LABOUR MARKET POLICY EVALUATION

The value of a third year in upper secondary vocational education - Evidence from a piloting scheme

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Abstract

The 1991-reform of upper secondary school, in which the two-year vocational programmes were transformed into three-year programmes, was implemented all over the country in 1995/96. The reform was piloted in the final years of the 1980s. The pilot scheme is an example of a "natural experiment". Expressed in a simple way, students who applied to upper secondary school in 1990 either lived in a pilot municipality with a possibility to choose a three-year vocational programme instead of a two-year or in a non-pilot municipality with only two-year vocational programmes. In this paper I estimate the effect of living in a pilot municipality in 1990 on three outcomes: years of upper secondary education, university enrolment and the rate of inactivity. My results suggest positive effects on years of upper secondary education for those who lived in a pilot municipality in 1990. One of the important changes was that the third year in upper secondary vocational education gave individuals general eligibility to continue to higher education. However, the third year did not have a statistically significant effect on the probability to continue to higher education, at least not within six years after completing upper secondary education.

Keywords: vocational education, upper secondary education, natural experiment
JEL classification: I21

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1 Introduction

Vocational education and training has been the focus of the educational policy in many European countries during the 1990s (see e.g. Lasonen (1996), Bennett *et al*. (1995), Cloonan & Canning (2000), Heraty *et al.* (2000)). In Sweden a reform of the vocational education and training[1] in upper secondary education was proposed in 1986. The Swedish Employer's Confederation (SAF) and the Swedish Confederation of Trade Unions (LO) were both promoting this expansion and upgrading of the vocational education (Lundahl, 1997). However, it was not until 1991 that the reform was decided upon (Gov. Bill 1990/91:85). Before the reform the vocational programmes lasted for two years and contained a mix of general education and vocational training. The academic programmes were mainly three-year programmes. The vocational programmes were extended to three years and included more general education as a consequence of the 1991-reform. This also gave individuals from vocational programmes general eligibility to continue to higher education.

Before the reform of upper secondary school was decided upon, a pilot scheme with three-year vocational programmes including more workplace training was conducted. The pilot scheme was carried out in the academic years 1988/89, 1989/90 and 1990/91.[2] In the first academic year of the pilot scheme, 6 000 study places were planned for the new programmes. The year after another 10 000 study places were planned for and in the last academic year 11 200 study places (SOU 1992:25). The pilot scheme involved about 11 percent of the students in vocational programmes the first year, 17 percent the second and 21 percent the third year.

The pilot scheme and the reform have been described in a number of previous reports regarding the implementation of the pilot scheme and the consequences of the reform.[3] My approach is instead to use the pilot scheme to examine the value of a third year in upper secondary vocational education using register data.

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[1] Further on I shall abbreviate it to vocational education or vocational programme.

[2] The pilot scheme was tried out in 1987/88 in a small scale with 500 study places. The two-year vocational programmes were then prolonged with a one-year supplementary course, but it was not a pilot with workplace training. Therefore, the 500-pilot cannot be compared with this pilot scheme.

[3] SOU 1989:90, 1989:106, 1990:75, 1992:25, 1996:1, 1997:1, 1997:107, National Agency for Education (1999, 2000a, 2000b).

The paper has two purposes. The first purpose is to estimate the effects of the reform on the career development of the students. This is made possible by the fact that the pilot scheme can be viewed as a "natural experiment". I will examine what the effects have been of the pilot scheme on three outcomes: i) years (two- or three-year) of upper secondary education (including adult secondary education), ii) university enrolment and iii) the rate of inactivity[4]. Since the vocational programmes were extended from two to three years the second purpose is to measure the effect of years in upper secondary vocational education on university enrolments and the rate of inactivity.

The paper is structured as follows. Section 2 gives a brief description of the Swedish school system. Section 3 describes the pilot scheme. The empirical framework is presented in Section 4. In Section 5 the results are presented. Section 6 concludes.

2   The Swedish school system

To facilitate the understanding of the analysis of the paper for those who are not familiar with the school system in Sweden it is essential to briefly describe the Swedish public school system, particularly the upper secondary school system.[5]

The school system in Sweden comprises compulsory (e.g. the nine-year compulsory education) and non-compulsory schooling (e.g. upper secondary education and adult secondary education). The nine-year compulsory education was implemented in the 1960's and in 1971 the vocational education was integrated with the upper secondary school. The 1971-reform comprised academic as well as vocational education, including a large number of special courses. After 20 years a new reform of upper secondary education was decided upon. In this reform both academic and vocational programmes were reformed, but the major change concerned the vocational programmes. They changed from two-year to three-year programmes. Today the upper secondary school is again faced with a new reform, which will be put forward by the Committee of upper secondary school in January 2003.

All students who have completed the nine-year compulsory school are offered an upper secondary education. A student has the right to begin a pro-

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[4] The rate of inactivity refers to individuals who are neither employed nor in higher education.
[5] For a detailed description see National Agency for Education (2002).

gramme in upper secondary school until the first calendar year the student turns 20. In today's upper secondary school there are two academic and fifteen vocational programmes. All are three-year programmes. They offer a broad general education and give eligibility to continue to higher education. But note that a particular upper secondary programme may not necessarily give eligibility to all university studies, particularly if the students from the vocational programmes do not make use of the individual choice in an optimal way (Johansson & Strandberg, 1999). Most upper secondary schools are municipal and most students attend a school in the municipality of residence. Students may also choose to attend a school in another municipality, e.g. if the programme desired is not offered in their own municipality.

Students at age 20 or older may attend adult secondary education.[6] Adult secondary education is meant to offer education to adults who lack the equivalent of compulsory school or upper secondary school, but it also offers continuing education providing the student with knowledge in an occupational field. Individuals with e.g. a two-year upper secondary education are able to supplement their education leading to three-year upper secondary education. The adult upper secondary education is comparable to the education given in the regular upper secondary school, though not identical.

3   The pilot scheme

3.1   The implementation of the pilot scheme[7]

In this section I will describe the agencies involved in the implementation of the pilot and how these agencies affected the process. The Ministry of Education delegated the responsibility of the implementation to the National Board of Education[8].

The local school boards in the municipalities applied to participate. Usually, the initiative came from the local upper secondary school after having negotiated with the local firms about their possibilities to take on students and give

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[6] There are exceptions from this rule. People below the age of 20 may be admitted as far as supplies admit.
[7] The information in this section is mainly based on SOU 1989:106.
[8] In 1991 it was replaced by the National Agency for Education.

them extended workplace training. This was often the most difficult part of the implementation of the new three-year vocational programmes.

The application from the local school boards was sent to the county school board.[9] They examined the application and made recommendations to the National Board of Education if the school should participate or not. But the National Board of Education made the final decision.[10] They had three main criteria for selecting the participating municipalities: i) proportionality, ii) substitution and iii) workplace training.

The idea behind proportionality was that the number of study places within each vocational programme in the pilot scheme should be in proportion to the number of study places of the corresponding regular two-year programme. For example, if the two-year metalwork programme had five percent of the study places of all the regular vocational programmes then the same percentage should be given to the corresponding three-year industry programme. In some cases there were some exceptions from this criterion. The programmes with fewer number of study places were over-represented. Also, the labour market put some limits to what was possible to obtain.

The idea behind the substitution criterion was that every class in the pilot scheme should substitute a class in the corresponding two-year programme. Even from this criterion a few exceptions was made. In some municipalities it was not possible to change all the regular classes into three-year classes within the same programme, since the number of study places in the pilot scheme was limited. For example, if one municipality had six classes with a two-year metalwork programme then a three-year industry programme did not replace all these. This made it possible for students to make a choice between a two-year and a three-year programme within the same school.

The third criterion was whether the local labour market had the possibility to arrange the extended workplace training. The trade association in question examined whether the municipalities had the resources to arrange the extended workplace training. The National Board of Education made no study of their own but relied on the recommendations by the trade representatives.

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[9] Upper secondary school was mainly financed by the state until 1991.
[10] From data regarding the pilot scheme in the academic year 1990/91 (provided by Thorbjörn Wall at the National Agency for Education), one can see that the National Board of Education followed the recommendation by the county school boards with the exception of one vocational education in a municipality.

The National Board of Education received applications from local school boards for 10 100 students, but only 6 000 students could participate in the first year of the pilot scheme, i.e. 1988/89. Thus, all local school boards were not permitted to participate and the dimension of participation in the selected municipalities was also restricted.

In the second year of the pilot scheme, 1989/90, it was decided that schools already participating in the pilot scheme should continue their participation by taking on a new age cohort in the first academic year of their three-year programmes. It was also decided that the number of study places in the pilot scheme should expand to 10 000 study places.

The National Board of Education had the same criteria the second year of the pilot scheme as for the first, but another criterion was added. It concerned the extended number of study places. They should be distributed over the country to municipalities of varying size and characteristics. The recommendations by the trade associations regarding the workplace training were even more important in the second year of the pilot scheme. Altogether the local school boards applied for 15 400 students to participate. About 10 000 students could participate in the second year of the pilot scheme. Thus, a selection of local boards and the dimension of their participation were made also the second year.

The third year of the pilot scheme, 1990/91, has not been descriptively analysed. However, the number of schools in the third year was probably very much the same as the previous year, since the number of study places in the pilot scheme was extended by only 1 200 study places. The structure of the pilot scheme is illustrated in *Table 1*.

Table 1 The structure of the pilot scheme

	1988/89	1989/90	1990/91	1991/92	1992/93
6 000 study places	→————————→				
10 000 study places		→————————→			
11 200 study places			→————————————→		

The table shows that those individuals that began in the academic year 1988/89, i.e. the first year of the pilot scheme, left upper secondary school in the spring 1991.

Because the implementation of the pilot scheme generates a framework where students, living in municipalities that were given the pilot scheme, had the possibility of three-year vocational studies instead of the regular two-year

vocational studies the pilot scheme may be used as a "natural experiment", since differences in educational attainment is caused by the students' municipality of residence. Thus, the municipality of residence is used as an instrumental variable, i.e. the municipality of residence is not part of the outcome equation.

3.2   The distribution of the pilot scheme

At the time of the pilot scheme Sweden had 284 municipalities. But only 193 of these municipalities offered vocational education. In the first year of the pilot scheme, i.e. 1988/89, 93 municipalities and 23 counties were involved. In the academic year 1989/90 145 municipalities and all Sweden's 24 counties had some kind of pilot scheme. Only five of these municipalities had exclusively three-year vocational education. Thus, 140 municipalities offered both three-year and two-year vocational education in some vocational fields (SOU 1990:75). Another two municipalities were added in the last year of the pilot scheme, counting to 147 municipalities. Also the pilot scheme seemed to be more common in larger municipalities with upper secondary education than in smaller ones.

In the academic year 1990/91 75.4 percent of the 195 municipalities that offered vocational education were involved in the pilot scheme. A detailed table of how many pilot municipalities per county that participated in the academic year 1990/91 are presented in Appendix A.

Unfortunately there is no available data on the distribution of study places in the pilot scheme by municipality. Instead, *Table 2* presents the distribution of study places by county.

Table 2 Study places in the pilot scheme by county and academic year

County	1988/89		1989/90		1990/91	
	Number	Percent	Number	Percent	Number	Percent
Blekinge	210	3.4 %	256	2.6 %	240	2.2 %
Gotland			64	0.6 %	64	0.6 %
Gävleborg	380	6.1 %	460	4.7 %	452	4.1 %
Göteborgs and Bohus	464	7.4 %	632	6.4 %	698	6.3 %
Halland	108	1.7 %	140	1.4 %	156	1.4 %
Jämtland	176	2.8 %	244	2.5 %	260	2.3 %
Jönköping	110	1.8 %	266	2.7 %	266	2.4 %
Kalmar	46	0.7 %	92	0.9 %	122	1.1 %
Kopparberg	236	3.8 %	284	2.9 %	300	2.7 %
Kristianstad	322	5.2 %	360	3.7 %	360	3.2 %
Kronoberg	94	1.5 %	350	3.6 %	334	3.0 %
Malmöhus	260	4.2 %	478	4.9 %	526	4.7 %
Norrbotten	236	3.8 %	314	3.2 %	314	2.8 %
Skaraborg	46	0.7 %	364	3.7 %	434	3.9 %
Stockholm	522	8.4 %	888	9.0 %	892	8.0 %
Södermanland	266	4.3 %	306	3.1 %	322	2.9 %
Uppsala	48	0.8 %	232	2.4 %	220	2.0 %
Värmland	1 194	19.1 %	1 288	13.1 %	1 950	17.6 %
Västerbotten	224	3.6 %	608	6.2 %	828	7.5 %
Västernorrland	162	2.6 %	258	2.6 %	258	2.3 %
Västmanland	302	4.8 %	512	5.2 %	628	5.7 %
Älvsborg	198	3.2 %	324	3.3 %	324	2.9 %
Örebro	110	1.8 %	494	5.0 %	550	5.0 %
Östergötland	522	8.4 %	638	6.5 %	608	5.5 %
Total	**6 236**	**100.0 %**	**9 852**	**100.0 %**	**11 106**	**100.0 %**

Source: SOU 1992:25

Värmland is the county with most study places in the pilot scheme. This county was selected to implement the pilot scheme in all their school with vocational education. The table also shows that the new pilot places that were added during the period also favoured other counties.

Before the introduction of the pilot scheme a student could chose among 17 vocational programmes in upper secondary school. Most of these were reformed into a three-year vocational programme in the pilot scheme (see Appendix B).

The pilot scheme in 1988/89 comprised ten vocational programmes. In 1989/90 seven new programmes were added. The graphic programme was included the last year of the pilot scheme. *Table 3* presents the three-year voca-

tional programmes along with their number of study places and number of admitted students.

Table 3 Number of study places and admitted students by educational programme and year in the pilot scheme

Programme	1988/89 Number of study places	1988 Number of admitted students	1989/90 Number of study places	1989 Number of admitted students	1990/91 Number of study places	1990 Number of admitted students
Building and construction	296	287	408	403	432	429
Electrical & telecommunication engineering	528	535	656	637	776	770
Motor and transport engineering	752	725	992	961	1 056	1 035
Commercial	210	207	660	640	990	953
Industry	1 536	1 380	1 856	1 638	1 976	1 739
Caring services	2 106	1 804	2 946	2 434	3 040	2 537
Textile & clothing manufacturing	136	122	208	163	224	186
Nursing	256	226	390	389	420	420
Heating & plumbing	64	65	72	73	104	105
Natural resource use	352	328	640	588	720	717
Craft	-	-	32	31	64	61
Restaurant	-	-	336	335	416	414
Food manufacturing	-	-	224	205	256	229
Painting	-	-	56	54	88	86
Constructional metalwork	-	-	56	51	56	52
Woodwork	-	-	144	130	168	152
Productive engineering	-	-	176	147	208	161
Graphic	-	-	-	-	112	112
Total	**6 236**	**5 679**	**9 852**	**8 879**	**11 106**	**10 158**

Source: SOU 1990:75 & Statistics Sweden, various issues.

The largest programmes in the pilot scheme were industry, caring services and motor and transport engineering programmes. With this background borned in mind, I will now turn to discuss the empirical framework of this study.

4 Empirical framework

4.1 Characterising the "natural experiment"

After nine-years of compulsory school it is the individuals' choice to continue to upper secondary school or not. The individuals also decide what programme

they will attend at upper secondary school. Therefore, individuals with different education also differ in other respects such as interests, motivation and ability. In order to evaluate the effect of education on the outcome, it is necessary to disentangle the causal impact of education from outcome differentials caused by education and what part is caused by other differences between individuals. The problem is that information on these other factors usually is missing. It is therefore difficult to identify the causal effect of education. Different statistical methods have been developed during the 1980s and the 1990s in order to solve this problem, e.g. see Card (1999).

One approach in order to measure the causal effect of education is to use "natural experiments". A "natural experiment" is a situation where other variables than the individuals' own choice is relevant for how much and which type of education they obtain.

An example of a "natural experiment" is the pilot scheme that preceded the 1991-reform of upper secondary school. In this pilot scheme students were presented a choice of three-year vocational studies instead of the regular two-year vocational studies. Consider individuals who have decided to pursue vocational studies. Having a three-year vocational alternative may affect the choice margin between a vocational and academic programme as well. However, I will ignore the effects of this choice throughout the analysis. Individuals who lived in municipalities with the pilot scheme could choose three-year vocational programmes – sometimes as an alternative to two-year vocational programmes in the same field, sometimes as the only vocational programme available in a vocational field. Individuals who lived in municipalities with no pilot scheme could only choose among two-year vocational programmes. However, those who only had the three-year option in some fields could choose the traditional two-year programme in a nearby municipality.

In one study (SOU 1990:75) it was found that students who had the possibility to choose between two- and three-year vocational programmes tended to choose the traditional two-year programme as their first priority. However, this pattern was not univocal, but it existed. One example pertains to the caring services programme. Here students preferred the two-year programme because they understood that the three-year caring services programme gave a more limited vocational education.

My purpose is to estimate the value of a three year upper secondary vocational education. One might then be tempted to use educational attainment (two- or three-year vocational education) for comparison. Why not use this di-

vision of the data? This is due to that some pilot municipalities offered both three- and two-year vocational programmes. Since the students in these municipalities could choose between a range of vocational programmes of different length. The educational attainment is non-randomised. Instead, to be able to use the random variation in education that the pilot scheme could give rise to I will study the differences in educational attainment caused by living in a municipality with the pilot scheme or not. Hence, I will group the data based on individuals who lived in a municipality with the pilot scheme and individuals who lived in a municipality with no pilot scheme. I will denote the two groups *pilot municipality* and *non-pilot municipality*, respectively.

What effects could the pilot scheme have had for the individuals' choice of education and their future labour market situation? The pilot scheme probably affects: i) the choice of continuing to the upper secondary school or not, ii) the choice of the programme, iii) the probability to complete the programme, iv) the choice of supplementing their education within adult secondary education or not, v) the choice of university enrolment or not, and vi) future earnings and employment. In this paper, I will measure the effect of the pilot scheme on years of upper secondary education, university enrolment and the rate of inactivity. I will also present instrumental variable estimates of the effect of years of upper secondary education on university enrolment and the rate of inactivity.

4.2   Data

To study the effects of the pilot scheme with the three-year vocational programmes I have used data from registers on education (register of pupils and register of higher education) and employment (register-based labour market statistics) of the population of working age (16–64-years old) in Sweden. The data covers the years 1990–1998. Along with this data the National Agency for Education provided information on the participating municipalities in the pilot scheme in 1990/91.[11] In addition to this data I have municipality specific variables such as the unemployment rate for the years 1990–98[12] and the share of highly educated for the year 1990.

I decided to examine the last year of the pilot scheme, i.e. 1990/91, for two reasons. The first reason is that the pilot scheme had been running for two

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[11] Thorbjörn Wall has kindly provided this data, which was generated at the time of the pilot scheme.
[12] Kerstin Johansson has kindly provided this data.

years. This increases the probability that students from compulsory school had sufficient information about the new programmes. The second reason is that data on grade point averages from compulsory school were available for the age cohort who left compulsory school in 1990.

A sample of individuals born in 1974 was drawn from the registers. Individuals born in 1974 should begin in upper secondary school in 1990. The first restriction was that they should have left the nine-year compulsory school at age 16 in 1990. Since I only have information from which programme the individuals left, the second restriction is that the individuals should have completed a three-year vocational programme in the pilot scheme or a regular two-year vocational programme three or two years later, i.e. in 1993 or 1992, respectively, which also is the normal rate of studies. Thus, I have only included individuals that completed their vocational education without any delay. The comparison group then consist of individuals who begun upper secondary school at the same time as the study group. An alternative comparison group is individuals who completed the upper secondary education at the same time as the study group. By comparing the individuals who begun upper secondary school at the same time, I have considered that the decision of the choice to upper secondary school took place at the same time for the study- and comparison group, i.e. they competed for the same study places. As was mentioned in the previous section, I have divided the data into those individuals who lived in a *pilot municipality* and those individuals who lived in a *non-pilot municipality* in 1990.

The total number of individuals used and the sample restrictions made in my analysis is presented in details in *Table C1* in Appendix C. Data consist of students in all vocational programmes available in the pilot scheme and the regular system. But I excluded the students in programmes, which did not have a corresponding programme either in the pilot scheme or in the regular system. A number of individuals were also excluded due to inadequate data. After the restrictions the data consist of 21 602 individuals in the pilot municipalities and 8 475 in the non-pilot municipalities. Of those individuals who lived in a pilot municipality in 1990 16 097 students graduated in 1992 and 5 505 students in 1993. Of those individuals who lived in a non-pilot municipalities in 1990 7 068 students graduated in 1992 and 1 407 students in 1993.

I have three outcome variables. The first outcome is years (two- or three-year) in upper secondary education (including adult secondary education). This variable takes the value one the year that the individual got a three-year upper secondary education and the following years, zero otherwise. The second out-

come is the university enrolment rate. University enrolment has been measured by data from the register of students who attend higher education.[13] I have data collected from 1993 to 1998 on registration for my investigated groups. This variable equals one the year that the individual registered at the university and the following years, zero otherwise. Finally, I have the rate of inactivity as an outcome. This variable equals one if the individual neither is employed nor in higher education during the observed year, zero otherwise.

The background variables are: Grade point average when leaving compulsory school 1990. Gender, defined as one if female and zero otherwise. I have information on whether and when individuals immigrated to Sweden. Immigrant is defined as one if the individual has an immigration year. I also control for the municipality specific variables local unemployment rate, share of highly-educated and which county the individual was living in at the time when municipalities were given pilot status. The local unemployment rate is defined as the number of individuals who are able to take employment at once divided with the number of individuals in the labour force. The share of highly educated is the sum of post secondary and post graduated education. The two last variables are characteristics of the municipality and are included in order to control for the municipality variation. I have also tested other municipality characteristics such as mean labour income, size of municipality in terms of population and increase in population between the years 1989 and 1990. In 1990 there were 24 counties, but during the 1990's the number has reduced to 21. Since I also check whether the results change when I include the counties at the time of the outcome, I decided to use the new definition of the counties.[14]

Descriptive statistics of the variables (except the county dummies) used in my regression analysis is presented in *Table 4*. The composition of the data changes as one move through the studied period. It is mainly the dependent variables that change and this is because of their definitions. Thus, I report descriptive statistics each year for those variables that change.

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[13] To be registered at the university a student must have been admitted to a university. They must also attend roll-call day. In addition they should have paid their fee to the local student organisation, a necessary prerequisite for getting exams registered.

[14] It should be mentioned that I obtain rather similar results using the old definition of the counties when I only control for the county where the individual was living in at the time when municipalities were given pilot status.

Table 4 Descriptive statistics of variables used in the analysis

	1992 Mean	1993 Mean	1994 Mean	1995 Mean	1996 Mean	1997 Mean	1998 Mean
Pilot municipality							
Outcome variables							
Three years in USE		0.49	0.51	0.52			
University enrolments		0.03	0.05	0.08	0.10	0.12	0.14
Rate of inactivity	0.18	0.18	0.14	0.09	0.08	0.08	0.06
Background variables							
Female	0.39						
Immigrant	0.04						
Grade point average	2.92 (0.49)	2.93 (0.49)					
Unemployment rate 1990	0.019 (0.008)						
Highly-educated 1990	0.152 (0.050)	0.149 (0.049)					
Number of individuals	16 097	21 584	21 564	21 533	21 478	21 414	21 323
Non-pilot municipality							
Outcome variables							
Three years in USE		0.42	0.45	0.46			
University enrolments		0.03	0.05	0.07	0.09	0.11	0.12
Rate of inactivity	0.17	0.16	0.12	0.07	0.07	0.07	0.05
Background variables							
Female	0.38	0.40					
Immigrant	0.03						
Grade point average	2.92 (0.49)	2.94 (0.49)					
Unemployment rate 1990	0.014 (0.010)	0.015 (0.010)					
Highly-educated 1990	0.132 (0.054)	0.130 (0.053)					
Number of individuals	7 068	8 467	8 449	8 433	8 418	8 385	8 347

Note: Standard deviations are reported in parentheses. USE = upper secondary education.

Table 4 shows that individuals, both in the pilot and non-pilot municipalities, add a third year in upper secondary education, but it comes to an end in 1995. Having a third year is more common in the pilot municipalities, since these municipalities offered the three-year vocational programmes. The increase of

university enrolment reflects the fact that the transition to university education takes some time.[15] The rate of inactivity also confirms that individuals are more in education or employment in later years. The background variables are similar in the two groups, except for the municipality specific variables, which are higher in the pilot municipalities.

4.2.1 Assumptions

In order to use the randomisation in education that the pilot scheme possibly involved one has to use the population that was affected by the pilot scheme, e.g. use all individuals who leave the nine-year compulsory school a specific year. As was outlined in the data section I have data on a sample of individuals who left the nine-year compulsory school 1990. I therefore need to make some assumptions in order to interpret the regression analysis.

I have to assume that there are no systematic differences between individuals in the pilot municipalities and non-pilot municipalities with respect to i) the choice to continue to upper secondary school, ii) the choice of the programme, and iii) the probability of completing the programme. The second assumption assumes that the three-year vocational programmes did not attract students from the academic programmes. One way to examine this assumption is to present the number of the first hand applicants to upper secondary school by type of programme.

Table 5 First hand applicants to upper secondary school 1987-1991

Programme	1987	1988	1989	1990	1991
3-year academic	27.9 %	28.2 %	29.5 %	31.5 %	31.0 %
2-year academic	4.6 %	4.3 %	4.3 %	4.8 %	5.0 %
3-year vocational	0.0 %	3.5 %	6.7 %	8.0 %	9.5 %
2-year vocational	34.7 %	31.7 %	29.8 %	29.2 %	27.1 %
Supplementary courses	32.8 %	32.3 %	29.7 %	26.5 %	27.4 %
Total	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**

Source: Statistics Sweden, various issues.

Table 5 indicates that the first hand applicants to the three-year academic programmes increased from 1987 to 1991. I can also see that the number of first

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[15] Statistics Sweden (2002) reports that 10.6 percent and 7.5 percent continued to university within three years among those who left upper secondary school with a three-year or a two-year vocational education in 1992/93 or 1991/92, respectively.

hand applicants decreased for the two-year vocational programmes as well as supplementary courses during the same period.

The third assumption assumes that the drop out rate is the same for individuals beginning a two- or a three-year vocational education. There is no available information about the drop out rate for individuals that continued to a two- or a three-year vocational education in 1990. But a reasonable approximation of the drop out rate for the two vocational paths can be calculated by taking the sum of admitted students in 1990 for the two-year as well as for the three-year vocational programmes. Then divide these by the sum of students leaving school in 1991/92 (the two-year students) and 1992/93 (the three-year students), respectively. Calculating the drop out rates gives 6 percent for students leaving from a two-year vocational programme and 16 percent for students leaving from a three-year vocational programme (Statistics Sweden, various issues). Individuals dropping out from a three-year vocational programme may change to a regular two-year vocational programme explaining the low drop out rate for the two-year vocational programmes. Hence, the drop out rate for the two-year vocational programmes may be higher than 6 percent. Remember that this drop out rate is an approximation and should be taken with caution.[16]

4.3 Model specification

This section outlines the reduced form equations, which I use to estimate the effect of living in a pilot municipality 1990 with respect to i) years (two- or three-year) of upper secondary education (including adult secondary education)[17], ii) university enrolment rate and iii) the rate of inactivity. I estimate the effect including all vocational programmes – no regressions are made separately for each vocational programme. The following reduced form equation will be estimated separately for each year:

$$y_{it} = \gamma + \mathbf{X}'_i \beta + \beta_1 Z_i + \varepsilon_{it} \qquad (1)$$

where $\mathbf{X}'_i$ is a vector of individual and municipality specific characteristics, Z_i is a dummy variable and equals one if the individual lived in a pilot municipality 1990 and ε_{it} is the error term. Equation (1) can be used to estimate all three

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[16] SOU 1992:25 gives examples about drop out from the three-year vocational education.
[17] Further on I shall abbreviate it to years of upper secondary education.

outcomes mentioned above. Individuals living in a pilot municipality in 1990 got access to a three-year vocational education beyond the two-year vocational education. This effect is picked up by the coefficient on the dummy variable, Z_i. The reduced form equations are estimated by ordinary least square (OLS).

The "natural experiment" also gives me the opportunity estimate the causal effect of an additional year at upper secondary school on university enrolment and on the rate of inactivity. Then Z_i is used as an instrumental variable (IV). The instrumental variable estimator is used when ordinary least square estimates of the returns to education are not consistent because years of upper secondary education is endogenous. Since the model is exactly identified the instrumental variable estimate (β_{IV}) can be written as a ratio between the reduced form estimates of living in a pilot municipality on e.g. university enrolment and of living in a pilot municipality on years of upper secondary education:

$$\beta_{IV} = \frac{E[y_{it} \mid Z_i = 1] - E[y_{it} \mid Z_i = 0]}{E[s_{it} \mid Z_i = 1] - E[s_{it} \mid Z_i = 0]} \tag{2}$$

where y_{it} is university enrolments and s_{it} is the years of upper secondary education. Since Z_i is a dummy variable β_{IV} is the so-called Wald estimate, i.e. the mean differences in university enrolment for individuals in a pilot and non-pilot municipality divided by the mean differences in years of upper secondary education for individuals in a pilot and non-pilot municipality.

5 Results

The estimation results of the effect of living in a pilot municipality in 1990 (*pilot* parameter) with respect to i) years of upper secondary education, ii) university enrolment, and iii) rate of inactivity are presented in this section. The effect of years in upper secondary education on university enrolment and the rate of inactivity are also presented.

Details on the pilot parameter estimates as well as the estimates on the background variables – gender, immigrant, grade point average when leaving compulsory school, local unemployment rate and the share of highly-educated – are presented in Appendix D, *Table D1*. The regression also control for the

residence county in 1990. The estimates on the county dummies are not reported, but are available upon request. Including the local unemployment rate and the share of highly-educated seems to be two reasonable municipality specific variables that influence the choice of continuing to study, both in upper secondary education as well as in higher education.[18]

Two alternative specifications, beyond the presented specification, have also been tested. In the first alternative specification I add indicator variables for the county of residence when measuring outcomes. In the second alternative specification I add to the first alternative specification the local unemployment rate of the time of the outcome. The results from these two specifications will only be commented on when the results are different from the baseline specification.

5.1   Effects on years of upper secondary education

The estimates of the *pilot* parameter, i.e. living in a pilot municipality in 1990, from the reduced form on years of upper secondary education are plotted by year in *Figure 1* along with the 95 percent confidence bands.
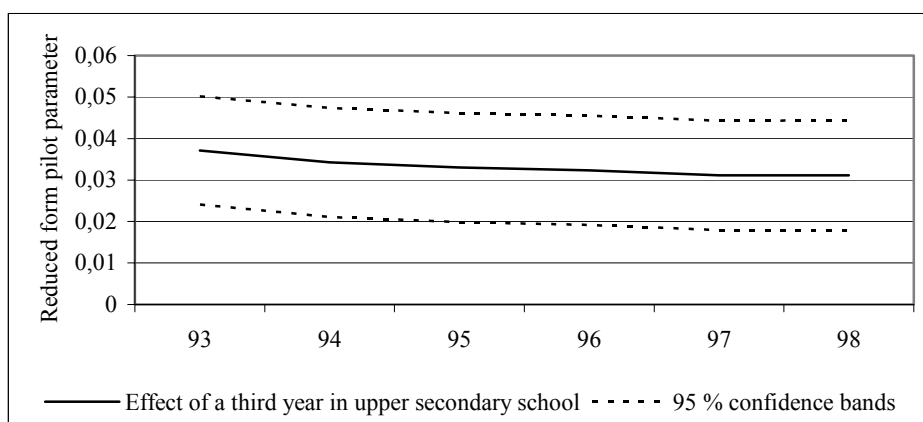
Figure 1 Reduced form estimates of the effect of living in a pilot municipality on years of upper secondary education

These estimates show that individuals who lived in a pilot municipality in 1990 have a higher probability of having a three-year vocational education than those

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[18] I have also tested other municipality specific variables such as the size of the municipality in 1990, mean labour income in 1990 and population growth between 1989 and 1990.

individuals who lived in a non-pilot municipality. The effect decreases over time, but only very marginally. Indeed, the effect turns out to be constant in the last two years. The small decrease of the effect reflects that individuals with a two-year vocational education living in a non-pilot municipality add a third year within the adult secondary education over time. The incentives for individuals to invest in an additional year could have been caused by the continuing deterioration of the Swedish labour market between 1992 and 1993. Another reason for adding a third year is the reform itself, since the decision of the reform was taken already in 1991 when school leavers involved in the pilot scheme had not finished their education.

5.2 University enrolment rate effects

One goal for introducing a third year into the two-year upper secondary vocational education was to give young people a more qualified education in order to be prepared to meet the future demand from the labour market. Another goal was to facilitate university enrolment for students in vocational programmes. *Figure 2* shows the effects of living in a pilot municipality in 1990 on university enrolments by year along with the 95 percent confidence bands.
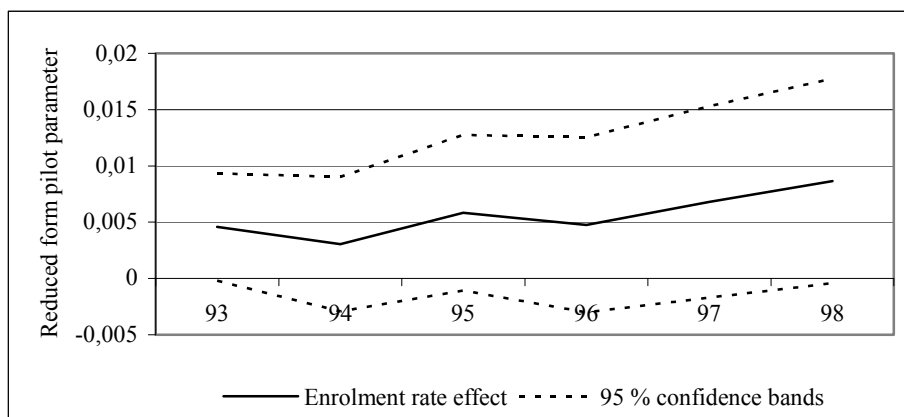
Figure 2 Reduced form estimates of the effect of living in a pilot municipality on university enrolments

There is a positive relationship between living in a pilot municipality in 1990 and the probability of university enrolment, though not statistically significant at the five percent level. The effect is very small, but increases from 1993 to 1998. Usually Swedish young adults do not continue directly to higher educa-

tion after leaving upper secondary school. The two alternative specifications give similar results except in 1997 where the alternative specifications show a slightly smaller effect. In 1998 the enrolment rate effect is statistically significant on the five percent level when using the second alternative specification.

The goal to facilitate university enrolment is an interesting and important causal question. This question should be of general interest because a broader and more general education in the upper secondary school affects the eligibility to university studies. The three-year vocational programmes offered more general education and therefore individuals with this education do not need to supplement their education to the same extent as the individual having a regular two-year vocational education in order to be eligible to university. Being eligible to university studies should off course cause an increase in university enrolments, but what is the magnitude? I will know turn to consider this effect by using the instrumental variable (IV) technique. As was outlined in Section 4.3 the instrument, Z_i, is binary and equals one if the individual lived in a pilot municipality in 1990, zero otherwise. In this case, IV estimates the average effect of a third year in upper secondary education on university enrolment for the individuals whose behaviour was changed by living in a pilot municipality in 1990. In *Figure 3* I plot the IV estimates of the effect of years of upper secondary education on university enrolments by year along with the 95 percent confidence bands.
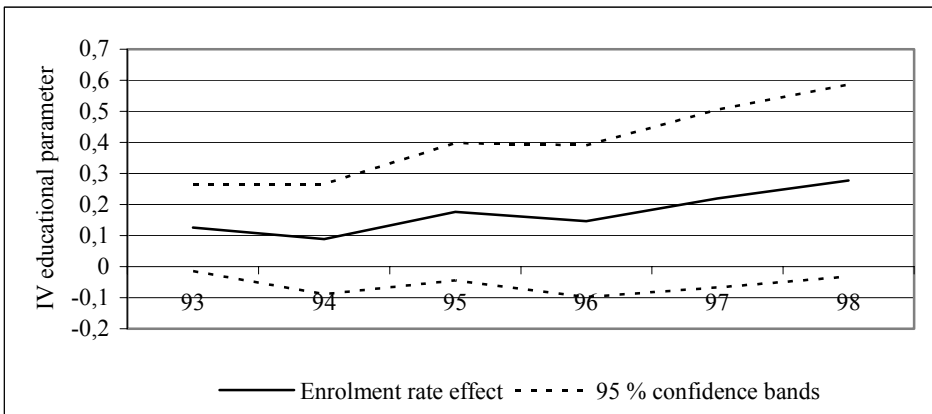

Figure 3 Instrumental variables estimates of enrolment rate effects

The IV estimates for the enrolment rates are positive, but not statistically significant at the five percent level. The causal interpretation of the positive uni-

versity enrolment rate effects on an additional year in upper secondary school is that these individuals are, to a higher extent, eligible to university studies than those with a regular two-year vocational education. The effect of continuing to university within six years is about 0.28 higher for school leavers who had a three-year vocational education and whose educational attainment has been affected by living in a pilot municipality. However, the effect is not statistically significant on the five percent level. One possible explanation to this result could be that individuals with a three-year vocational education only get general eligibility to higher education, which lead to that the individuals are not able to choose between all the university studies offered.

In contrast, when I use the ordinary least square (OLS) and the probit approaches (see *Table D2* in Appendix D) for estimating the effect of educational attainment on university enrolments the results are much lower, even significantly negative in the first years. By using OLS the effects are considerably underestimated.

5.3   Inactivity rate effects

Unemployment was continually very high during the 1990s in Sweden until 1998 when the unemployment rate began to decrease. Among young adults it was even higher (Edin *et al.*, 2000). For a description of the changes in the labour market for young adults from the 1970s to the 1990s see Murray (2000).

A third year in upper secondary education should decrease the probability of being unemployed in the future, since the extension of the third year in vocational education opened up for the choice of continuing to higher education. Therefore, it would be interesting to study what the effect has been of living in a pilot municipality in 1990 on employment. To analyse the employment effects I have preferred to analyse the rate of inactivity, i.e. the individual neither is employed nor in higher education, since a third year should give the opportunity to continue to higher education. *Figure 4* shows the inactivity rate effect of living in a pilot municipality in 1990 by year along with the 95 percent confidence bands.
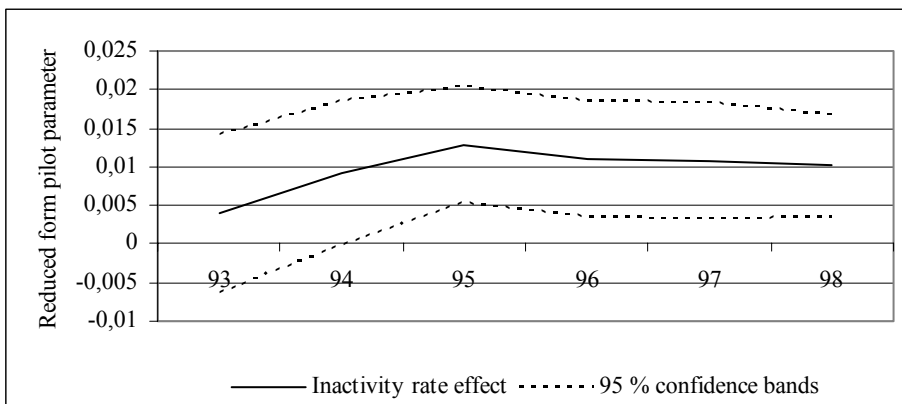
Figure 4 Reduced form estimates of the effect of living in a pilot municipality on rate of inactivity

The figure shows that the inactivity rate effect for individuals who lived in the pilot municipalities is positive and not negative, as one would have assumed, since an extension of the vocational education should decrease the probability of unemployment. Using the second alternative specification, i.e. adding indicator variables for the county of residence as well as the local unemployment rate of the time of the outcome, changes my result only for the years 1993–1995, producing a lower parameter estimates on the inactivity rate effect.

Might the choice of the comparison group influence the result? A sensitivity analysis was carried out using individuals with a two-year vocational programme completing the upper secondary education at the same time as the individuals with the three-year vocational programme, i.e. all individuals left the upper secondary school in 1993. The sensitivity analysis was carried out for the last year of the studied period. The effect of living in a pilot municipality on the rate of inactivity turns out to be zero.

The differences in the results might be explained by the changes in unemployment rate between 1992 and 1993. A recession may indirectly affect the individuals entrance on the labour market, e.g. through a lower staff turnover in the working life. The consequence of not directly be able to get into the labour market on completing the studies may give long-term unemployment effects, e.g. see Gregg (2001).

In *Figure 5* I plot the IV estimates of the effect of years of upper secondary education on the rate of inactivity along with the 95 percent confidence bands.

Here IV estimates the average effect of a third year in upper secondary education on the rate of inactivity for the individuals whose behaviour was changed by living in a pilot municipality in 1990.
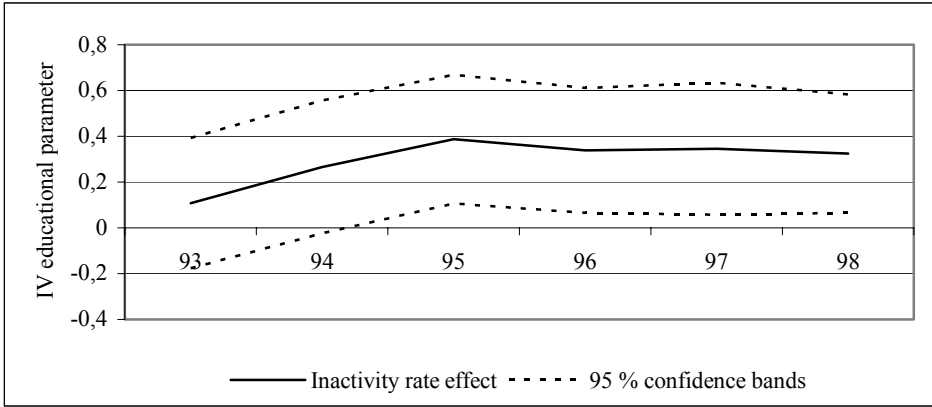
Figure 5 Instrumental variables estimates of inactivity rate effects

The probability of being inactive is positive and significantly different from zero for four of the years, for school leavers who had a three-year vocational education and whose educational attainment has been affected by living in a pilot municipality. The positive inactivity rate effects may reflect the fact that the individuals with a two-year vocational education managed to establish themselves on the labour market before it declined. These results differ from the OLS and probit estimates, which are negative from 1995 and significantly different from zero, see *Table D3* in Appendix D. Moreover, the IV estimates are significantly different from the OLS estimates for the years 1995–1998. The changes in specification change the result in 1993–1995 when using the second alternative specification.

Even here the sensitivity analysis was carried out using the other comparison group. The effect a third year in vocational education seems to be almost zero and it is not significantly different from zero. Thus, the choice of the comparison group seems to matter for the effect on the inactivity rate. Therefore, one should be very careful when making predictions about the effect of a third year of vocational studies on the future rate of inactivity.

6 Conclusions

The pilot scheme, which preceded the 1991-reform of upper secondary education, is an example of a "natural experiment". I argue that conditional on a set of local characteristics the assignment of the pilot status is random. Hence, this natural experiment has given me the opportunity to analyse the random variation in education that the pilot scheme gave rise to. I have examined school leavers from municipalities with the pilot scheme and school leavers from municipalities with no pilot scheme. These school leavers should have completed a two-year upper secondary vocational education in 1992 or a three-year upper secondary vocational education in 1993.

The effects of living in a pilot municipality in 1990 have been estimated with respect to: i) years (two- or three-year) of upper secondary education (including adult secondary education), ii) university enrolment, and iii) the rate of inactivity[19]. I have also estimated the effect of years of upper secondary education on university enrolment and on the rate of inactivity by using an instrumental variable approach.

The result shows that the effects on years of upper secondary education are positive for individuals who lived in a pilot municipality in 1990 compared with individuals who did not live in a pilot municipality in 1990, but the effect decrease over time. Within six years the effect is about 0.03. The effect may be somewhat lower in the long run.

One of the important reasons for adding a third year was to facilitate university enrolment for school leavers with a vocational education. Within six years the effect on university enrolment is 0.28 higher for the individuals with a three-year upper secondary vocational education compared with the individuals with a two-year upper secondary vocational education. The effect on university enrolment is large in magnitude, but not statistically significant at the five percent level. One possible explanation to the result is that individuals with a three-year upper secondary vocational education get general eligibility to higher education, which in turn leads to that they cannot choose among all offered university studies.

My results on the rate of inactivity suggest that the probability of being inactive is positive for individuals who had a three-year vocational education from

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[19] The rate of inactivity refers to individuals who are neither employed nor in higher education.

upper secondary school compared with individuals who had a two-year vocational education from upper secondary school. One would expect that adding a third year in upper secondary school should decrease the rate of inactivity, since the third year should open up for the choice of continuing to higher education. One possible explanation of the result could be the change in unemployment rate between 1992 and 1993, which lead to that the individuals with the two-year upper secondary vocational education managed to establish themselves on the labour market before it declined. However, since the rate of inactivity was expected to decrease for those individuals having a three-year vocational education from upper secondary school a sensitivity analysis was carried out using another comparison group, than the group presented in this report. The effect of a third year in upper secondary school on the rate of inactivity changed from being significantly positive to being zero and statistically insignificant. Therefore, the effects on the rate of inactivity, presented here, should be interpreted with due care.

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Appendix A – The dimension of the pilot municipalities

Table A1 The proportion of participating municipalities in the pilot scheme by county in the academic year 1990/91

County	Number of municipalities	Number of municipalities with vocational education	Number of pilot municipalities	Percent with voc. education
Blekinge	5	5	4	80.0 %
Gotland	1	1	1	100.0 %
Gävleborg	10	7	7	100.0 %
Göteborgs and Bohus	15	9	8	88.9 %
Halland	6	5	2	33.3 %
Jämtland	8	7	5	40.0 %
Jönköping	11	7	5	71.4 %
Kalmar	12	6	3	50.0 %
Kopparberg	15	11	8	72.7 %
Kristianstad	13	10	5	50.0 %
Kronoberg	8	7	7	100.0 %
Malmöhus	20	12	7	58.3 %
Norrbotten	14	10	7	70.0 %
Skaraborg	17	10	9	90.0 %
Stockholm	25	21	9	42.9 %
Södermanland	7	5	4	80.0 %
Uppsala	6	4	4	100.0 %
Värmland	16	13	13	100.0 %
Västerbotten	15	7	6	85.7 %
Västernorrland	7	7	6	85.7 %
Västmanland	11	8	7	87.5 %
Älvsborg	18	10	8	80.0 %
Örebro	11	6	6	100.0 %
Östergötland	13	7	5	71.4 %
Total	284	195	147	75.4 %

Appendix B – Vocational programmes

Table B1 The vocational programmes before the reform and in the pilot scheme

The two-year vocational programmes before the reform	*The three-year corresponding vocational programmes in the pilot scheme*
Electrical and telecommunications engineering	Electrical and telecommunication engineering
Motor engineering	Motor and transport engineering
Metalwork	Industry
Process engineering	Productive engineering
Woodwork	Woodwork
Clothing manufacturing	Textile and clothing manufacturing
Building and construction	Building and construction
	Constructional metalwork
	Painting
	Heating and plumbing
Food manufacturing	Food manufacturing
	Restaurant
Nursing	Nursing
	Caring services
Community care	
Agriculture	Natural resource use
Forestry	
Gardening and landscaping	
Distribution and clerical	Commercial
Retail trade and clerical work	
Production and maintenance engineering	-
Consumer studies	-
-	Craft
-	Graphic

Note: The two-year community care programme also belonged to the three-year caring services programme.

Appendix C – Sample restrictions

Table C1 Number of individuals omitted due to sample restrictions

Restrictions	Pilot municipality		Non-pilot municipality	
	1992	1993	1992	1993
Total number of individuals	18 054	5 603	7 658	1 437
Number of individuals omitted due to				
non-comparable programme	1 834	66	586	8
two leaving certificates from upper secondary school	0	32	0	21
educational level equals compulsory education	105	0	1	0
not in employment register	0	0	0	1
grade point average equals zero	2	0	0	0
educational level not consistent with vocational programme	16	0	3	0
Total number of individuals in the analysis	**16 097**	**5 505**	**7 068**	**1 407**

Note: Adding the year 1992 and 1993 within the pilot municipalities and within the non-pilot municipalities gives a total of 21 602 and 8 475 individuals, respectively. These numbers of individuals are not identical with the 1993 column of *Table 4* in Section 4.2, since the composition of the data changes as one move from 1992 to 1993.

Appendix D – Parameter estimates

Table D1 Reduced form estimates by outcome variable and year

	1993	1994	1995	1996	1997	1998
Years of upper secondary Education (USE)						
Pilot municipality	0.0364	0.0345	0.0330	0.0326	0.0311	0.0312
	(0.0068)	(0.0069)	(0.0069)	(0.0069)	(0.0069)	(0.0069)
Female	-0.100	-0.087	-0.088	-0.087	-0.087	-0.088
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Immigrant	-0.036	-0.030	-0.033	-0.030	-0.030	-0.029
	(0.015)	(0.015)	(0.015)	(0.015)	(0.014)	(0.014)
Grade point average	0.079	0.074	0.076	0.078	0.077	0.079
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Unemployment rate 1990	0.213	-0.069	-0.0018	-0.063	0.016	-0.024
	(0.440)	(0.443)	(0.4431)	(0.444)	(0.445)	(0.446)
Highly-educated 1990	-0.150	-0.192	-0.174	-0.175	-0.167	-0.169
	(0.064)	(0.064)	(0.065)	(0.065)	(0.065)	(0.065)
Constant	0.247	0.284	0.280	0.280	0.279	0.275
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
University enrolment						
Pilot municipality	0.0046	0.0031	0.0058	0.0048	0.0068	0.0087
	(0.0024)	(0.0030)	(0.0035)	(0.0040)	(0.0043)	(0.0046)
Female	0.048	0.062	0.067	0.067	0.066	0.066
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Immigrant	-0.0003	0.005	0.012	0.011	0.020	0.028
	(0.0053)	(0.007)	(0.008)	(0.008)	(0.009)	(0.009)
Grade point average	0.060	0.090	0.118	0.143	0.164	0.181
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Unemployment rate 1990	-0.081	-0.080	-0.274	-0.422	-0.500	-0.716
	(0.156)	(0.196)	(0.227)	(0.255)	(0.279)	(0.298)
Highly-educated 1990	0.023	0.127	0.196	0.256	0.328	0.355
	(0.023)	(0.029)	(0.033)	(0.037)	(0.041)	(0.043)
Constant	-0.182	-0.281	-0.368	-0.435	-0.493	-0.529
	(0.008)	(0.010)	(0.012)	(0.013)	(0.014)	(0.015)

Note: Standard errors are reported in parentheses.

Table D1 cont Reduced form estimates by outcome variable and year

	1993	1994	1995	1996	1997	1998
Rate of inactivity						
Pilot municipality	0.0039	0.0092	0.0128	0.0110	0.0107	0.0101[20]
	(0.0053)	(0.0048)	(0.0039)	(0.0038)	(0.0038)	(0.0034)
Female	-0.097	-0.066	0.0008	0.018	0.030	0.030
	(0.005)	(0.004)	(0.0033)	(0.003)	(0.003)	(0.003)
Immigrant	0.102	0.106	0.093	0.096	0.087	0.062
	(0.011)	(0.010)	(0.008)	(0.008)	(0.008)	(0.007)
Grade point average	-0.098	-0.079	-0.067	-0.069	-0.068	-0.045
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Unemployment rate 1990	1.465	1.347	1.476	0.739	0.809	0.256
	(0.338)	(0.307)	(0.249)	(0.245)	(0.243)	(0.216)
Highly-educated 1990	0.045	-0.042	-0.058	-0.091	-0.086	0.019
	(0.049)	(0.045)	(0.036)	(0.036)	(0.035)	(0.031)
Constant	0.480	0.380	0.263	0.273	0.254	0.154
	(0.017)	(0.016)	(0.013)	(0.013)	(0.012)	(0.011)

Note: Standard errors are reported in parentheses.

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[20] The corresponding parameter estimate from the sensitivity analysis, i.e. using individuals with a two-year vocational programme completing the upper secondary education at the same time as the individuals with the three-year vocational programme is -0.0008, with a standard error of 0.0036.

Table D2 IV, OLS and probit estimates on university enrolment by year

	1993	1994	1995	1996	1997	1998
Instrumental variable estimates						
Three years in USE	0.126	0.089	0.177	0.146	0.219	0.277
	(0.072)	(0.090)	(0.113)	(0.125)	(0.146)	(0.158)
Female	0.061	0.069	0.082	0.079	0.085	0.090
	(0.008)	(0.008)	(0.010)	(0.011)	(0.013)	(0.014)
Immigrant	0.004	0.0077	0.018	0.016	0.027	0.036
	(0.006)	(0.0072)	(0.009)	(0.009)	(0.010)	(0.011)
Grade point average	0.050	0.083	0.105	0.131	0.147	0.159
	(0.006)	(0.007)	(0.009)	(0.010)	(0.012)	(0.013)
Unemployment rate 1990	-0.108	-0.074	-0.273	-0.413	-0.504	-0.710
	(0.172)	(0.199)	(0.240)	(0.260)	(0.292)	(0.316)
Highly-educated 1990	0.041	0.144	0.227	0.281	0.365	0.402
	(0.024)	(0.030)	(0.035)	(0.039)	(0.043)	(0.047)
Constant	-0.213	-0.306	-0.418	-0.476	-0.554	-0.605
	(0.020)	(0.028)	(0.034)	(0.037)	(0.043)	(0.046)
OLS estimates						
Three years in USE	-0.014	-0.0055	0.0041	0.016	0.025	0.033
	(0.002)	(0.0026)	(0.0030)	(0.003)	(0.004)	(0.004)
Female	0.047	0.061	0.067	0.068	0.068	0.069
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Immigrant	-0.0007	0.0050	0.013	0.012	0.021	0.029
	(0.0053)	(0.0066)	(0.008)	(0.008)	(0.009)	(0.009)
Grade point average	0.061	0.090	0.118	0.141	0.162	0.178
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Unemployment rate 1990	-0.0036	-0.033	-0.190	-0.359	-0.413	-0.604
	(0.152)	(0.191)	(0.221)	(0.248)	(0.271)	(0.290)
Highly-educated 1990	0.033	0.134	0.0021	0.269	0.347	0.379
	(0.022)	(0.028)	(0.0003)	(0.036)	(0.039)	(0.042)
Constant	-0.178	-0.279	-0.370	-0.439	-0.500	-0.538
	(0.008)	(0.010)	(0.010)	(0.013)	(0.014)	(0.015)

Note: Standard errors are reported in parentheses.

Table D2 cont IV, OLS and probit estimates on university enrolment by year

	1993	1994	1995	1996	1997	1998
Probit estimates						
Three years in USE	-0.0052	-0.0013	0.0061	0.017	0.026	0.034
	(0.0010)	(0.0016)	(0.0022)	(0.003)	(0.003)	(0.004)
Female	0.028	0.042	0.049	0.053	0.056	0.058
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Immigrant	0.0004	0.006	0.014	0.014	0.025	0.031
	(0.0026)	(0.005)	(0.007)	(0.008)	(0.009)	(0.010)
Grade point average	0.031	0.062	0.095	0.127	0.155	0.178
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Unemployment rate 1990	-0.020	-0.120	-0.297	-0.456	-0.513	-0.699
	(0.075)	(0.129)	(0.170)	(0.212)	(0.247)	(0.276)
Highly-educated 1990	0.031	0.108	0.186	0.260	0.343	0.390
	(0.010)	(0.017)	(0.023)	(0.029)	(0.034)	(0.038)

Notes: Standard errors are reported in parentheses. The estimates from the probit model are the marginal effects. The marginal effect is the partial derivative of estimated probability with respect to the variable, evaluated at the means.

Table D3 IV, OLS and probit estimates on the rate of inactivity by year

	1993	1994	1995	1996	1997	1998
Instrumental variable estimates						
Three years in USE	0.108	0.266	0.388	0.338	0.346	0.324[21]
	(0.145)	(0.148)	(0.143)	(0.139)	(0.147)	(0.132)
Female	-0.086	-0.043	0.035	0.048	0.060	0.058
	(0.015)	(0.014)	(0.013)	(0.013)	(0.013)	(0.012)
Immigrant	0.106	0.114	0.105	0.106	0.097	0.071
	(0.013)	(0.012)	(0.011)	(0.010)	(0.010)	(0.009)
Grade point average	-0.106	-0.099	-0.097	-0.096	-0.095	-0.071
	(0.012)	(0.012)	(0.012)	(0.011)	(0.012)	(0.011)
Unemployment rate 1990	1.442	1.365	1.477	0.760	0.803	0.264
	(0.349)	(0.326)	(0.305)	(0.290)	(0.294)	(0.265)
Highly-educated 1990	0.061	0.0086	0.0098	-0.031	-0.028	0.074
	(0.049)	(0.0487)	(0.0448)	(0.043)	(0.043)	(0.039)
Constant	0.453	0.304	0.154	0.179	0.158	0.065
	(0.040)	(0.045)	(0.043)	(0.042)	(0.044)	(0.039)

Note: Standard errors are reported in parentheses.

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[21] The corresponding parameter estimate from the sensitivity analysis, i.e. using individuals with a two-year vocational programme completing the upper secondary education at the same time as the individuals with the three-year vocational programme is -0.011, with a standard error of 0.051.

IFAU – Evidence from a piloting scheme

Table D3 cont IV, OLS and probit estimates on the rate of inactivity by year

	1993	1994	1995	1996	1997	1998
OLS estimates						
Three years in USE	0.020	0.0067	-0.0085	-0.017	-0.024	-0.022
	(0.004)	(0.0040)	(0.0032)	(0.003)	(0.003)	(0.003)
Female	-0.095	-0.065	0.0001	0.017	0.028	0.028
	(0.005)	(0.004)	(0.0033)	(0.003)	(0.003)	(0.003)
Immigrant	0.103	0.106	0.093	0.096	0.086	0.061
	(0.011)	(0.010)	(0.008)	(0.008)	(0.008)	(0.007)
Grade point average	-0.099	-0.079	-0.067	-0.068	-0.066	-0.044
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Unemployment rate 1990	1.508	1.478	1.667	0.907	0.977	0.414
	(0.329)	(0.299)	(0.242)	(0.239)	(0.237)	(0.210)
Highly-educated 1990	0.056	-0.019	-0.027	-0.065	-0.062	0.042
	(0.047)	(0.043)	(0.035)	(0.034)	(0.034)	(0.030)
Constant	0.475	0.378	0.265	0.280	0.261	0.160
	(0.017)	(0.016)	(0.013)	(0.013)	(0.013)	(0.011)
Probit estimates						
Three years in USE	0.020	0.0064	-0.0074	-0.016	-0.023	-0.021
	(0.004)	(0.0040)	(0.0031)	(0.003)	(0.003)	(0.003)
Female	-0.098	-0.066	-0.0012	0.016	0.026	0.027
	(0.004)	(0.004)	(0.0032)	(0.003)	(0.003)	(0.003)
Immigrant	0.106	0.108	0.087	0.091	0.081	0.058
	(0.014)	(0.013)	(0.011)	(0.011)	(0.010)	(0.009)
Grade point average	-0.098	-0.077	-0.061	-0.063	-0.060	-0.040
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Unemployment rate 1990	1.468	1.403	1.551	0.839	0.886	0.418
	(0.325)	(0.291)	(0.228)	(0.222)	(0.218)	(0.192)
Highly-educated 1990	0.070	-0.0063	-0.010	-0. 051	-0.051	0.047
	(0.047)	(0.0427)	(0.034)	(0.034)	(0.033)	(0.029)

Notes: Standard errors are reported in parentheses. The estimates from the probit model are the marginal effects. The marginal effect is the partial derivative of estimated probability with respect to the variable, evaluated at the means.

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