parents has higher education or incomes.

Table 1 shows that, on the basis of the student's main activity during 2003, some 62.2% were employed[4], 12.8% pursued further studies[5] and 15.5% were non-employed[6] five years after starting their studies. The remaining 9.5% can be referred to as drop-outs. They have no job and no secondary educational degree. Substantial variation can be found between the main fields of education.

[INSERT TABLE 1 ABOUT HERE]

Table 2 gives descriptive statistics of the key variables used in the estimation models below. The average annual teaching expenditure for the total sample is 3.80 thousand euros per student. The data nevertheless display considerable variation in this respect. The interquartile range is 1.07 (= 4.27 minus 3.20) thousand euros. Teaching expenditures account for the main part of total expenditures. The average number of teaching hours is 75 (not

reported in Table 2). The average share of teachers with a university degree or formal competence is less than 30% in initial vocational education institutions. The average share of teachers aged below 35 is 11.2% and the share of those aged 50 or more is 38.4%. As a measure of the "peer effect" we have calculated the proportion of the school-mates in primary school (i.e. in the comprehensive school) who have graduated from at least upper-secondary education before the end of 2003. The average proportion is 82% and the interquartile range 9%.

As another important control, we have in our analysis included a variable that measures how much the student's grades differ from the average grades in his or her comprehensive school (grades vary from 4 to 10). The table shows the well-known fact that students who attain a vocational education have generally had below-average grades in comprehensive school. According to the table, the average difference is 0.54 but the variation is considerable, the interquartile range being 0.91. The average employment growth rate in the neighbourhood of the student's residence between 2000 and 2002 is -0.56%. Again, however, the interquartile range is not negligible being 3.21%.

[INSERT TABLE 2 ABOUT HERE]

4 Econometric analysis

4.1 Multinomial logit method

Multinomial models can be used when the dependent variable consists of several mutually exclusive outcomes. We use the multinomial logit model (MNL) proposed by Luce (1959), which is the simplest alternative of multinomial models. It is a suitable method when the regressors do not vary over alternatives, as is the case in our analysis. This means that the value of an explanatory variable (e.g. the grades in comprehensive school) of a certain student is the same for each of the four outcomes.[7] The multinomial probit model (MNP) is an

alternative to MNL. It is, however, computationally much more demanding. When regressors do not vary over alternatives, MNP does not have any appreciable advantage over MNL. Both methods should produce nearly identical results (Long and Freese, 2006). Our experimentations indicated that this is true also here. We therefore report only the MNL results. We focus on marginal effects on the probabilities of a change in the regressors. The marginal effects are calculated at the means of the explanatory variables. The sum of these marginal effects over the four outcomes is zero by construction.

4.2 Results

Table 3 presents the marginal effects from MNL estimations and their standard errors. The results are divided into three parts describing the effects of, respectively, the educational organisations (expenditures) or their institutions (variables for teachers), student characteristics and local business conditions. The results in the first part show that teaching expenditures per student are not significantly related to any of the different choices. We have also estimated models that, in addition, included work-life expenditures and teacher training expenditures per student but all three expenditure variables had insignificant relationships with the alternative student outcomes (not reported here). Instead of expenditures we also used teaching hours per student as an indicator of education input. Again, insignificant results were found (not reported here).

[INSERT TABLE 3 ABOUT HERE]

Table 3 shows that the share of teachers having a university degree has a significantly positive effect on the students' employment probability. Somewhat surprisingly, formal competence for teaching has an independent negative effect on the employment probability. When the variable for the teachers' formal competence is dropped, the effect of the teachers' university degree remains unchanged (not reported here). Broadly speaking similar findings

are made when the university degree variable is dropped; the formal competence of the teachers has a negative impact on students' employment ($p<0.01$) (not reported here). Weak indication is obtained that young teachers are able to lower the students' risks of non-employment. The size of the educational organisation exerts no statistically significant negative influence on the outcomes considered here.

In order to better capture the more "qualitative" aspects of education production at the initial vocational education level we have also added variables related to awards for quality and conduct. The reward for quality variable indicates whether or not the educational institution has received an award for high quality operations ("laatupalkinto") at least once in the period 2001-2005. The estimated coefficient indicates a positive relationship with further studies but a negative relationship with employment. Hence, the results suggest that although the award criteria have changed over time, these evaluations seem to continuously pay attention to such aspects of education production that are important for providing the students with capabilities for further education but less so for employability. Our other main findings remain largely intact after the inclusion of this "quality" variable (results not reported here).

Policymakers have become increasingly aware of the importance of providing incentives (in addition to resources) to the organisations for improving their education production. To this end one part of the funding is nowadays distributed on the basis of a performance indicator that is constructed in co-operation with Statistics Finland (for details, see Appendix 1). It is a composite index that gives the greatest weights to employability and further studies (see Virtanen, 2006). The indicator is relatively simple and neglects a number of potentially important factors that are found important in this study such as the field of education at a detailed sub-level and the initial quality of the students' skills, for example. Our results show that the award winning organisations (rewarded for conduct) do not fare any

better in improving the employment or the further studies probability of their students as compared to the non-winners.

One of the most interesting findings of our study is that teaching expenditures spent per student do not seem to affect on the student's destination after initial vocational education. The measurement problem of this variable is one possible explanation for this finding (see Ollikainen, 2007). Part of this problem arises from the fact that we use the average annual expenditures per student in the given organisation and main field of education (452 groups) as our explanatory variable. This ratio may be inaccurate because the costs can vary between different students within the same group. In particular, some special-case student groups might be more (or less) costly to teach than others, which our average expenditure variable does not account for. To control for this possibility we included a proxy variable that measures the share of "special-case students" (including the disabled and immigrant students) in the student's group.

Table 3 also shows that the students' characteristics predict well their different outcomes. Unsurprisingly, high grades in comprehensive school (compared to the average grades in the student's comprehensive school) increase the probability of finding a job or pursuing further studies and, conversely, decrease the risk of becoming non-employed or dropping-out (i.e. exit the labour force altogether). The "peer effect" of the comprehensive school level on the propensity for further education is positive and highly significant while its effect on employment is negative. The size of the comprehensive school is positively related to employment and negatively to further studies and non-employment. Students having switched their main field of education in initial vocational education have a higher probability to pursue further studies and a lower probability to become employed or non-employed. Male students are 4.7 percentage points more likely to get a job than are female students, whereas female students more frequently continue their studies (the probability is 3.0 percentage

points higher for female than for male students) upon graduation from initial vocational education. The drop-out propensity is similar for both genders. As expected, the younger students of the two cohorts studied (for instance those who did not repeat any class during comprehensive schooling) have a clearly higher probability to enter employment and a lower probability to enter non-employment or to drop out compared to their older counterparts.

A dummy variable that indicates when the student was selected to his or her first request in the joint application procedure shows that these students have a higher employment probability but a lower probability to pursue further studies or to drop out than the other students. To account for the possibility that some students may have complemented their vocational education with general education, and thus may have paved their way for further studies, we have included a dummy variable indicating inclusion of senior high school studies. Its coefficient is statistically insignificant for all outcomes except drop out (the probability of which it increases).

Parental background has a major role to play in determining the student's choice. The parent's (the one who has the higher education) education years have a strong effect on the student's choice between employment and further studies, decreasing the former and increasing the latter at the same rate. However, the independent effect of the parent's income (measured by a dummy indicating whether the annual income of either of the parents exceeds 30 000 euros in 1995) on the student's probability to pursue further studies is insignificant. This finding suggests that it is the norms (or social networks) rather than the pecuniary resources that determine the student's choice between employment and further studies. Furthermore, we find that a student having a high-income parent has a high employment probability and a low drop-out and non-employment probability. Our results also indicate that the Finnish-speaking students have a lower employment and a higher non-employment probability compared to their non-Finnish-speaking mates. This finding is likely to reflect

primarily the fact that the Swedish-speaking people, representing the other major group in Finland, fare well in the labour market.

High net job creation in the region's business sector increases employment and decreases non-employment probabilities but is unrelated to the further studies probability. We have also studied the potential impact of separations of older workers in the region as the ageing of the workforce may have profound effects on the local labour markets. We find that a high separation rate of workers aged 50 or more, which can be thought as a proxy for retirements[8], in the neighbourhood lowers the students' non-employment probability.

We have also controlled for the sub-field of the student's education (these 22 sub-fields are described in Appendix 2). We do not show these results in the tables, but we note in this context that the effects of the different sub-fields vary quite considerably implying that detailed sub-fields are worth controlling for in this kind of analysis. For example, the Vehicle and Transportation field ("auto- ja kuljetusala") and the Machinery and Metal Technology field ("kone- ja metalliala") are characterised by relatively high employment probabilities whereas the Textile and Clothing field ("tekstiili- ja vaatetusala") and, in particular, the Communications and Visual Arts field ("viestintä- ja kuvataideala") point to weak employment probabilities. The difference in employment probability between the two extremes is about 30 percentage points even after careful control for other determinants (such as the students' characteristics) of employability.

In view of the current discussion about the differential success of boys and girls in the education system, we have also estimated our models separately for girls (Table 4) and boys (Table 5). The amount of resources used in the educational organisation seems to be ineffective for both sexes. We find evidence that girls are more responsive to teacher quality: a high share of university educated teachers increases the employment probability and decreases the non-employment probability of girls but not of boys. Interestingly, the

organisations that have received awards for high quality education production increase the further studies probability of girls but not of boys. However, those educational organisations that have been rewarded for high conduct do not seem to produce different outcomes for the two genders.

[INSERT TABLE 4 ABOUT HERE]

[INSERT TABLE 5 ABOUT HERE]

Gender differences arise also with respect to local business conditions as these are an important determinant for boys but not for girls. High net job creation in the proximity of the student's residence has a significantly positive effect on the employment probability of boys whereas the employability of girls does not seem to be dependent on local business conditions. On the basis of our estimates and descriptive statistics (given in Table 2) we can evaluate the economic significance of the different determinants. For boys, the difference between well-performing (measured at the 3rd quartile of the net job creation variable) and poorly performing regions (1st quartile) is 2.2 percentage points in the employment rate and -1.3 percentage points in the non-employment rate (calculated from the coefficients in Table 5).

4.3 Consideration of the omitted variable problem and robustness

A cause for concern is whether our interpretation of the statistical relationships found here may be misled by the omitted variable problem. This might be the case if there is selection of the students on the basis of characteristics that are unobservable to us. However, our view is that this is not a major problem here. Firstly, it is worth reminding that the set of conditioning variables is quite large and detailed including a broad number of important determinants such as parental background.

Secondly, in the Finnish nation-wide joint application system the selection of students for initial vocational studies is made primarily on the basis of the grade in the compulsory school leaving certificate. In addition a student gets some extra points for his or her first request.[9] In some rare cases, education providers use application tests, in which case they might be able to screen out students on the basis of characteristics that we cannot observe in our data. However, these tests are common and important only in four fields (out of 22) that are “Crafts and design”, “Communication and visual arts”, “Social and health care services” and “Beauty care”. It should be noted that in our baseline model we have a control for the student’s grade in the school-leaving certificate, an indicator stating whether or not the student has started in his or her first-request field of studies, and a set of dummy variables for fields of study. We have also performed an additional robustness check by use of a sub-sample of students that excludes those few sub-fields where application tests are used. These results (not reported here) do not challenge our main findings.

Yet, there may be selection from the students’ part. Students with certain characteristics that are unobservable to us (like motivation) may want to apply to certain kinds of educational organisations or institutions. Such a selection mechanism might potentially generate spurious statistical relationships between the characteristics of organisations (or institutions) and the destinations of their students. We have made an effort to tackle this potential problem by excluding those students who were selected to their first request. The idea is that in this sub-group there is likely to be a considerable amount of randomness in the sorting of students into educational organisations and institutions. The sample size decreases from 17,553 to 4,785, which may weaken the accuracy of our estimates.

[INSERT TABLE 6 ABOUT HERE]

The results of this experiment are reported in Table 6. Again we find no relationship whatsoever between the amount of resources used and the outcome. The share of university-

educated teachers has a positive effect on employment probability but the coefficient is no longer statistically significant at conventional levels of significance (p-value is 0.137). Now we find somewhat stronger evidence that young teachers lower students' non-employment probability.

It is well known that MNL assumes that the ratio of two alternatives does not depend on other alternatives (i.e. that the assumption of independence of irrelevant alternatives, IIA, holds). For the IIA assumption it is important that the alternatives are reasonably distinct and dissimilar (McFadden, 1973; Amemiya, 1981). Our view is that this is the case here. Moreover, statistical tests give support to our conjecture. Hausman IIA tests do not reject the IIA assumption. We have also performed Wald and LR tests to check whether there are any pairs of outcomes that can be combined in our analysis. Both of these tests unmistakably reject this for all six different cases. Likelihood-ratio tests for our explanatory variables give support to our decision to control for the sub-field of education. In the models that are reported in the tables we have allowed correlation between students who study in the same organisation *and* in the same main field of education; that is, we have used standard errors that are clustered by these groups (446 clusters). As a further robustness check, we have calculated standard errors that are robust with respect to heteroskedasticity with all observations assumed to be independent (i.e. no clustering). In this case, the standard errors are generally smaller.

5 Conclusions

This paper contributes to the literature on the effectiveness of initial vocational education (ISCED 3) production by use of an extensive set of linked register data. We examine the determinants of students' alternative labour market outcomes upon initial vocational education. Our categorical dependent variable distinguishes between four separate states: 1) employment 2) further studies 3) non-employment and 4) drop-out. The explanatory variables

are classified into three main groups: the characteristics of 1) the educational organisations (and their institutions), 2) the students and 3) the local business conditions.

Our main findings are the following. Teaching expenditures do not seem to matter but teachers' skills have a role to play. Teachers with a university degree increase the employment probability of the students whereas the formal competence of the teachers does not have such a positive effect. The student's characteristics and performance in comprehensive school play an important role in directing post initial vocational education outcomes. Local business conditions affect the outcomes of boys but less those of girls. The official quality evaluations adopted in recent years seem to pay attention especially to such aspects of education production that are important for providing capabilities for further studies but less so for employability.

An import policy issue in Finland, as in many other countries, is how to improve the employability of the young. When it comes to initial vocational education in Finland, some steps have already been taken in this direction. The idea is to identify and reward those education providers that are able to increase the students' employment probability or encourage them to pursue further studies. Against this background our findings are somewhat worrying. The traditional policy tool of increasing funding does not seem to help. The qualitative approaches in their current mode do not seem encouraging either. Those organisations that, according to official evaluations ("laatupalkinto"), have high quality educational production, are able to increase the students' further studies probability but at the cost of a lower employment probability while the non-employment probability is unaffected.

In particular, we have found evidence that the qualitative aspects, as the current quality reward systems identify them, seem to have some effects for girls. For boys, however, these institutional characteristics seem to be ineffective. Our findings also seem to indicate that the determinants of high employability may be deeper and more case-specific than those

affecting the capability of pursuing further studies. Additionally, our results highlight the important role of student background characteristics, including performance in comprehensive schooling, as well as parental background in creating the prerequisite skills for further success. Employability thus poses a great challenge to education policy. The point is how to provide education providers with incentives for finding and implementing those tools that are most effective in varying situations.

The field of education strongly affects outcomes. Our results show that a difference of 20 percentage points in employment probability rates between two sub-fields of education is not unusual at all. These findings indicate that the balance of labour demand and supply, and thus the level of employment, can be substantially improved by reallocating resources (and students) between fields of study according to the contemporary needs.

Our findings for local business conditions give support to the view that measures of education policy do not suffice but need to be complemented with those of regional or employment policy such as policies aiming to increase regional mobility of the labour force. Our results suggest that such complementary tools are particularly important for boys.

In this study we have only scratched the surface of the complicated mechanisms of educational demand and supply. Further analysis using large-scale register data would give important new knowledge for policymakers in developing the education system and its incentives. For example, the links between the business life and educational organisations and the effects of these connections on employability should be studied more extensively.

Endnotes:

[1] We provide here only a brief overview of the research on educational production functions. For more comprehensive summary see Gustafsson (2003). Additionally, Webbink (2005) has reviewed the recent studies exploiting controlled or natural tests. European education production functions are examined more in Wößmann (2003).

[2] As a proxy measure for the retirement intensity in the "region" we have used the share of the separated older workers (above 50 years old) of total employment in the "region's" business sector firms. For the definition of "region" see endnote 3 below.

[3] More precisely, the numbers for each area are calculated by taking a weighted average of all municipalities in the area around the "central municipality". Each municipality is the "central municipality" of its labour force area. So, calculations are performed separately for each municipality so that the number of areas is equal to the number of municipalities in Finland. The weight of an adjoining municipality is the share of employees of the total number employees in the "central municipality" who have their residence in that adjoining municipality. The weight of the "central municipality" is the share of those employees in the "central municipality" who do not commute between municipalities. About this approach of defining regions and calculating indicators for these regions, see Maliranta and Nurmi (2004)

[4] Most of these students (84%) had completed their initial vocational education while the rest (i.e. 16%) had a job without graduating.

[5] These students had completed their initial vocational education.

[6] These students had completed their initial vocational education but were now passive, i.e. these young people were neither in education nor in employment or training.

[7] See Cameron and Trivedi (2005) for a comprehensive description of multinomial models.

[8] Ilmakunnas and Maliranta (2007) uses the same variable in their analyses and they find that in two cases of three the destination of these separations was retirement or the so-called pension unemployment.

[9] In some cases applicants may receive some additional points on the basis of work experience. The importance of this factor, however, is quite minor in general, and in our sample in particular because we focus on the students that are quite young.

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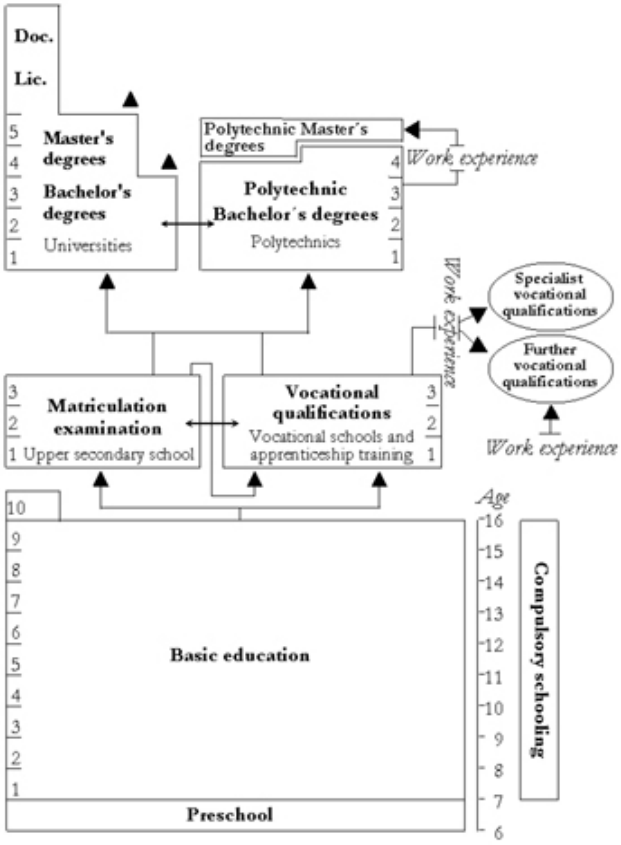
Appendix 1

Initial vocational education and training in Finland

Post-compulsory level in Finland is divided into general and vocational education (Figure A1.1). In 2004 there were 64,100 students in the top form (year 9) in the comprehensive school. Of these students 54 % went on to general upper secondary education, 38 % to vocational education and training (VET), 3 % to the additional 10th form, and 5 % did not immediately continue studying. Students can enter the VET not only from comprehensive school but also in later stages in their education. All in all about 147,000 students are enrolled in vocational education every year.

Figure A1.1 Education System in Finland



Source: Finnish National Board of Education

Vocational qualification takes on average three years to complete. It aims to provide necessary vocational competence, knowledge, and skills for working life and to encourage

life-long learning. It also gives general eligibility for polytechnic and university studies. Vocational education and training includes theoretical instruction given by vocational institutions and a supervised on-the-job-learning period (at least six months). It can also take the form of apprenticeships in which case 70 to 80 % of the training takes place at the workplace. Initial vocational education and training is available in seven fields: Technology and Transport, Business and Administration, Health and Social Services, Culture, Natural Sciences, Leisure and Physical Education, and Tourism, Catering and Home Economics (the current classification).

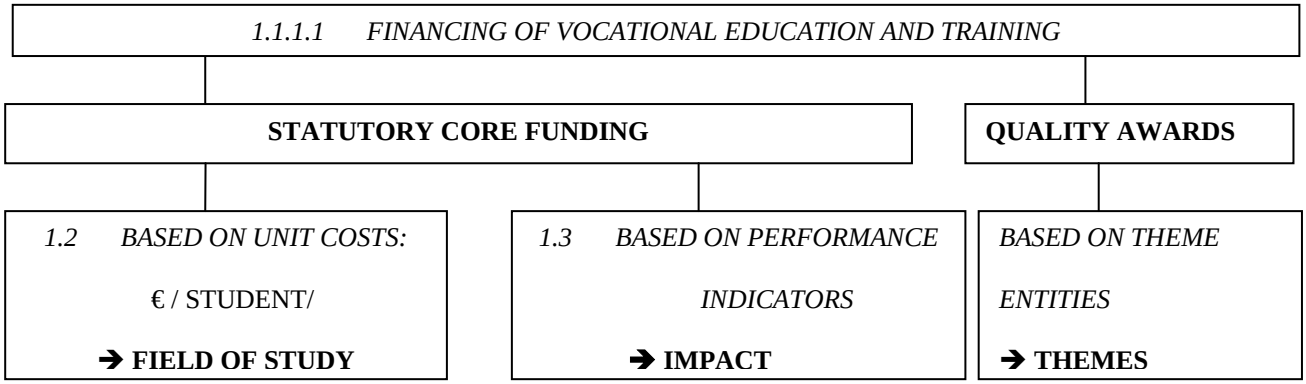
Application to vocational education and training takes place through a national joint application system. Students can apply simultaneously to five different degree programmes in all vocational institutions involved in the system and to indicate their preferences of the ranking of these degrees. The education provider makes the decisions on admissions. Student selection is typically based on grades in the school-leaving certificate. Other selection criteria are various entrance or aptitude tests, work experience and success in previous studies.

Vocational education and training providers are responsible for organising training in their areas, matching provision with local market needs, and devising curricula based on the core curricula and requirements set by the Ministry of Education. There are 210 vocational education providers in Finland. They may be a local authority, a municipal training consortium, a foundation or other registered association, or a state company.

Responsibility for funding the vocational education and training is divided between the state and municipal governments. The present system was adopted in 1997 and reformed in 2002 (Figure A1.2). The statutory financing is based on unit costs (average cost), transactions (student numbers) and costs (field-specific; special tasks). It does not depend on the actual expenditure. In addition, two per cent of the funding is based on performance indicators which evaluate the performance of the education providers. Firstly, the indicators

estimate students' placement in employment and further education after their graduation (impact). They also include drop-out and graduation rate measures (process). Furthermore, formal competence of teachers and staff development is evaluated (staff). Vocational education providers may also receive quality awards based on separately selected themes. It should be noted that only a proportion of education providers have decided to apply the reward.

Figure A1.2 Financing of vocational education and training in Finland



Sources: www.minedu.fi, www.oph.fi

Appendix 2

Fields of study in vocational studies and training in Finland (the classification by the Finnish National Board of Education, the version of year 1995)

CODE	FIELD OF STUDIES AND TRAINING	KOULUTUS- JA OPINTOALA SUOMEKSI	
	Natural Resources Sector	**Luonnonvara-ala**	
05	Agriculture	Maatilatalous	
06	Horticulture	Puutarhatalous	
08	Fishery	Kalatalous	*
09	Other primary industries	Muu luonnonvara-ala	*
10	Forestry	Metsätalous	
	Technology and Transport Sector	**Tekniikan ja liikenteen ala**	
17	Graphics technology	Graafinen ala	
18	Heating and ventilation	LVI-ala	
19	Machinery and metal technology	Kone- ja metalliala	
20	Vehicles and transportation	Auto- ja kuljetusala	
21	Textiles and clothing	Tekstiili- ja vaatetusala	
22	Food industry	Elintarvikeala	
24	Electrical engineering	Sähköala	
25	Land survey technology	Maanmittausala	*
26	Construction technology	Rakennusala	
27	Wood industry	Puuala	
28	Surface treatment	Pintakäsittelyala	
29	Paper and chemical industry	Paperi- ja kemianteollisuudenala	
37	Seafaring	Merenkulkuala	*
38	Other technology and transportation	Muu tekniikka ja liikenne	*
	Administration and Commerce Sector	**Kaupan ja hallinnon ala**	
40	Business and administration	Kaupan ja hallinnon ala	
	Hotel, Catering and Home Economics Sector	**Matkailu-, ravitsemis- ja talousala**	
31	Hotel, restaurant and catering	Hotelli-, ravintola- ja suurtalousala	
32	Home economics and cleaning services	Koti-, laitostalous- ja puhdistuspalveluala	
	Social and Health Care Services Sector	**Sosiaali- ja terveysala**	
44	Social and health care services	Sosiaali- ja terveysala	
45	Beauty care	Kauneudenhoitoala	
	Culture Sector	**Kulttuuriala**	
12	Crafts and design	Käsi- ja taideteollisuusala	
13	Communications and visual arts	Viestintä- ja kuvataideala	
64	Music	Musiikkiala	*
65	Theatre and dance	Teatteri- ja tanssiala	*
	Humanist and Teaching Sector	**Humanistinen ja opetusala**	
63	Leisure activities	Vapaa-ajan toiminta	
66	Physical education	Liikunta-ala	*

* Excluded from the analysis due to a small number of students (<100) in the group

Table 1. Destinations of students in 2003 by the field of education

Occupation	Natur.	Technology	Adm.&Commerce	Hotel	Social&Health	Culture	Humanist	Total
Employment	428	5,226	1,905	1,778	1,224	296	67	10,924
	62.12	63.40	59.11	63.07	64.69	50.34	67.68	62.23
Studies	85	1,112	410	264	248	122	6	2,247
	12.34	13.49	12.72	9.37	13.11	20.75	6.06	12.80
Non-employ-ment	101	1,271	468	543	230	97	7	2,717
	14.66	15.42	14.52	19.26	12.16	16.50	7.07	15.48
Drop-out	75	634	440	234	190	73	19	1,665
	10.89	7.69	13.65	8.30	10.04	12.41	19.19	9.49
Total	689	8,243	3,223	2,819	1,892	588	99	17,553
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: The full names of the main fields and their sub-fields are reported in Appendix 2.

Table 2. Descriptive statistics on estimation sample, selected variables

			Percentile				
Continuous variables	*Mean*	*Std*	*p1*	*p25*	*p50*	*p75*	*p99*
Teaching exp./student (1000€)	3.80	1.07	1.99	3.20	3.81	4.27	7.62
University degree teachers (%)	29.2	17.9	5.4	17.7	22.9	36.8	79.5
Formal qualified teachers (%)	27.4	13.2	3.8	19.8	25.5	32.4	71.9
-34 year teachers (%)	11.2	5.5	1.9	7.9	10.7	14.2	26.4
50- year teachers (%)	38.4	8.7	13.4	32.4	38.9	44.3	60.1
Size of organisation (00s)	7.5	7.9	0.5	2.9	5.5	8.5	45.1
Grade difference in element. sch.	-0.54	0.68	-2.03	-1.01	-0.56	-0.10	1.11
Peer effect of elementary sch.	0.8	0.1	0.5	0.8	0.8	0.9	0.9
Size of elementary school (00s)	3.5	1.6	0.0	2.4	3.4	4.5	8.2
Parent's schooling years	12.2	2.1	9.0	12.0	12.0	14.0	18.0
Employment growth in region (%)	-0.6	3.1	-8.5	-1.9	-0.5	1.3	8.2
Separations of the above 50-years old per all workers in the business sector of the region (“retirements" in region) (%)	7.6	1.2	5.2	6.7	7.5	8.1	10.6

Binary variables	*Proportion (%)*
Rewarded for quality (organisation)	9.4
Rewarded for conduct (organisation)	21.2
Switching education field	3.2
Male student	59.6
Born in 1982 (ref. 1981)	90.5
Selected to first request	72.7
Senior high school studies	6.0
Parent's earnings > 30 000 euros	14.3
Finnish-speaking student	94.6
Number of observations	*17 553*

Table 3. MNL estimations, base model

	Emp. b/se	Studies b/se	Non-emp. b/se	Drop-out b/se
Educational organisation/institution				
Teaching exp./student,1000€	-0.003	0.003	0.003	-0.003
	(0.008)	(0.004)	(0.006)	(0.003)
Univer. degr. teachers,%	0.001*	-0.000+	-0.000	-0.000+
	(0.000)	(0.000)	(0.000)	(0.000)
Formal qualif. teachers,%	-0.001*	0.000	0.001+	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
-34 year teachers,%	0.002	-0.001	-0.002+	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
50- year teachers,%	0.001	-0.000	-0.000	0.000
	(0.001)	(0.000)	(0.001)	(0.000)
Size of organisation,00s	0.001	-0.001	-0.000	0.000
	(0.001)	(0.000)	(0.001)	(0.000)
Rewarded for quality	-0.054*	0.031*	0.016	0.007
	(0.024)	(0.012)	(0.014)	(0.007)
Rewarded for conduct	0.002	0.002	-0.005	0.001
	(0.017)	(0.007)	(0.011)	(0.007)
“Special-case” student share	-0.331*	0.029	0.244**	0.057
	(0.157)	(0.078)	(0.089)	(0.063)
Characteristics of student				
Grade dif. in element. sch.	0.040***	0.063***	-0.031***	-0.073***
	(0.007)	(0.004)	(0.005)	(0.004)
Peer effect of element. sch.	-0.140*	0.297***	0.136**	-0.293***
	(0.056)	(0.038)	(0.044)	(0.024)
Size of element. sch.,00s	0.011***	-0.004**	-0.006**	-0.001
	(0.003)	(0.002)	(0.002)	(0.001)
Switching edu. field	-0.097***	0.062**	-0.057***	0.092***
	(0.025)	(0.020)	(0.013)	(0.019)
Male student	0.047***	-0.030***	-0.019*	0.002
	(0.013)	(0.009)	(0.009)	(0.005)
Born in 1982 (ref. 1981)	0.047***	0.006	-0.034**	-0.019**
	(0.012)	(0.009)	(0.011)	(0.007)
Selected to first request	0.035***	-0.016**	-0.002	-0.017***
	(0.008)	(0.006)	(0.006)	(0.005)
Senior high school studies	-0.019	-0.010	0.004	0.025*
	(0.024)	(0.009)	(0.017)	(0.012)
Parent's schooling years	-0.008***	0.008***	-0.000	0.001
	(0.002)	(0.001)	(0.001)	(0.001)
Parent's earnings > 30 000 €	0.043***	-0.009	-0.019*	-0.015**
	(0.011)	(0.006)	(0.009)	(0.005)
Finnish-speaking	-0.039*	-0.019	0.045***	0.013
	(0.018)	(0.013)	(0.012)	(0.008)

(continue)

(continued)

	Emp.	Studies	Non-emp.	Drop-out
	b/se	b/se	b/se	b/se
Local business conditions				
Emp. growth in region	0.005**	-0.000	-0.004**	-0.001+
	(0.002)	(0.001)	(0.001)	(0.001)
Retirements in region	0.007	0.000	-0.006+	-0.000
	(0.005)	(0.003)	(0.003)	(0.002)
N	17553			
pseudo R^2	0.065			
log likelihood	-17574.2			

Note: Coefficients refer to the average marginal effects. Robust standard errors in parentheses, clustered on the basis of the educational organisation and the main field of education (446 clusters)
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Table 4. MNL estimations, for girls

	Emp. b/se	Studies b/se	Non-emp. b/se	Drop-out b/se
Educational organisation/institution				
Teaching exp./student,1000€	-0.001	0.005	0.004	-0.008+
	(0.010)	(0.006)	(0.008)	(0.005)
Univer. degr. teachers,%	0.002***	-0.000	-0.001+	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Formal qualif. teachers,%	-0.001*	-0.000	0.001*	0.001**
	(0.001)	(0.000)	(0.000)	(0.000)
-34 year teachers,%	0.000	0.000	-0.001	0.000
	(0.002)	(0.001)	(0.001)	(0.001)
50- year teachers,%	-0.001	-0.000	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.000)
Size of organisation,00s	0.003*	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.000)
Rewarded for quality	-0.048*	0.038**	-0.009	0.019
	(0.022)	(0.012)	(0.016)	(0.014)
Rewarded for conduct	-0.007	0.014	-0.017	0.011
	(0.020)	(0.011)	(0.013)	(0.008)
“Special-case” student share	-0.634***	0.129	0.365***	0.140+
	(0.187)	(0.109)	(0.111)	(0.082)
Characteristics of student				
Grade dif. in element. sch.	0.058***	0.050***	-0.034***	-0.074***
	(0.010)	(0.007)	(0.007)	(0.005)
Peer effect of element. sch.	-0.223**	0.289***	0.225***	-0.291***
	(0.073)	(0.064)	(0.067)	(0.035)
Size of element. sch.,00s	0.016***	-0.006*	-0.007*	-0.002
	(0.004)	(0.003)	(0.003)	(0.002)
Switching edu. field	-0.045+	0.045*	-0.070***	0.070***
	(0.027)	(0.023)	(0.015)	(0.020)
Born in 1982 (ref. 1981)	0.043*	0.010	-0.039*	-0.014
	(0.020)	(0.015)	(0.016)	(0.010)
Selected to first request	-0.004	0.006	0.013	-0.015*
	(0.014)	(0.011)	(0.009)	(0.007)
Senior high school studies	0.041+	-0.014	-0.045**	0.019
	(0.024)	(0.014)	(0.016)	(0.015)
Parent's schooling years	-0.010***	0.009***	0.001	0.000
	(0.003)	(0.002)	(0.002)	(0.002)
Parent's earnings > 30 000 €	0.071***	-0.019	-0.036**	-0.016*
	(0.016)	(0.012)	(0.012)	(0.008)
Finnish-speaking	-0.079**	0.014	0.066***	-0.001
	(0.026)	(0.018)	(0.019)	(0.014)

(continue)

(continued)

	Emp.	Studies	Non-emp.	Drop-out
	b/se	b/se	b/se	b/se
Local business conditions				
Emp. growth in region	0.000	0.002	-0.003+	0.000
	(0.002)	(0.002)	(0.002)	(0.001)
Retirements in region	0.008	0.001	-0.011*	0.002
N	7086			
pseudo R^2	0.066			
log likelihood	-7312.0			

Note: Coefficients refer to the average marginal effects. Robust standard errors in parentheses, clustered on the basis of the educational organisation and the main field of education (405 clusters)
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Table 5. MNL estimations, for boys

	Emp. b/se	Studies b/se	Non-emp. b/se	Drop-out b/se
Educational organisation/institution				
Teaching exp./student,1000€	-0.002	0.001	0.000	0.000
	(0.010)	(0.004)	(0.007)	(0.004)
Univer. degr. teachers,%	0.000	-0.000	-0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Formal qualif. teachers,%	-0.003***	0.001+	0.001*	0.001**
	(0.001)	(0.000)	(0.001)	(0.000)
-34 year teachers,%	0.002	-0.001+	-0.002	0.001
	(0.002)	(0.001)	(0.001)	(0.001)
50- year teachers,%	0.001	-0.001	-0.000	0.000
	(0.001)	(0.000)	(0.001)	(0.000)
Size of organisation,00s	-0.001	-0.000	0.000	0.001**
	(0.001)	(0.000)	(0.001)	(0.000)
Rewarded for quality	-0.045	0.018	0.034	-0.006
	(0.032)	(0.015)	(0.021)	(0.008)
Rewarded for conduct	0.004	-0.003	0.008	-0.008
	(0.019)	(0.008)	(0.015)	(0.008)
“Special-case” student share	-0.262	0.009	0.186	0.067
	(0.214)	(0.099)	(0.127)	(0.079)
Characteristics of student				
Grade dif. in element. sch.	0.037***	0.063***	-0.027***	-0.072***
	(0.009)	(0.005)	(0.007)	(0.005)
Peer effect of element. sch.	-0.068	0.276***	0.081	-0.289***
	(0.072)	(0.034)	(0.056)	(0.032)
Size of element. sch.,00s	0.009**	-0.003+	-0.005*	-0.001
	(0.003)	(0.002)	(0.002)	(0.002)
Switching edu. field	-0.165***	0.089*	-0.038	0.114***
	(0.042)	(0.035)	(0.025)	(0.030)
Born in 1982 (ref. 1981)	0.054***	0.002	-0.033**	-0.024**
	(0.014)	(0.010)	(0.012)	(0.009)
Selected to first request	0.053***	-0.026***	-0.008	-0.018**
	(0.010)	(0.006)	(0.008)	(0.006)
Senior high school studies	-0.076*	-0.007	0.054*	0.029+
	(0.033)	(0.010)	(0.024)	(0.016)
Parent's schooling years	-0.006**	0.006***	-0.001	0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Parent's earnings > 30 000 €	0.029*	-0.005	-0.009	-0.015*
	(0.013)	(0.007)	(0.011)	(0.006)
Finnish-speaking	-0.009	-0.037*	0.025	0.021*
	(0.023)	(0.016)	(0.016)	(0.009)

(continue)

(continued)

	Emp.	Studies	Non-emp.	Drop-out
	b/se	b/se	b/se	b/se
Local business conditions				
Emp. growth in region	0.007***	-0.001	-0.004**	-0.002*
	(0.002)	(0.001)	(0.001)	(0.001)
Retirements in region	0.006	-0.001	-0.003	-0.002
	(0.006)	(0.003)	(0.004)	(0.003)
N	10467			
pseudo R^2	0.076			
log likelihood	-10103.1			

Note: Coefficients refer to the average marginal effects. Robust standard errors in parentheses, clustered on the basis of the educational organisation and the main field of education (360 clusters)
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Table 6. MNL estimations, for those who were not selected to their first request

	Emp. b/se	Studies b/se	Non-emp. b/se	Drop-out b/se
Educational organisation/institution				
Teaching exp./student,1000€	-0.006	0.001	0.006	-0.000
	(0.014)	(0.005)	(0.010)	(0.008)
Univer. degr. teachers,%	0.001	0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Formal qualif. teachers,%	-0.000	-0.000	0.000	0.001
	(0.001)	(0.000)	(0.001)	(0.000)
-34 year teachers,%	0.000	0.001	-0.003*	0.002
	(0.002)	(0.001)	(0.001)	(0.001)
50- year teachers,%	0.001	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Size of organisation,00s	-0.000	0.001	-0.001	0.000
	(0.001)	(0.000)	(0.001)	(0.001)
Rewarded for quality	-0.053	0.019	0.013	0.021
	(0.035)	(0.019)	(0.025)	(0.024)
Rewarded for conduct	-0.020	0.005	0.016	-0.001
	(0.026)	(0.011)	(0.016)	(0.018)
“Special-case” student share	-0.296	0.174	0.146	-0.023
	(0.259)	(0.116)	(0.170)	(0.166)
Characteristics of student				
Grade dif. in element. sch.	0.053***	0.051***	0.003	-0.107***
	(0.014)	(0.007)	(0.010)	(0.010)
Peer effect of element. sch.	-0.234*	0.265***	0.400***	-0.431***
	(0.095)	(0.062)	(0.083)	(0.055)
Size of element. sch.,00s	0.009+	-0.005+	-0.002	-0.002
	(0.005)	(0.003)	(0.004)	(0.003)
Switching edu. field	-0.108**	0.038	-0.040+	0.109**
	(0.040)	(0.027)	(0.023)	(0.035)
Male student	-0.015	-0.017	0.025+	0.007
	(0.020)	(0.012)	(0.015)	(0.013)
Born in 1982 (ref. 1981)	0.087***	0.036**	-0.052**	-0.071***
	(0.025)	(0.013)	(0.019)	(0.019)
Senior high school studies	-0.013	0.004	-0.006	0.015
	(0.034)	(0.014)	(0.028)	(0.022)
Parent's schooling years	-0.016***	0.009***	0.005+	0.003
	(0.003)	(0.002)	(0.002)	(0.002)
Parent's earnings > 30 000 €	0.046*	-0.006	-0.032*	-0.009
	(0.021)	(0.012)	(0.014)	(0.012)
Finnish-speaking	-0.033	-0.015	0.036	0.012
	(0.043)	(0.022)	(0.029)	(0.023)

(continue)

(continued)

	Emp.	Studies	Non-emp.	Drop-out
	b/se	b/se	b/se	b/se
Local business conditions				
Emp. growth in region	0.008**	-0.001	-0.002	-0.005**
	(0.003)	(0.001)	(0.002)	(0.002)
Retirements in region	0.002	0.003	0.003	-0.007
	(0.008)	(0.004)	(0.005)	(0.005)
N	7086			
pseudo R^2	0.065			
log likelihood	-7322.9			

Note: Coefficients refer to the average marginal effects. Robust standard errors in parentheses, clustered on the basis of the educational organisation and the main field of education (xxx clusters)
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001