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Does more general education reduce the risk of future unemployment? Evidence from labor market experiences during the Great Recession

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Does more general education reduce the risk of future unemployment?

Evidence from labor market experiences during the Great Recession

Caroline Hall

WORKING PAPER 2013:17

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Does more general education reduce the risk of future unemployment? Evidence from labor market experiences during the Great Recession[*]

by

Caroline Hall[♦]

July 31, 2013

Abstract

This paper investigates whether more general education reduces the risk of future unemployment by examining individuals' labor market experiences during the "Great Recession" (2008–2010). To estimate the causal impact of differences in educational content, I exploit a reform in Sweden in the 1990s which prolonged vocational programs in upper secondary school and gave them a considerably larger general content. The research design takes advantage of variation across regions and over time in the implementation of a large-scale pilot which preceded the reform. I find no evidence that having attended a longer and more general program reduced the risk of experiencing unemployment during the 2008–2010 recession. Among students with low GPAs from compulsory school, attending a pilot program seems instead to have led to an increased risk of unemployment. This pattern is strongest among male students and the effect is likely to be explained by the increased dropout rate which resulted from the change of the programs.

Keywords: vocational education; upper secondary school curriculum; unemployment
JEL-codes: I21; I28

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1 Introduction

Countries differ remarkably in the emphasis their school systems place on general versus vocational education. In many European countries, e.g. Germany and Sweden, secondary education consists partly of vocational programs that prepare individuals for work in specific occupations. The main argument for providing such programs is that equipping students with specific job-related skills will facilitate their entry into the labor market and thereby make them productive at an earlier point (e.g. Hanushek *et al* 2011; Fersterer *et al* 2008). Secondary schools in others countries, e.g. the United States, focus more exclusively on general academic education, which should provide broad knowledge and serve as a basis for further learning. Equipping students with general skills is often considered to be particularly important in a fast-changing economy, as it should enable individuals to change occupations and respond more quickly to technological change (e.g. Goldin 2001).[1] There may thus be a trade-off between short-term and long-term costs and benefits of vocational versus general education: While vocational education may facilitate school-to-work transitions, initial employment gains could be offset by higher unemployment later on if occupational skills become obsolete at a faster rate (Hanushek *et al* 2011). The previous literature also highlights another potential trade-off: as general academic programs are likely to have more demanding graduation requirements they may improve labor market outcomes for some, but may at the same time be associated with higher dropout rates among those less likely to meet these requirements (e.g. Bishop and Mane 2001; Dee and Jacob 2006). Generally, since selection into different types of educational programs is not random, evaluating their impact on individuals' labor market outcomes is very difficult.

This paper investigates whether more general education reduces the risk of future unemployment by examining how individuals with varying amount of general upper secondary education fared on the labor market during the "Great Recession" (2008–2010). In order to the estimate the causal impact of differences in educational content, I exploit a reform of vocational programs in the Swedish upper secondary school system in the beginning of the 1990s. Before this reform, vocational education programs were two years long and consisted almost exclusively of vocational training. Through the reform they were prolonged by an additional year and obtained a considerably larger

[1] Krueger and Kumar (2004a; 2004b) argue that that the focus on general rather than vocational education may be a reason for differences in grown rates between United States and Europe.

general content. Vocational students thereby became eligible for university studies. In the years preceding the reform, longer and more general vocational tracks were tried out in a large-scale pilot scheme. The pilot, which involved around half of Sweden's municipalities and three cohorts of students, provides a unique setting for testing whether a more general curriculum reduces the risk of future unemployment.

While several studies have compared labor market outcomes for individuals with different proportions of general and vocational courses in their high school curricula, they have rarely accounted for the fact that selection into different educational tracks is most likely based to a large extent on unobservable characteristics.[2] Only a couple of papers have exploited policy changes that give rise to (potentially) exogenous shifts in curriculum content. Malamud and Pop-Eleches (2010) study an educational reform in Romania in 1973 that shifted a large fraction of students from vocational to general education. They use this reform to examine the relative benefits of general versus vocational education during the country's transition to a market economy. Using a regression discontinuity design, they find no significant difference in unemployment or earnings between pre-reform and post-reform cohorts. Oosterbeek and Webbink (2007) investigate the effect of a Dutch reform in 1975 that prolonged three-year vocational tracks with an additional year of general education. The effect is estimated using a difference-in-differences approach where students in tracks that did not change length serve as a control group. They find no positive effect of the extra year of schooling on the vocational students' long-term wages. Hall (2012) studies the same pilot as in the current paper and concludes that entering a longer and more general vocational program increased the amount of upper secondary schooling obtained, but did not raise enrollment in university studies. It also does not seem to have affected individuals' wage earnings. Moreover, the more demanding programs significantly increased the dropout rate among weaker students. However, neither Oosterbeek and Webbink (2007) nor Hall (2012) considers impacts on the risk of unemployment. As pointed out by Malamud (2012), to the extent that a more general education helps to insure workers against ad-

[2] For examples of studies that are based on a selection on observables approach, see Kang and Bishop (1989), Arum and Shavit (1995), and Mane (1999). See also the review in Ryan (2001).

verse shocks on the labor market, it is possible that these benefits show up on the margin of unemployment and not on wages.[3]

This paper adds to this limited literature by investigating whether enrolling in a longer and more general vocational program affected the students' risk of unemployment later in life. To handle that selection into different educational tracks is likely to be endogenous, I follow Hall (2012) and take advantage of variation across municipalities and over time in the implementation of the pilot. This institutional feature creates a source of potentially exogenous variation in access to more general vocational tracks. The data come from administrative registers that cover the entire Swedish working-age population and contain a large set of individual characteristics (year of birth, foreign background, place of residence, etc.), parental characteristics and detailed annual information on each person's education, employment, and periods of registered unemployment. I can follow the individuals up until 2010; they have then reached their late 30s.

I find no evidence that enrolling in the longer and more general vocational programs implied a reduced the risk of experiencing unemployment during the 2008–2010 recession. Among students with low grades from compulsory school, entering a pilot program seems instead to have resulted in an increased risk of unemployment. This pattern is strongest among the male students, who exhibit a substantially increased risk of experiencing long periods of unemployment if entering the longer and more general programs. A likely explanation for the worse labor market outcomes for this group is the increased dropout rate from upper secondary school that resulted from the change of the programs.

The paper proceeds as follows: The next section describes the pilot and the labor market conditions during the pilot period. Section 3 discusses the empirical strategy and Section 4 presents the data. Section 5 reports the results as well as a variety of robustness checks. Section 6 concludes.

[3] There is also a related set of papers which study the return to specific high school courses, see e.g. Altonji (1995), Levine and Zimmerman (1995), and Rose and Betts (2004).

2 Institutional background

2.1 The pilot with longer and more general vocational tracks[4]

After completing nine years of compulsory schooling, students in Sweden are entitled to upper secondary education. Schooling at the upper secondary level is voluntary but the vast majority enrolls. In the end of the 1980s, almost 90 percent continued directly to upper secondary school. In recent years, the enrollment rate has been as high as 98 percent (National Agency for Education 2008). Upper secondary education consists of several different educational tracks to which individuals apply based on their compulsory school GPA. Students who have turned 20 are not entitled to enroll in a general upper secondary school, but may instead take courses at the upper secondary level within the adult education system.[5]

The Swedish upper secondary school went through a major reform in the beginning of the 1990s. Before the reform, upper secondary education consisted of a few academic and several vocational tracks. The vocational tracks were two years long and consisted mainly of vocational training. The academic tracks typically lasted three years and prepared the students for higher education. In the years leading up to the reform, around 45 percent of the upper secondary school students were enrolled in vocational tracks. Compared to the academic students, the vocational students were negatively selected in terms of compulsory school GPA and parents' educational background.[6]

The largest changes in the reform concerned the vocational tracks: They were prolonged from two- to three-year tracks, and received a considerably larger general content. The changes were motivated by the view that today's working life requires more general knowledge, and that a broader education would make the students more flexible and better able to adapt to rapid changes in the requirements on the labor market (SOU 1996:1, Government Bill 1990/91:85). As a result of the reform, vocational students also attained basic eligibility for university studies.[7] Figure 1 illustrates the Swedish school system before and after the reform. (Table A 1 in the appendix lists the vocational tracks that existed during this time period).

[4] This section draws heavily on Hall (2012) to which I refer for further details.
[5] Within the adult education system, both those who lack any upper secondary education and those who dropped out before graduating can finalize a degree. It is also possible to supplement e.g. a two-year upper secondary degree in order to obtain a three-year degree. See Stenberg (2009) for more information on the adult education system.
[6] Own calculations based on the Upper Secondary School Application Record for 1986–1990.
[7] Note that 'basic eligibility' does not mean eligibility to all university programs as some have special requirements.

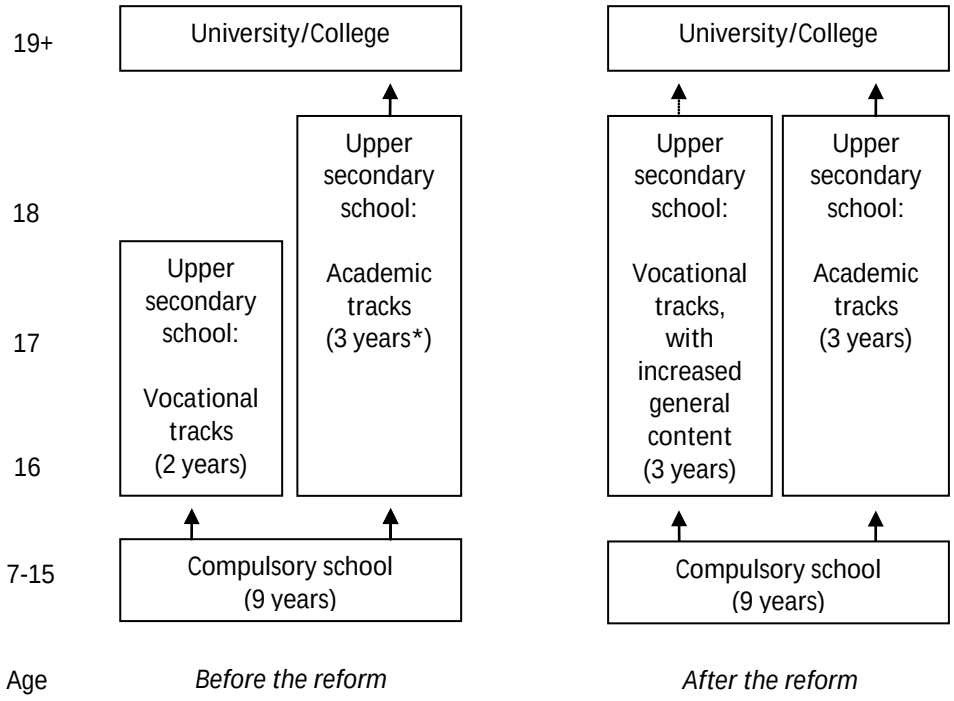

Figure 1. The Swedish school system before and after the reform

Note: *) There was also a small proportion of 2-year academic tracks as well as one 4-year academic track. Regardless of track length, all academic tracks gave eligibility to university studies.

The reform was preceded by a nation-wide pilot period during 1988–1993 in which longer and more general vocational tracks were tried out in several municipalities.[8] While Swedish was the only general theoretical subject included in all of the regular two-year vocational tracks, the three-year pilot tracks also contained English, Social Studies and an elective course. Math appears to be by far the most common choice of elective.[9] Another difference between the pilot and the regular vocational tracks was that the former located a larger share of the vocational training in workplaces rather than in schools.[10]

The pilot comprised around 6,000 educational slots in 1988, 10,000 in 1989, and 11,200 in 1990. On top of this, there was a very limited 'pre-pilot' in 1987 which only

[8] This extensive pilot was the outcome of a thorough evaluation of the vocational upper secondary education conducted by a government appointed committee. The pilot is described in Government Bill 1987/88:102.
[9] The National Board of Education (1990a) reports that 86 percent of the students in 1988 chose Math as elective.
[10] About 40 percent of the extended time seems to have consisted of general theoretical courses for most tracks (own calculations based on information provided in Government Bill 1987/88: 102, p. 35–39). For the 3-year pilot tracks, around 22 percent of the total number of hours consisted of general theoretical courses; for most of the 2-year tracks around 13 percent of the time seems to have been devoted to general theoretical content. Compared to the pilot tracks, the 3-year programs that were implemented after the reform contained even more general courses and somewhat less training in workplaces.

contained 500 available places.[11] The number of three-year slots thereby corresponded to between 1 and 20 percent of the total number of available places in vocational tracks.[12] For the current study it is important to point out that the total number of slots in vocational tracks did not expand due to the pilot; rather a class in the pilot always replaced a class in a corresponding two-year track.

The National Board of Education was in charge of distributing the pilot slots among the different vocational tracks as well as among the municipalities.[13] The allocation of slots among the different tracks was done proportionally; the goal was that each track would receive the same share of three-year vocational slots as they received of two-year slots. However, some tracks were not included the first years as their curricula had not yet been prepared. Table 1 lists the tracks that were included each year as well as their number of available slots.[14]

Table 1. Number of educational slots by pilot track and year

	1987	1988	1989	1990
	No. of slots	No. of slots	No. of slots	No. of slots
Electrical engineering	48	528	656	776
Health care	46	2,182	2,918	3,072
Heating, ventilation and sanitation	64	64	72	104
Industry	352	1,608	1,952	1,968
Business and services		210	660	990
Caring services: children and youth		256	420	420
Construction		296	408	432
Textile and clothing manufacturing		136	208	224
Transport and vehicle engineering		752	992	1,056
Use of natural resources		352	640	720
Constructional metalwork			56	56
Food manufacturing			224	256
Handicraft			32	64
Painting			56	88
Process technology			176	208
Restaurant			336	416
Wood technology			144	168
Graphic				112
Total	**510**	**6,384**	**9,950**	**11, 130**

Source: National Board of Education (1988), (1989a), (1989b), and (1990b).

The government stipulated that the pilot be distributed between regions with different industry and population structures. It also stated that different regions should participate to different extents: in some regions all or a large share of the vocational tracks should

[11] The tracks in the 'pre-pilot' differed somewhat from those in the actual pilot as they did not contain more extensive workplace training.
[12] Calculations based on statistics from the National Board of Education (1988), (1989a), (1989b), and (1990b).
[13] The implementation process in 1988 and 1989 is described in SOU 1989:106. The implementation in 1990 has not been documented, but was most likely carried out according to the same principles. There is unfortunately no available documentation of the implementation of the pre-pilot scheme in 1987.
[14] The share vacant slots in the pilot varied from 0.03 in 1987 to 0.07 in 1990. The share vacant slots was in general somewhat lower for the pilot tracks than for the regular vocational tracks.

be prolonged to three-year tracks; in others only a few of the tracks should be prolonged. These demands were made for evaluation purposes: The government wanted to get an idea of how the more extensive workplace training worked in different types of labor markets, and if it would be a strain on the local labor market if it was implemented on a large scale. On top of these criteria, the National Board of Education tried to assess whether the local labor market would be able to arrange the extended workplace training in a relatively short time.[15] This concern seems to have led to that some priority was given to municipalities with a tradition of involving workplace training in the vocational education. The initiative to participate always came from the municipalities themselves as they had to apply in order to be considered. The interest was large; each year the demand for pilot slots by far exceeded the number of available places.

Sweden had 284 municipalities at the time. Only around 70 percent offered vocational tracks. Students from the other (typically small) municipalities could apply to a school in a nearby municipality if they wanted to obtain a vocational degree.[16] The 'pre-pilot' in 1987 involved less than 10 percent of the municipalities. When the actual pilot started in 1988 about 40 percent were granted participation, and in 1990 the share had increased to about 52 percent. The extent to which the municipalities participated also increased over time, as the pilot was extended to more tracks in municipalities that already participated. Figure 2 shows the share of municipalities that participated each year as well the extent of their participation.

It is clear from the figure that most of the participating municipalities offered both two- and three-year vocational tracks. It happened that the very same track was offered both as a two- and as a three-year option within the same municipality. Also in municipalities that only offered either two- or three-year tracks, students could sometimes have a choice of program length if a nearby municipality offered tracks of a different length. Hence, the pilot generates a setting where some students were given the choice of enrolling in a more general three-year, rather than an ordinary two-year, vocational track. The degree to which an individual had this choice depended jointly on where he or she lived, and which year he or she finished compulsory school.

[15] To judge this they relied on recommendations from employer and union representatives in different sectors.
[16] In general, students attended schools in their municipality of residence, but if the track they wanted to attend was not offered they could apply to a school in a nearby municipality.

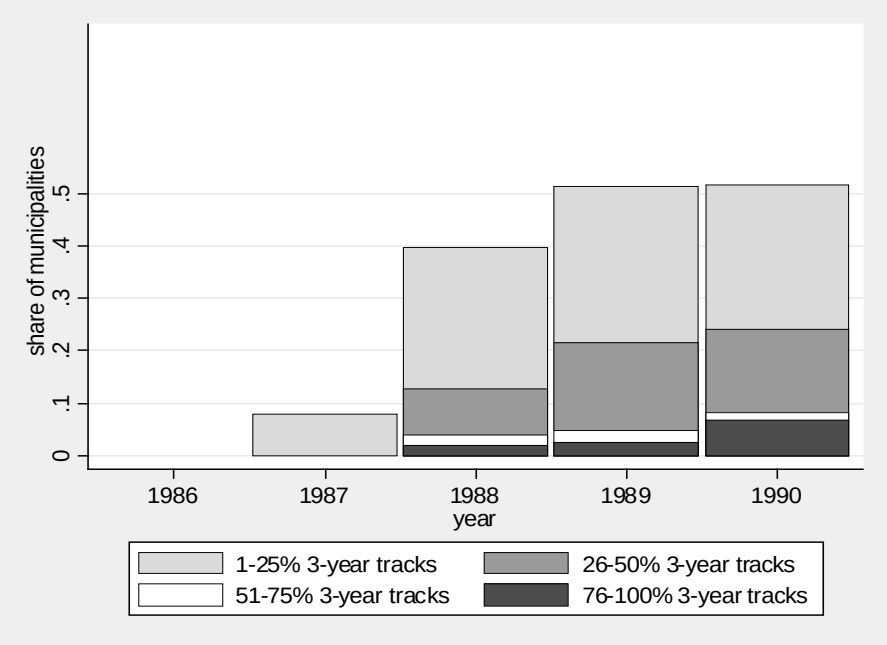

Figure 2. Share of municipalities that participated in the pilot each year, and the extent of their participation

Note: '% 3-year tracks' is the percent of all vocational tracks available in a municipality which were part of the pilot. *Source*: Figure 1 in Hall (2012). The calculations are based on the Upper Secondary School Application record.

2.2 Labor market conditions during the pilot period

The pilot took place during an increasingly turbulent period on the Swedish labor market, where the unemployment rate rose to higher levels than at any time since the 1930s. Figure 3 shows the average local unemployment rate among municipalities that participated in the pilot to different extents. Municipalities with an above-average share of three-year vocational tracks in 1990 are referred to as 'high-level municipalities', and those with a below-average share are referred to as 'low-level municipalities'.[17] We can see that the unemployment rate rose steeply in the beginning of the 1990s, i.e. at the time when the last cohorts that could enter the pilot finished their upper secondary education. The figure also illustrates that the unemployment rate in general was somewhat higher in municipalities that participated to a high degree in the pilot.

[17] The average share of three-year vocational tracks in 1990 was 0.18. Note that 'low level group' includes municipalities that did not participate in the pilot at all.

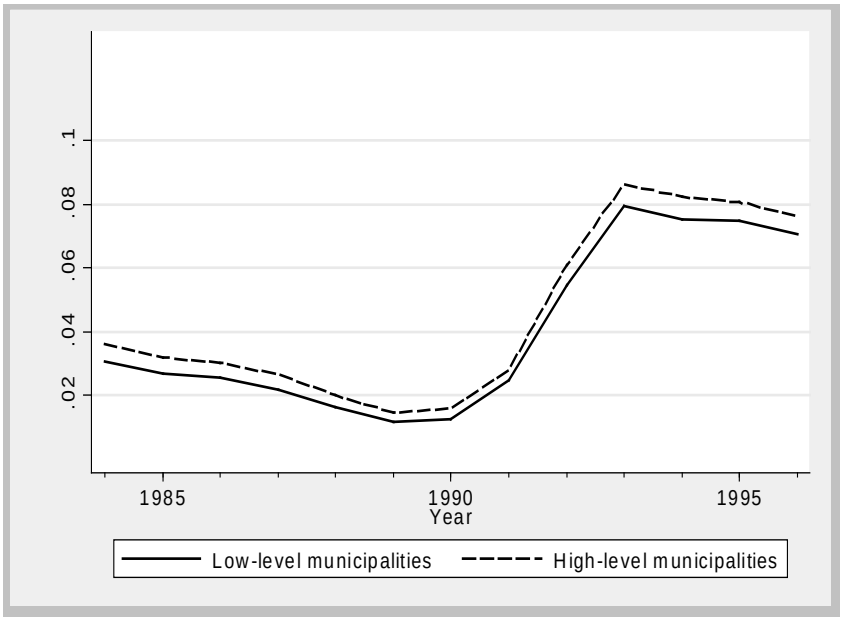

Figure 3. Average unemployment rate among municipalities that participated in the pilot to different extents, 1985–1996

Note: Share of population aged 16–64 that was registered as unemployed at the Public Employment Service. 'High (Low) level municipalities' refers to municipalities where the share of three-year tracks was above (below) the average in 1990. *Source*: the Public Employment Service.

3 Empirical strategy: using the pilot as a policy experiment

The aim of this paper is to estimate the impact of enrolling in a longer and more general vocational track on future unemployment. Consider the following baseline specification:

$$Unemployed_{ijk} = \beta General_{ijk} + \boldsymbol{\delta}\mathbf{X}_i + \gamma_j + \mu_k + \varepsilon_{ijk} \quad (1)$$

where subscript *i* refers to individual, *j* municipality of residence, and *k* which year the individual enrolled in upper secondary school. $Unemployed_{ijk}$ is an indicator equal to one if individual *i* was unemployed during a specific year and zero otherwise; $General_{ijk}$ is a dummy variable which takes the value one if the individual enrolled in a more general three-year vocational track and zero if he/she enrolled in a regular two-year track; $\mathbf{X}_i$ is a vector of individual and parental characteristics (sex, age at enrolment, foreign background, final GPA from compulsory school, the parents' highest education level and whether both of the parents have immigrant background[18]); γ_j and μ_k denote

[18] The background characteristics are displayed in Table A.2.

municipality of residence and upper secondary school starting year fixed effects; and ε_{ijk} is an error term. The parameter of interest is thus β which ideally captures the causal effect of enrolling in the longer and more general vocational program.

Even though the model contains a rich set of covariates, including a measure of ability (compulsory school GPA), one could still be concerned that standard OLS estimates may be biased due to non-random selection into different educational tracks. We cannot to rule out the possibility that ε_{ijk} contains unobserved factors which are correlated with an individual's choice of track. For instance, individuals with higher career aspirations may be more likely to choose the longer and more general track and may also have a lower risk of future unemployment.

To account for endogenous selection into different tracks, I follow Hall (2012) as well as Grönqvist and Hall (2011), and take advantage of variation across municipalities and over time in the implementation of the pilot.[19] As described earlier, the pilot gave some students the opportunity of enrolling in a more general three-year, rather than a regular two-year, vocational program. The extent to which a person had this opportunity depended on which year he/she finished compulsory school, as well as on his/her municipality of residence. I argue that this plausibly exogenous variation, conditional on upper secondary school starting year and municipality of residence, is a valid instrument for the chosen track.

More specifically, the instrument is the degree to which the individual's municipality of residence participated in the pilot by the time he/she enrolled in upper secondary school, as measured by the share of the available vocational tracks which were part of the pilot, i.e. $N^{-1}\sum_{l}^{N} 1\{Track_l > 2 year\}$[20].[21] I measure municipality of residence during the fall semester of the individual's last year of compulsory school in order to avoid the possibility that municipality of upper secondary school attendance could be endogenous with respect to the location of the pilot.[22]

[19] Similar strategies have also been used in other studies; see e.g. Duflo (2001).
[20] N is the number of available vocational tracks. The instrument is zero for municipalities that did not offer any vocational tracks.
[21] Ideally, the instrument would be measured as the share of the available *slots* in vocational tracks which represented three-year slots, but such data is not available at the municipality level.
[22] It seems unlikely that students would move already during compulsory school in order to take advantage of the pilot tracks, especially as it was already possible to apply to upper secondary schools in municipalities other than one's own. Moreover, the decision of where to locate the new available pilot slots each year was not taken until during the following spring, i.e. after the point in time when I measure municipality of residence. At least this was the

The instrument is valid under the assumption that it is not correlated with any unobserved variables affecting a person's risk of future unemployment, and that it had no impact on future unemployment other than through influencing whether the person enrolled in a pilot or a regular vocational program. Note that this entails assuming that the availability of pilot tracks did not affect an individual's choice of whether or not to enroll in a vocational track at all. In the empirical analysis I provide several pieces of evidence that support the validity of these assumptions (see Section 5.2).

If the effect of entering a pilot-program varies across individuals, the IV estimate should be interpreted as the effect for individuals who on the margin are induced to select the new programs due to the availability of pilot programs in their home municipality, and the margin that varies with the instrument (e.g. Heckman and Vytlacil 2005). For this interpretation to be correct, increased availability of pilot programs in a municipality must never have reduced participation in three-year programs among those living in that municipality (monotonicity assumption).

As already discussed, the Swedish unemployment rate rose sharply in the beginning of the 1990s (see Figure 3). This means that students completing three-year pilot programs systematically graduated during worse labor market conditions than those belonging to the same cohort who completed regular two-year programs. The estimated effect of attending a three-year program will thus include the effect of graduating in a worse labor market situation. However, as the analysis will center on economic outcomes as late as 16–24 years after graduation, the labor market conditions at the time of graduation are likely to play a minor role for the interpretation of the results: Using data for roughly the same cohorts of vocational students, Nordström Skans (2011) finds that unemployment during the first year after graduation from upper secondary school increased the probability of unemployment during the subsequent five years. This effect however seems to decrease over time and is not statistically significant six years after graduation.

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case in 1988 and 1989, which were the years that involved the largest increases of pilot slots (see SOU 1989:106 for details); the decision process in 1987 and 1990 has not been documented.

4 Data and sample selection

The analysis exploits rich register data from Statistics Sweden and the Public Employment Service (PES). The registers from Statistics Sweden cover the entire working-age population during 1985–2010, and include a large set of individual characteristics (year of birth, foreign background, place of residence et.) as well as detailed information on each person's education and employment history. The individuals are also linked to their biological parents. The PES register contains information on unemployment periods for all unemployed persons who have been registered with the PES during 1991–2010.

One of the most central registers for this study is the Upper Secondary School Application Record, which contains information on when and where a person began upper secondary school as well as what track he/she enrolled in. I use this record to construct the sample of individuals, but also to obtain information on which municipalities participated in the pilot each year and to what extent they participated.

My sample consists of individuals who finished compulsory school during 1986–1990 and who enrolled in upper secondary school the same year. In the main analysis I focus on those who began vocational tracks.[23] An additional restriction that I impose is to only include pilot programs which corresponded to regular two-year vocational programs, and vice versa.[24] For 7.5 percent of this population information on some of the key variables is missing in the registers.[25] After excluding these individuals I have a sample of 186,871 persons.

The empirical analysis centers on the probability of being unemployed for different amounts of time during the "Great Recession" 2008–2010; the individuals are then 34–40 years old. I measure unemployment using the PES data, which implies that a person is considered to have been unemployed if he/she has been registered as unemployed with the PES.[26] Since registration with the PES is required in order to receive unemployment benefits, most unemployment spells should be included in this record. As an alternative indicator of labor market status I also use data on employment for the same

[23] In Section 5.2 I show evidence indicating that the pilot did not affect selection into vocational tracks or enrollment in upper secondary school.
[24] This restriction excludes students in the two smallest three-year tracks (Graphic and Handicraft); in total 125 persons. A few individuals who were younger than 16 or older than 19 upon entering upper secondary school are also excluded from the analysis.
[25] Most of them lack information on municipality of residence or compulsory school GPA.
[26] Time in labor market programs is treated as unemployment.

years. Employment is measured using Statistics Sweden's earnings-based definition, which counts a person as employed if he/she had earnings corresponding to at least one hour of work per week during the month of November.

The analysis also incorporates several background variables: sex; age at enrolment in upper secondary school; foreign background (defined as born in a non-Nordic country); final GPA from compulsory school; and municipality of residence the year before applying to upper secondary school. I also include information on the parents' highest education level (measured when the students enrolled in upper secondary school) and their foreign background. Table A 2 shows descriptive statistics for the sample of vocational students.

Figure 4 presents a simple graphical analysis, comparing the developments of (selected) student outcomes between municipalities that participated in the pilot to different extents. The students have again been separated into 'high-level' and 'low-level pilot municipalities' based on where they lived the year before they applied to upper secondary school.[27] The figure shows the difference between students from the two groups of municipalities, separately for different cohorts.[28] We can see that the educational variables are almost identical in high and low-level municipalities for students beginning upper secondary school 1985–1987; they start diverging in 1988 when the pilot was launched on a large scale. Students from high-level municipalities then become increasingly more likely to enroll in three-year vocational programs, and they are also more likely to have completed at least this level of education in their mid 30s.[29] Unemployment, on the other hand, is close to one percentage point higher in the high-level municipalities for all cohorts. Similarly, employment tends to be around one percentage point lower (though this difference generally is not statistically significant). For neither of these outcomes is there a detectable difference in developments depending on the municipalities' degree of participation in the pilot.

[27] Municipalities where the share of three-year vocational programs was above the average in 1990 are considered 'high-level pilot municipalities', and those with a lower than average share are considered 'low-level pilot municipalities'. The average share of three-year vocational programs in 1990 was 0.18. Note that 'low-level pilot municipalities' include municipalities that did not participate in the pilot at all.

[28] Note that the figure includes students who enrolled in upper secondary school in 1985, though this cohort (due to data restrictions) is not included in the sample which is analyzed in the paper.

[29] Note that the share completing at least three years of upper secondary education includes all individuals who have completed some type of post-secondary education.

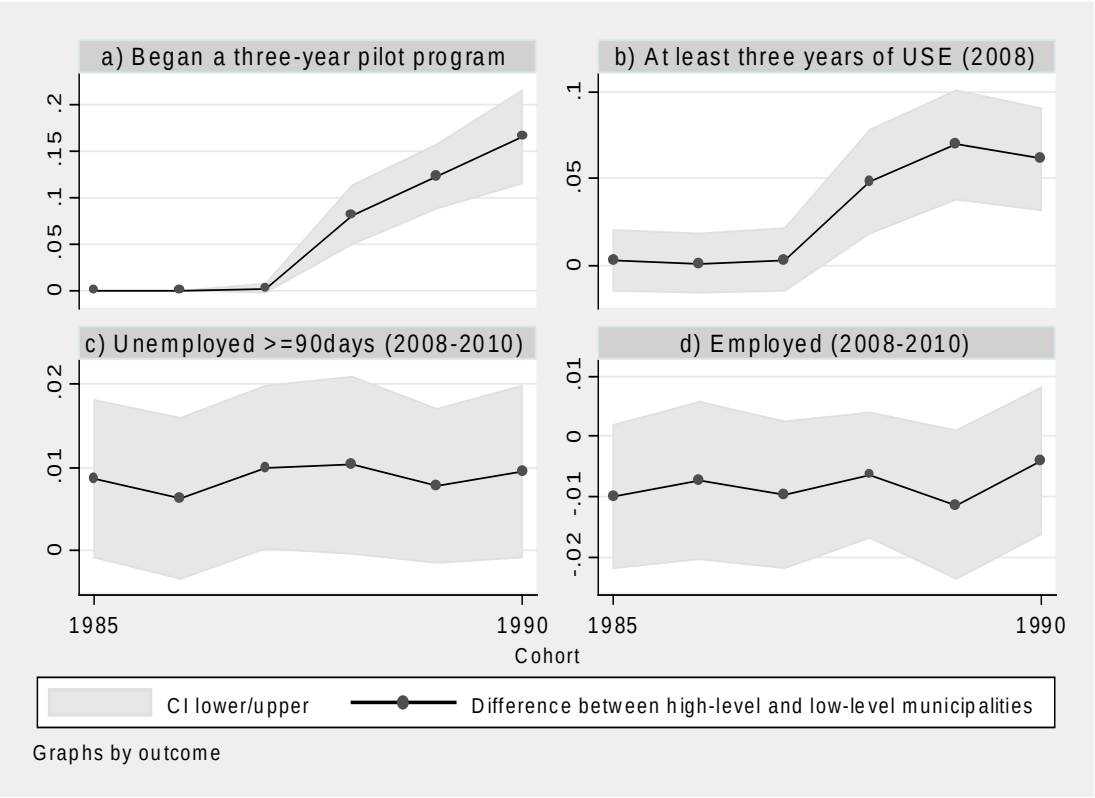

Figure 4. Difference between students from municipalities with high and low levels of pilot. Selected outcome variables.

Notes: 'High (low) level municipalities' refers to municipalities where the share of three-year programs was above (below) the average in 1990. The students are divided into groups based on where they lived the year before they applied to upper secondary school. USE=Upper secondary education. The figure includes individuals who finished compulsory school 1985–1990 and who enrolled in vocational programs in upper secondary school the same year.

5 Results

This section presents the results from the empirical analysis. I show results for the entire sample of vocational students, separately by gender, and for subgroups defined by the student's ability. Subsection 5.1 presents the main results and subsection 5.2 shows results from a number of robustness checks. In subsection 5.3 I extend the analysis by investigating if the effects vary over time or depend on local labor market conditions. I also examine whether there are heterogeneous effects by field of vocational education and whether attending the longer and more general programs affected the probability of working in more than one sector of the economy.

5.1 Effects on labor market outcomes during the 2008−2010 recession

Before presenting the main results I show estimates for the first-stage relationship, i.e. the effect of pilot intensity in a person's home municipality on his/her choice of voca-

tional program. Table 2 reveals that the first-stage relationship is strong: The coefficient for the instrument is statistically significant at the 1 percent level and suggests that increasing the fraction of three-year vocational programs in a municipality by, e.g., 50 percentage points, increases the probability that a student from that municipality enrolls in such a program by nearly 30 percentage points.[30] Standard F-tests clearly suggest that a weak instrument is not a concern.[31] Table A 2 presents separate first-stage estimates for the different subgroups, showing that the first-stage relationship is strong for all groups.

In Table 2 we can also see that the coefficient for the instrument is very robust to the inclusion of individual covariates in the model. The fact that the location of the pilot seems to be exogenous to observed individual characteristics suggests that it may also be uncorrelated with unobserved characteristics. The table also shows that the students in the longer and more general vocational programs are positively selected in terms of compulsory school GPA and parents' educational background. Gender and foreign background on the other hand do not seem to matter for the choice between a two-year and a three-year vocational program.

[30] The fact that there is not a one-to-one correspondence between the fraction of three-year programs and the probability that a student enrolls in such a program, is likely to be largely explained by the possibility to attend schools outside one's municipality of residence.
[31] Staiger and Stock (1997) suggest that an F-statistic less than 10 indicates weak instruments.

Table 2. First-stage regressions: The effect of pilot intensity on the probability of enrolling in a longer and more general vocational track

	(1)	(2)
Pilot intensity in municipality of residence (instrument)	.577***	.577***
	(.050)	(.050)
Age at enrolment (dummies)	No	Yes
Female		-.004
		(.008)
Final GPA compulsory school		.026***
		(.005)
Foreign-born		.007
		(.007)
Both parents are foreign-born		-.006
		(.004)
Parents' highest education level:		
Compulsory school < 9 years		Ref.
Compulsory school 9 years		-.000
		(.002)
Upper secondary education ≤ 2 years		.005***
		(.002)
Upper secondary education > 2 years		.011***
		(.003)
Post-secondary education < 3 years		.023***
		(.003)
Post-secondary education ≥ 3years		.032***
		(.004)
Information is missing		.007
		(.005)
Mean of dependent variable	.113	.113
F-statistic on the instrument	131.02	131.27
Number of obs.	186,871	186,871

Notes: The instrument is the share of available vocational programs in the municipality of residence at the time of enrollment which constituted three-year programs. Both regressions include municipality of residence and upper secondary school starting year fixed effects. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

Table 3 presents the estimated effects of entering a longer and more general vocational program on the probability of being unemployed, as well as employed, during the recession 2008−2010; the individuals are then 34–40 years old. The table displays both OLS and IV estimates. The OLS regressions reported include controls for individual characteristics, while the IV regressions are shown both with and without these controls.[32] As discussed in Section 3, even when the OLS regressions control for several key background characteristics, the estimates may be plagued by non-random

[32] To save space the table does not include estimates for the control variables (available on request). These tend to show that future unemployment is negatively correlated with compulsory school GPA and parents' education level, and positively correlated with being female and having immigrant background. The correlations with employment generally have the opposite signs.

selection into different educational programs and may therefore not represent causal effects.

The estimates in Panel A show that the policy change indeed brought about an increased education level among the vocational students. Entering a longer and more general vocational program increased the probability of obtaining three years of upper secondary education or a higher level of education by close to 40 percentage points.[33] The IV and OLS estimates are very similar. This result has previously been shown in Hall (2012), who also finds that enrolling in a new program had no effect on the education level beyond the upper secondary level.[34]

The estimated effects on unemployment are shown in Panel B. When interpreting these results we should note that because the policy change induced many students to obtain an additional year of upper secondary schooling they would often enter the labor market one year later than those of the same cohort who enrolled in two-year programs, and, as a result, generally have less work experience early on in their labor market careers. The regressions in Table 3 do not control for years of education or experience. Hence, the estimated effects of entering a three-year program will depend on, among other things, how the labor market values more schooling relative to more experience.

I present results for three different indicators of unemployment corresponding to the prevalence of at least 90, 180 and 360 days of unemployment during the period 2008–2010. The OLS estimates (Col. 1) suggest that attending a longer and more general vocational program is associated with a lower risk of unemployment, as measured by all three unemployment variables. The IV estimates (Col. 2–3) on the other hand point to a different conclusion: If anything, they suggest that entering a pilot program increased the risk of unemployment during this time period. However, only the last variable capturing unemployment (unemployed ≥360 days) is statistically significant and only at the 10 percent level.

Panel C shows the estimated effect on the probability of being employed each year during the same time period. The OLS regression suggests a positive effect of the longer and more general programs, while the IV estimates have a negative sign but, again, are not significantly different from zero.

[33] This effect may seem small given the content of the policy change. The main reason that the increase is not larger than this is that many students from two-year vocational programs also manage to obtain this level of education.
[34] She finds no effect on university enrolment or graduation.

An additional point to note in relation to Table 3 is that the IV estimates change very little as covariates are added to the model (compare Col. 2 and 3). The fact that the estimates are robust to including controls for some arguably important background characteristics suggests that omitted individual characteristics could be unimportant as well. Section 5.2 presents results from further robustness checks.

Table 3. Effects of enrolling in the longer and more general vocational program on the probability of unemployment and employment during the recession 2008−2010

	All vocational students		
	(1)	(2)	(3)
Outcome variable:	OLS	IV	IV
A. Level of education in 2008			
At least three years of upper	.368***	.389***	.389***
secondary education	(.005)	(.025)	(.022)
Outcome mean	.469	.469	.469
Number of obs.	182,863	182,863	182,863
B. Unemployment 2008–2010			
Unemployed ≥90 days	-.009***	.013	.011
	(.003)	(.013)	(.012)
Outcome mean	.128	.128	.128
Unemployed ≥180 days	-.007***	.020	.019
	(.002)	(.012)	(.012)
Outcome mean	.094	.094	.094
Unemployed ≥360 days	-.003*	.018*	.017*
	(.002)	(.010)	(.010)
Outcome mean	.053	.053	.053
Number of obs.	186,871	186,871	186,871
C. Employment 2008–2010			
Employed all three years	.012***	-.010	-.007
	(.003)	(.015)	(.015)
Outcome mean	.851	.851	.851
Number of obs.	182,123	182,123	182,123
All control variables included	Yes	No	Yes

Notes: Each cell represents a separate regression. All reg. include municipality of residence and upper secondary school starting year fixed effects. Col. (1) and (3) additionally control for: gender, age at enrolment (dummies), compulsory school GPA, foreign background, the parents' highest education level (6 levels), whether both parents are foreign-born and missing data on parents' education. The (potentially) endogenous variable takes the value one if the individual enrolled in the three-year vocational program and zero if he/she enrolled in a two-year vocational program. The instrument is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

Table 4 displays results from separate regressions by gender (for the preferred model specification, i.e. Col. 3 in Table 3). Male and female students tend to enroll in different types of vocational programs, which is why it might be interesting to study them separately. While men most commonly chose a track within the technological/industrial

sector (almost 83 percent of the male vocational students chose a program within this sector), the most common sectors among women were health care/social services (51 percent) and economic/mercantile (31 percent). See Table A 3 for more details. Table 4 additionally shows results for subgroups defined by the student's ability, as measured by their compulsory school GPA. I define 'high GPA' as having a final compulsory school GPA that at least corresponds to the average among the vocational students in the sample, and 'low GPA' as having a final GPA below this average.[35]

Panel A shows that entering a pilot program had a positive effect on the education level in all subgroups: the probability of obtaining at least three years of upper secondary education increased by between 23 and 50 percentage points. The effect is larger among students with a low compulsory school GPA, and larger among men than among women.

Examining the effects on labor market outcomes in Panels B–C, we can see that for none of the variables or subgroups is there evidence of improved labor market attachment during the 2008−2010 recession due to attending the longer and more general vocational programs. We can also see that the increased risk of long periods of unemployment – which was hinted at in Table 3 – is concentrated to men, and among men, to those who finished compulsory school with poor grades (Col. 2). For this group, the results clearly suggest an increased risk of unemployment as measured by all three unemployment variables. The estimates in Col. 2 suggest that, for this group, enrolling in a pilot program increased the probability of experiencing 180 days or more of unemployment by 5.2 percentage points, and the probability of 360 days or more of unemployment by 3.4 percentage points. These estimates are statistically significant at the 1 and 5 percent level, respectively. In relation to the mean of the dependent variables these estimates correspond to increases of around 45-50 percent (.052/.115; .034/.068).

For students with poor previous grades, Hall (2012) identifies a large increase in the probability of dropping out due to entering the longer and more general vocational programs.[36] Many of these dropouts may still have obtained more general education than if they would had they entered a less general two-year program, particularly if they

[35] During this time period Sweden used relative grades. Students were graded on a 1–5 scale, which was supposed to follow a normal distribution, with a mean of 3, on the national level.

[36] Enrolling in a pilot program is estimated to have increased the probability of dropping out by 8.3 percentage points among students with a below-average compulsory school GPA. In relation to the mean of the dependent variable this corresponds to an increase of around 50 percent.

dropped out during the third year.[37] Nevertheless, the lack of a complete degree may be a more likely explanation to their worse labor market outcomes than the increased general content of their education.

Table A 4 presents reduced-form estimates from regressing individuals' labor market outcomes on pilot intensity directly. Hence, it gives us the total effect of increasing the share of longer and more general vocational programs in a municipality for each sub-group. The qualitative pattern of results is very similar to that of the IV analysis.

Table 4. Effects of enrolling in the longer and more general vocational program. Separate estimates by gender and ability

	Male vocational students			Female vocational students		
	All	Low GPA	High GPA	All	Low GPA	High GPA
Outcome variable:	(1)	(2)	(3)	(4)	(5)	(6)
A. Level of education in 2008						
At least three years of upper secondary education	.452*** (.027)	.496*** (.033)	.398*** (.038)	.248*** (.042)	.297*** (.074)	.225*** (.050)
Outcome mean	.399	.320	.491	.572	.444	.646
Number of obs.	109,237	58,636	50,601	73,626	27,118	46,508
B. Unemployment 2008–2010						
Unemployed ≥90 days	.010 (.015)	.041* (.023)	-.024 (.021)	.013 (.028)	.027 (.060)	.004 (.028)
Outcome mean	.119	.153	.080	.141	.200	.107
Unemployed ≥180 days	.022 (.014)	.052*** (.020)	-.010 (.018)	.012 (.025)	.014 (.055)	.011 (.025)
Outcome mean	.088	.115	.056	.103	.153	.074
Unemployed ≥360 days	.020** (.009)	.034** (.013)	.005 (.013)	.009 (.021)	-.014 (.052)	.017 (.019)
Outcome mean	.049	.068	.027	.058	.092	.038
Number of obs.	111,709	60,032	51,677	75,162	27,627	47,535
C. Employment 2008–2010						
Employed all three years	-.005 (.018)	-.016 (.025)	.008 (.020)	-.003 (.030)	-.013 (.073)	.009 (.032)
Outcome mean	.881	.845	.923	.807	.732	.852
Number of obs.	108,737	58,350	50,387	73,386	27,023	46,363
Method	IV	IV	IV	IV	IV	IV
All control var. included	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each cell represents a separate regression. All reg. control for municipality of residence and upper secondary school starting year fixed effects as well as compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average. The (potentially) endogenous variable takes the value one if the individual enrolled in a three-year vocational program and zero if he/she enrolled in a two-year vocational program. The instrument is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

[37] Note that the general courses were not concentrated to the third year. The schools could choose themselves how to distribute the courses across the three years, but were urged not to allocate more than a third of the general content to the first year (Government Bill 1987/88:102, p. 43) and to devote 60 percent of the last year to vocational training in workplaces (ibid., p. 18).

All estimates for women presented so far are very imprecise. In order to increase precision I have performed some further analyses, invoking some additional assumptions. As noted above, the vocational tracks are highly segregated by gender. I take this into account and redefine the instrument (pilot intensity) assuming that tracks where less than 5 percent (as well as less than 10 percent) of the students are women do not provide a relevant alternative for female students; consequently these tracks are removed when pilot intensity is computed. The same is done for the male students.[38] Hence, the instrument now differs by gender. Table 5 shows results from regressions based on these alternative instruments. The estimates for men stay very similar, which is not surprising as the new instruments for men turn out to be highly correlated with the original instrument (the correlation coefficients are 0.995 and 0.982, respectively). For women, where the new instruments exhibit a weaker correlation with the original instrument (0.928 and 0.785, respectively), the estimates change more and now become more in line with those of men. When tracks with less than 10 percent women are excluded in the computation of pilot intensity, there are some indications of an increased risk of unemployment due to entering the longer and more general programs among women with poor compulsory school GPA as well. However, for women the effect is only statistically significant (at the 10 percent level) for short (≤90 days) unemployment periods, as well as for the indicator of employment. Again, the worse labor market outcomes for this group may be explained by the increased dropout rate that resulted from the change of the programs.

[38] For women (men), pilot intensity is thus defined as the share of the available vocational tracks with at least 5 (or 10) percent women (men) that were part of the pilot.

Table 5. Effects of enrolling in the longer and more general vocational program. Regressions using alternative definitions of the instrument

	Male vocational students			Female vocational students		
	All	Low GPA	High GPA	All	Low GPA	High GPA
Outcome variable:	(1)	(2)	(3)	(1)	(5)	(6)
A. Unemployment 2008–2010						
Unemployed ≥90 days:	.010	.041*	-.024	.013	.027	.004
original instrument	(.015)	(.023)	(.021)	(.028)	(.060)	(.028)
Unemployed ≥90 days:	.010	.042*	-.024	.019	.071	-.010
alt. instrument 5% excl.	(.015)	(.022)	(.020)	(.026)	(.057)	(.028)
Unemployed ≥90 days:	.012	.046**	-.026	.027	.103*	-.008
alt. instrument 10% excl.	(.015)	(.021)	(.020)	(.026)	(.054)	(.028)
Outcome mean	.119	.153	.080	.141	.200	.107
Unemployed ≥180 days:	.022	.052***	-.010	.012	.014	.011
original instrument	(.014)	(.020)	(.018)	(.025)	(.055)	(.025)
Unemployed ≥180 days:	.021	.051***	-.010	.026	.064	.006
alt. instrument 5% excl.	(.014)	(.019)	(.018)	(.026)	(.058)	(.026)
Unemployed ≥180 days:	.023*	.053***	-.010	.024	.077	-.001
alt. instrument 10% excl.	(.013)	(.019)	(.017)	(.025)	(.057)	(.025)
Outcome mean	.088	.115	.056	.103	.153	.074
Unemployed ≥360 days:	.020**	.034**	.005	.009	-.014	.017
original instrument	(.009)	(.013)	(.013)	(.021)	(.052)	(.019)
Unemployed ≥360 days:	.019**	.033*	.003	.029	.029	.027
alt. instrument 5% excl.	(.009)	(.013)	(.013)	(.023)	(.054)	(.020)
Unemployed ≥360 days:	.019*	.031**	.005	.035	.051	.028
alt. instrument 10% excl.	(.009)	(.013)	(.012)	(.023)	(.052)	(.019)
Outcome mean	.049	.068	.027	.058	.092	.038
Number of obs.	111,709	60,032	51,677	75,162	27,627	47,535
B. Employment 2008–2010						
Employed all three years :	-.005	-.016	.008	-.003	-.013	.009
original instrument	(.018)	(.025)	(.020)	(.030)	(.073)	(.032)
Employed all three years:	-.005	-.015	.008	-.004	-.065	.032
alt. instrument 5% excl.	(.018)	(.024)	(.020)	(.031)	(.075)	(.033)
Employed all three years:	-.002	-.012	.011	-.017	-.121*	.035
alt. instrument 10% excl.	(.017)	(.023)	(.020)	(.031)	(.069)	(.033)
Outcome mean	.881	.845	.923	.807	.732	.852
Number of obs.	108,737	58,350	50,387	73,386	27,023	46,363
Method	IV	IV	IV	IV	IV	IV
All control var. included	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each cell represents a separate regression. All reg. control for municipality of residence and upper secondary school starting year fixed effects as well as compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average. The (potentially) endogenous variable takes the value one if the individual enrolled in a three-year vocational program and zero if he/she enrolled in a two-year vocational program. The original instrument is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. For women (men), the alternative instrument is the share of available vocational programs with at least 5/10 percent women (men) which constituted three-year programs. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

5.2 Robustness checks

Recall that the identification strategy relies on the following assumptions: The instrument should not be correlated with any unobserved variables affecting a person's risk of future unemployment, and it should have no impact on future unemployment other than through influencing whether the person enrolled in a pilot or a regular vocational program. Below I present results for some tests of the validity of these assumptions.

A first potential concern is that the availability of more general vocational programs may have influenced individuals' choice between obtaining a vocational or an academic degree. If this is the case, it could be problematic to restrict the sample to vocational students as this could introduce some sample selection issues that could bias the results. Note however that this is only a concern to the extent that the included covariates are not rich enough to account for such compositional changes. In order to investigate this concern, I have regressed an indicator of enrolling in a vocational rather than an academic program on the intensity of the pilot in the student's home municipality, controlling for municipality and school starting year fixed effects as well as the other covariates. Table 6 displays results both for the full sample of upper secondary school students and separately by gender and compulsory school GPA. The results show that access to the pilot had no statistically significant impact on the probability of selecting a vocational rather than an academic program, suggesting that this type of selection should not cause too much concern.[39]

[39] As noted in Grönqvist and Hall (2011) there was some uncertainty about the localization of the pilot programs at the time when students applied to upper secondary school. This might be one explanation for why the pilot programs do not seem to have attracted students from academic programs. SOU 1989:90 and SOU 1990:75 report that the decision of where to locate new pilot tracks was sometimes taken *after* the deadline for application to upper secondary school. Case studies of the implementation process describe how municipalities then let the students who had already applied to vocational tracks reapply in order to be considered for the new tracks. These practices might however have differed across municipalities.

Table 6. Effects of pilot intensity on the probability of enrolling in a vocational rather than an academic program

	All students	Male students		Female students	
		Low GPA	High GPA	Low GPA	High GPA
	(1)	(2)	(3)	(4)	(5)
A. Without covariates					
Pilot intensity in municipality of residence	.012	.003	.005	-.021	.013
	(.012)	(.018)	(.016)	(.033)	(.018)
B. Covariates included					
Pilot intensity in municipality of residence	.008	.006	.017	-.022	.012
	(.012)	(.019)	(.016)	(.033)	(.017)
Mean of dependent variable	.452	.921	.341	.879	.288
Number of observations	413,506	65,162	151,744	31,437	165,163

Notes: OLS estimates. Each cell represents a separate regression. Pilot intensity is the share of available vocational tracks which constituted three-year tracks at the time of enrolment. All reg. control for municipality of residence and upper secondary school starting year fixed effects. Panel B additionally controls for: sex, age at enrolment (dummies), compulsory school GPA, foreign background, the parents' highest education level (6 levels), whether both parents are foreign-born and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average. The sample consists of all students who began upper secondary school during 1986–1990. Robust standard errors in parentheses allow for clustering by municipality of residence. */** denotes significance on the 10/5 percent level.

Although this seems less likely, it is possible that the introduction of longer and more general vocational programs affected students' decision of whether or not to enroll in upper secondary school at all. To examine this concern, I have done a similar exercise but instead using data on all students who finished compulsory school during 1988–1990.[40] Table 7 shows that there is no statistically significant correlation between the pilot intensity in the municipality of residence and the probability of continuing to upper secondary school.[41]

[40] Data on compulsory school graduation are not available before 1988.

[41] I do not have access to background characteristics for all individuals in the compulsory school sample, why this model is only estimated without covariates and only for the full sample of students.

Table 7. Effects of pilot intensity on the probability of continuing directly to upper secondary school

	All students finishing compulsory school
Pilot intensity in municipality of residence	-.008
	(.014)
Mean of dependent variable	.854
Number of obs.	327,892
Covariates included	no

Notes: Pilot intensity is the share of available vocational tracks which constituted three-year tracks at the time of enrolment. The regression controls for municipality of residence and upper secondary school starting year fixed effects. The sample consists of all individuals who finished compulsory school 1988–1990. Robust standard error in parentheses allows for clustering by municipality of residence. */** denotes significance on the 10/5 percent level.

Based on the results presented above, it seems unproblematic to restrict the sample to vocational students. However, I have also re-estimated all regressions including all upper secondary school students.[42] These results are shown in Table 8 (where the first row in each panel repeats the estimates from the main analysis). Note first that the samples of low ability students increase relatively little as academic students are included[43], showing that it is fairly uncommon that students with poor grades choose to enrol in academic programs. The samples of high ability students, on the other hand, become around three times as large. Note also that the estimated effects on educational attainment (Panel A) stay very similar as academic students are included in the regressions and that this holds across all subgroups.

The overall pattern of effects on labor market outcomes during the 2008−2010 recession (Panel B–E) also remains similar. The estimated effects on unemployment and employment generally have the same sign as when the sample is limited to vocational students, though many of the point estimates differ in size. Only one out of the 20 regressions indicates a statistically significant (at the 10 percent level) improvement in labor market attachment due to enrolling in the new programs. Hence, neither in this analysis is there any clear indication that attending a more general vocational programs improved students' labor market outcomes. The significant increase in the risk of unemployment due to attending the new programs among men with low GPA is visible also in these regressions, but is somewhat reduced in size.[44]

[42] These regressions estimate the effect of enrolling in the three-year more general vocational program compared to all other alternatives.
[43] The sample of male students increases by about 8.5 percent and the sample of females by about 13.5 percent.
[44] The patterns are similar if the regressions in Table 8 are instead estimated with the alternative, gender-specific, instruments (results available on request).

Table 8. Effects of enrolling in the longer and more general vocational program. Results for regressions including all upper secondary school students

	All	Male students		Female students	
		Low GPA	High GPA	Low GPA	High GPA
Outcome variable:	(1)	(2)	(3)	(4)	(5)
A. ≥ 3yrs of upper sec. educ. (2008)					
Sample=Vocational students	.389***	.496***	.398***	.297***	.225***
	(.022)	(.033)	(.038)	(.074)	(.050)
	[N=182,863]	[N=58,636]	[N=50,601]	[N=27,118]	[N=46,508]
Sample=All students	.395***	.506***	.411***	.306***	.208***
	(.029)	(.035)	(.047)	(.084)	(.062)
	[N=398,661]	[N=63,586]	[N=145,986]	[N=30,790]	[N=158,299]
B. Unempl. ≥90 days (2008–2010)					
Sample=Vocational students	.011	.041*	-.024	.027	.004
	(.012)	(.023)	(.021)	(.060)	(.028)
	[N=186,871]	[N=60,032]	[N=51,677]	[N=27,627]	[N=47,535]
Sample=All students	.019	.038	-.037	.026	.061
	(.018)	(.024)	(.025)	(.074)	(.052)
	[N=413,506]	[N=65,162]	[N=151,744]	[N=31,437]	[N=165,163]
C. Unemp. ≥180 days (2008–2010)					
Sample=Vocational students	.019	.052***	-.010	.014	.011
	(.012)	(.020)	(.018)	(.055)	(.025)
	[N=186,871]	[N=60,032]	[N=51,677]	[N=27,627]	[N=47,535]
Sample=All students	.010	.045**	-.037*	-.006	.025
	(.015)	(.022)	(.020)	(.064)	(.042)
	[N=413,506]	[N=65,162]	[N=151,744]	[N=31,437]	[N=165,163]
D. Unempl. ≥360 days (2008–2010)					
Sample=Vocational students	.017*	.034**	.005	-.014	.017
	(.010)	(.013)	(.013)	(.052)	(.019)
	[N=186,871]	[N=60,032]	[N=51,677]	[N=27,627]	[N=47,535]
Sample=All students	.014	.028*	-.005	-.017	.019
	(.013)	(.015)	(.016)	(.060)	(.033)
	[N=413,506]	[N=65,162]	[N=151,744]	[N=31,437]	[N=165,163]
E. Employed (2008–2010)					
Sample=Vocational students	-.007	-.016	.008	-.013	.009
	(.015)	(.025)	(.020)	(.073)	(.032)
	[N=182,123]	[N=58,350]	[N=50,387]	[N=27,023]	[N=46,363]
Sample=All students	.005	-.007	.018	-.028	.053
	(.020)	(.027)	(.032)	(.077)	(.055)
	[N=396,096]	[N=63,264]	[N=144,869]	[N=30,680]	[N=157,283]

Notes: IV estimates. Each cell represents a separate regression. All reg. control for municipality of residence and upper secondary school starting year fixed effects as well as compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average among the vocational students. The (potentially) endogenous variable takes the value one if the individual enrolled in a three-year vocational program and zero if he/she enrolled in a two-year vocational program or an academic program. The instrument is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

Since the models I estimate include municipality fixed effects, pilot intensity does not have to be unrelated to municipality characteristics for the empirical strategy to be valid. What could be problematic, however, is if there are different trends in unobserved characteristics across municipalities that participated in the pilot to different extents. As described in Section 2.1, the selection of pilot municipalities was partly based on the local labor market's (assumed) ability to arrange extended workplace training. One potential concern is if this could have meant that more pilot slots were systematically located to municipalities with more or less favorable developments on the labor market. Note first that Figure 3 suggests that this was not the case; the local unemployment rate seems in general to develop fairly similarly in municipalities that participated in the pilot to different extents. In order to more closely examine this concern I have regressed pilot intensity on the municipal unemployment rate, controlling for year and municipality fixed effects. The results from these regressions, which are displayed in Panel A of Table 9, suggest a negative relationship between the local unemployment rate and the intensity of the pilot; hence indicating that municipalities where labor market conditions developed relatively favorably during the pilot period participated to a somewhat higher degree. This pattern thereby suggests that enrolling in a pilot program may in fact be associated with worse labor market outcomes than what is indicated by the estimates presented in the paper.

In line with Hall (2012), I have also performed a similar test for the student background characteristics. These results, which are shown in Panel B of Table 9, indicate that pilot intensity is, for the most part, uncorrelated with changes in observed individual characteristics. Two of the estimates are indeed statistically significant, but in relation to the average pilot intensity, the magnitude of the correlations is rather small.

Table 9. Correlation between pilot intensity and sample characteristics

Dependent variable: Pilot intensity	Estimate	Standard error
A. Regression on municipality characteristics:		
Unemployment rate[1]	-.049*	.026
Mean of dependent variable	.110	
Number of observations	1,136	
B. Regression on individual characteristics:		
Final GPA compulsory school	-.0008	.0007
Female	.0001	.0005
Foreign-born	-.0010	.0018
Both parents are foreign-born	.0010	.0016
Enrolled in upper secondary school at:		
age 16 (=most common age)	Ref.	Ref.
age 17	-.0022*	.0013
age 18	-.0006	.0056
age 19	-.0308	.0201
Parents' highest education level:		
Compulsory school < 9 years	Ref.	Ref.
Compulsory school 9 years	-.0015	.0011
Upper secondary education ≤ 2 years	.0007	.0007
Upper secondary education > 2 years	.0009	.0010
Post-secondary education < 3 years	.0015*	.0008
Post-secondary education ≥ 3years	.0014	.0012
Information on parents' education is missing	.0019	.0022
Mean of dependent variable	.113	
Number of observations	186,871	

Notes: OLS estimates. Reg. A, which is based on municipal data for 1987–1990, controls for municipality and year fixed effects. Reg. B, which is based on the sample of vocational students, controls for municipality of residence and upper secondary school starting year fixed effects. "Pilot intensity" is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. [1]Unemployment is measured as percent of population aged 16–64 that was registered as unemployed at the PES. Robust standard errors clustered by municipality. */**/*** denotes significance on the 10/5/1 percent level.

In order to further examine whether the results could be distorted by differences in trends across regions, I have re-estimated the models controlling for linear as well as quadratic county-specific trends; see Table A 5. It is indeed possible that adding region-specific trends will control for actual responses to the policy change, and not just for pre-policy trends, and thereby lead to biased estimates (see Wolfers 2006). Nevertheless, it is reassuring to note that the main conclusion hold also in these regressions (though many point estimates differ a lot in size): Again there is no evidence that entering a longer and more general vocational program decreased the risk of unemployment during the 2008−2010 recession or increased chances of employment. For one

group of students – males with a low compulsory school GPA – entering a pilot program seems instead to have increased the risk of unemployment during these years.[45]

5.3 Extensions

In this subsection I extend the previous analyses by investigating if the effects of attending the longer and more general programs vary over time or depend on local labor market conditions. I also examine whether there are heterogeneous effects by field of vocational education and whether attending the new programs affected the probability of working in more than one sector of the economy.

Do the effects differ over time or depend on the local unemployment rate?

As discussed in the introduction, the effects of acquiring more general education on the risk of unemployment may differ over the life cycle; in particular, general skills may matter more in the long compared to the short run (Hanushek *et al* 2011). The effects may also differ over the business cycle. It is thus interesting to examine the time profile of the effects.

Figure 5 shows effects of enrolling in the longer and more general program by year, starting with year 2000; i.e. ten years after the last cohort under study enrolled in upper secondary school. Though even earlier effects could be of interest, these would be more difficult to interpret in the current setting: As mentioned earlier, students who completed three-year programs systematically graduated during worse labor market conditions than those of the same cohort who completed two-year programs (see Section 3 as well as Figure 3). The estimated effects of attending the longer and more general program will thus include the effect of graduating under worse labor market conditions. Using data from the same time period, Nordström Skans (2011) finds that unemployment during the first year after graduation from upper secondary school increased the probability of unemployment during the subsequent five years.[46] An additional difficulty when it comes to interpreting effects early on is that the pilot programs, on top of comprising more general courses, also involved more training in workplaces. More contacts with employers throughout the school years may also impact employment out-

[45] I have also re-estimated the models controlling for municipality-specific trends (linear as well as quadratic). The main conclusion hold also in these regressions, though the effects of entering the new programs are even less precisely estimated (results are available on request). Conclusions hold up also if Table A5 is instead produced using the alternative, gender-specific, instruments (results are available on request).

[46] Lasting effects of adverse initial labor market conditions have been found also in other countries; see e.g. Kahn (2010) and Oreopoulos *et al* (2012) for recent evidence from the US and Canada.

comes, perhaps particularly during the initial transition to the labor market. Hence, when it comes to labor market outcomes the first few years after graduation, it is harder to claim that any observed effects of attending the new programs should be mainly caused by the increased general content of the curriculum.

Figure 5 gives no indication that the importance of more general education for individuals' labor market attachment would increase with time since graduation, at least not during the age interval when I observe the individuals, i.e. up to their late 30s.[47] Almost all effects are statistically insignificant for all sub-groups. Only for men with below-average compulsory school GPA is there clear evidence of an impact of enrolling in the new programs. For this group we again observe an increased probability of unemployment, which, interestingly enough, is only statistically significant towards the end of the time period.[48] As discussed earlier, the worse outcomes for this group are probably more likely to be caused by an increased likelihood of not completing a degree than by an increased possession of general skills.

From Figure 5 it is also hard to detect any clear differences in effects depending on the business cycle. For instance, worse labor market outcomes for men with low GPA are observed also in 2007 when the national unemployment rate was fairly low (see Figure A 1 in the appendix).

[47] In Figure 5 the oldest cohort is observed at ages 30–40, and the youngest at ages 26–36.

[48] The pattern is similar if the outcome is instead unemployment for at least 90 days, or for at least 360 days. These results are available from the author. For women, the yearly effects are generally insignificant also if the alternative gender-specific instruments are used.

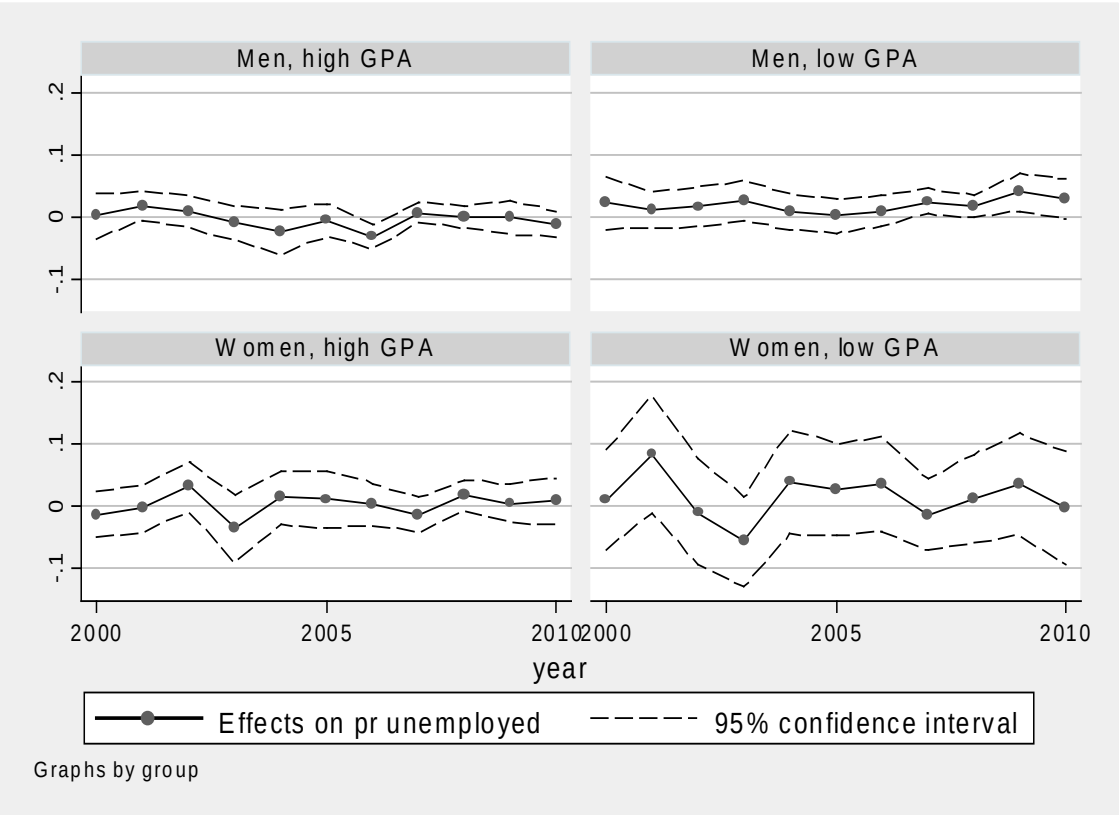

Figure 5. Effects on the probability of being unemployed 180 days or more, by year

Notes: IV estimates. The regressions control for municipality of residence and upper secondary school starting year fixed effects as well as compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average. Standard errors are robust and allow for clustering by municipality of residence.

As a more direct test of whether the effects depend on prevailing labor market conditions, I examine if there are heterogeneous effects depending on the labor market conditions in the individual's current location. Table 10 shows results from specifications which interact the instrument with the share of the population (aged 16–64) in the individual's current home municipality that is registered as unemployed at the PES.[49] If more general education can help to insure workers against the risk of unemployment, it is possible that beneficial effects on labor market outcomes would be more pronounced

[49] Both openly unemployed and participants in labor market programs are included.

when labor market conditions are weak.[50] However, as shown in the table, the coefficient for the interaction term is statistically insignificant for all sub-groups.[51]

Table 10. Effect of pilot intensity by local labor market conditions

	All vocational students	Males		Females	
		Low GPA	High GPA	Low GPA	High GPA
Outcome variable:	(1)	(2)	(3)	(4)	(5)
Unemployed ≥180 days, 2008–2010					
Average share of unemployed in current	.014***	.017***	.010***	.024***	.011***
home municipality (2008–2010)	(.001)	(.002)	(.001)	(.002)	(.001)
Pilot intensity	.018	-.013	.020	.094	.009
	(.021)	(.045)	(.031)	(.068)	(.040)
Pilot intensity*average share of unempl.	-.001	.008	-.004	-.014	-.001
in current home municipality (2008– 2010)	(.003)	(.007)	(.005)	(.010)	(.006)
Outcome mean	.096	.117	.057	.156	.076
Number of observations	182,123	58,350	50,387	27,023	46,363

Notes: OLS estimates. Each column represents a separate regression. All reg. control for municipality of residence and upper secondary school starting year fixed effects as well as compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education level (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average. "Pilot intensity" is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. The share of unemployed is measured as the share of the population aged 16–64 that is registered as unemployed at the PES. Robust standard errors in parentheses allow for clustering by municipality of residence (before enrolment). */**/*** denotes significance on the 10/5/1 percent level.

Effects on the probability of having worked in more than one sector

One reason general education is argued to be important for long run labor market outcomes is that it should enable individuals to change occupation over their life time (e.g. Goldin 2001). Unfortunately, I do not have access to yearly data on individuals' occupation so I cannot test this hypothesis directly. Instead, in order to at least shed some light on this issue, I examine whether individuals are more likely to have been employed in more than one sector during 2002–2010[52] as a result of entering a longer and more general vocational program.[53] Using the Swedish Standard Industrial Classification (SNI/NACE) the individuals' workplaces are grouped into 16 broad industry

[50] Malamud (2012) finds that curriculum breadth is associated with a lower probability of unemployment after leaving university among students in England, and that the benefits of curriculum breadth are larger when labor market conditions are relatively weak.
[51] Here I only show results for the probability of experiencing at least 180 days of unemployment, but the results are similar for the other outcome variables (available on request).
[52] For these years there is a consistent definition of industry codes.
[53] Each year individuals are considered to be employed in the sector from which they have the highest income in November. The sample is restricted to individuals who were employed in November during at least one of the years 2002–2010.

categories.[54] The results, which are shown in Table 11, do not indicate that enrolling in a pilot program had any causal impact on this outcome.

Table 11. Effects on the probability of having worked in more than one sector during 2002–2010

	All vocational students	Males		Females	
		Low GPA	High GPA	Low GPA	High GPA
	(1)	(2)	(3)	(4)	(5)
Effect of enrolling in a longer and more general program	-.005 (.021)	.028 (.030)	.018 (.032)	-.131 (.080)	-.039 (.044)
Outcome mean	.450	.459	.436	.469	.443
Number of observations	181,460	57,999	50,666	26,424	46,371

Notes: IV estimates. All reg. control for municipality of residence and upper secondary school starting year fixed effects as well as compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average among the vocational students. The (potentially) endogenous variable takes the value one if the individual enrolled in a three-year vocational program and zero if he/she enrolled in a two-year vocational program. The instrument is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. The sample is restricted to individuals who were employed in November during at least one of the years 2002–2010. Robust standard errors in parentheses allow for clustering by municipality of residence. */** denotes significance on the 10/5 percent level.

Do the effects differ by field of vocational education?

Lastly, one may wonder whether the effects of acquiring more general education differ by sector or field of education. In order to examine this possibility I have estimated separate regressions by field of vocational training (health care and social services; economic and mercantile; technological and industrial; and agriculture and forestry).[55] Unfortunately, the estimated effects of entering the longer and more general programs are very imprecise in most of these analyses, making it impossible to draw any firm conclusions. The statistically significant effects found are concentrated to the technological/industrial sector, where there is a positive effect on the risk of unemployment (all three indicators) among students with low compulsory school GPAs.[56] As this sector includes almost 83 percent of the male students in the sample (see Table A 3), this pattern is hardly surprising given the previous results.

[54] Agriculture, hunting and forestry; Fishing; Mining and quarrying; Manufacturing; Electricity, gas and water supply; Construction; Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods; Hotels and restaurants; Transport, storage and communication; Financial intermediation; Real estate, renting and business activities; Public administration and defense, compulsory social security; Education; Health and social work; Other community, social and personal service activities; Extra-territorial organizations and bodies.

[55] Note that these analyses rely on the additional assumption that the availability of pilot programs in a student's home municipality did not impact his or her choice of vocational field.

[56] These results are not shown in the paper but are available from the author.

6 Conclusion

This paper investigates whether more general education reduces the risk of future unemployment. To study this question I examine how individuals with varying amounts of general upper secondary education fared on the labor market during the "Great Recession" (2008−2010). If more general education can help to insure workers against the risk of unemployment, beneficial effects on labor market outcomes may be more pronounced when labor market conditions are weak.

In order to handle that selection into different educational tracks is likely to be endogenous, I exploit an educational reform that occurred in Sweden in the early 1990s. The reform prolonged the vocational tracks in upper secondary school by an additional year and gave them a considerably larger general content. The research design takes advantage of variation across regions and over time in the implementation of a large-scale pilot which preceded the reform.

I find no evidence that having attended a longer and more general vocational program implied a reduced the risk of experiencing unemployment during the 2008–2010 recession. Among students with low GPAs from compulsory school, entering a pilot program seems instead to have resulted in an increased risk of unemployment. This pattern is strongest among the male students, who exhibit a substantially increased risk of experiencing long periods of unemployment if entering the longer and more general programs. In some analyses, which rely on somewhat stronger assumptions, there are also indications of worse labor market outcomes among women with low compulsory school GPAs, though for women the increase in unemployment is concentrated to shorter periods (≤90 days during the three-year period). A likely explanation for the worse labor market outcomes among students with poor previous grades is the increased dropout rate from upper secondary school which resulted from the change of the programs. The results in this paper thereby indicate that an extension of the general content of upper secondary school can have negative effects in terms of higher dropout rates and, as a result, worse labor market outcomes among weaker students.

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Appendix

Table A 1. Vocational tracks in upper secondary school

Regular two-year vocational tracks	Three-year pilot tracks
Agriculture Forestry Gardening	Use of natural resources
Business & administration Distribution & administration	Business & services
Caring services Social services	Health care
Caring services: children & youth	Caring services: children & youth
Clothing manufacturing	Textile & clothing manufacturing
Construction	Construction Constructional metalwork Heating, ventilation & sanitation Painting
Consumer studies♦	
Electrical engineering	Electrical engineering
Food manufacturing	Food manufacturing Restaurant
Operation and maintenance engineering♦	
Process technology	Process technology
Vehicle engineering	Transport & vehicle engineering
Wood technology	Wood technology
Workshop techniques	Industry
-	Handicraft♣
-	Graphic♣

Notes: ♦Tracks which do not directly correspond to any of the pilot tracks, but are still included in the analysis as important elements of them appear to be present on one or more of the pilot tracks. ♣Tracks which are not included as they do not correspond to any of the two-year tracks.

Table A 2. First stage regressions: The effect of pilot intensity on the probability of enrolling in a longer and more general vocational track. Separate estimates by gender and ability

	Male vocational students		Female vocational students	
	Low GPA	High GPA	Low GPA	High GPA
	(1)	(2)	(3)	(4)
A. Without covariates				
Pilot intensity in municipality of residence (instrument)	.689*** (.062)	.631*** (.065)	.426*** (.053)	.478*** (.051)
F-statistic on the instrument	123.12	94.78	64.35	87.90
B. Covariates included				
Pilot intensity in municipality of residence (instrument)	.688*** (.062)	.630*** (.065)	.426*** (.053)	.479*** (.051)
F-statistic on the instrument	122.78	94.29	64.92	88.51
Mean of dependent variable	.113	.114	.082	.132
Number of obs.	60,032	51,677	27,627	47,535

Notes: Each cell represents a separate regression. Pilot intensity is the share of available vocational programs in the municipality of residence at the time of enrollment which constituted three-year programs. All reg. control for municipality of residence and upper secondary school starting year fixed effects. Panel B additionally controls for: sex, age at enrolment (dummies), compulsory school GPA, foreign background, the parents' highest education level (6 levels), whether both parents are foreign-born and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

Table A 3. Descriptive statistics for the sample of vocational students

	Men	Women
Background characteristics:		
Foreign background (=born in non-Nordic country)	.023	.030
Age at enrollment in upper secondary school	16.05	16.03
Final GPA compulsory school	2.77	3.01
Both parents have foreign background	.029	.028
Parents' highest education level:		
Compulsory school < 9years	.165	.174
Compulsory school 9 years	.113	.118
Upper secondary education ≤ 2 years	.413	.414
Upper secondary education > 2 years	.130	.123
Post-secondary education < 3 years	.101	.094
Post-secondary education ≥ 3 years	.062	.061
Information is missing	.015	.015
Type of vocational program the ind. enrolled in:		
Three-year pilot program	.113	.114
Sector:		
Health care and social services	.033	.510
Economic and mercantile	.095	.308
Technological and industrial	.826	.156
Agriculture and forestry	.046	.026
Outcome variables:		
At least three years of upper secondary educ. 2008	.399	.572
Unemployed ≥90 days during 2008–2010	.119	.141
Unemployed ≥180 days during 2008–2010	.088	.103
Unemployed ≥360 days during 2008–2010	.049	.058
Employed 2008–2010	.881	.807
Number of observations[a]	111,709	75,162

Notes: The sample consists of individuals who finished compulsory school 1986–1990 and the same year enrolled in a vocational program in upper secondary school. [a]The number of observations is somewhat smaller for some of the outcome variables.

Table A 4. Effects of pilot intensity on the probability of unemployment and employment during the 2008−2010 recession (Reduced form).

	Male vocational students			Female vocational students		
	All	Low GPA	High GPA	All	Low GPA	High GPA
Outcome variable:	(1)	(2)	(3)	(4)	(5)	(6)
A. Level of education in 2008						
At least three years of upper	.298***	.342***	.251***	.115***	.127***	.109***
secondary education	(.032)	(.035)	(.038)	(.021)	(.034)	(.026)
Outcome mean	.399	.320	.491	.572	.444	.646
Number of obs.	109,237	58,636	50,601	73,626	27,118	46,508
B. Unemployment 2008–2010						
Unemployed ≥90 days	.006	.028*	-.015	.006	.011	.002
	(.010)	(.016)	(.014)	(.013)	(.026)	(.013)
Outcome mean	.119	.153	.080	.141	.200	.107
Unemployed ≥180 days	.014	.036***	-.006	.006	.006	.005
	(.009)	(.013)	(.011)	(.012)	(.023)	(.012)
Outcome mean	.088	.115	.056	.103	.153	.074
Unemployed ≥360 days	.013**	.023***	.003	.004	-.006	.008
	(.006)	(.009)	(.008)	(.010)	(.022)	(.009)
Outcome mean	.049	.068	.027	.058	.092	.038
Number of obs.	111,709	60,032	51,677	75,162	27,627	47,535
C. Employment 2008–2010						
Employed all three years	-.004	-.011	.005	-.001	-.006	.004
	(.012)	(.017)	(.013)	(.014)	(.031)	(.016)
Outcome mean	.881	.845	.923	.807	.732	.852
Number of obs.	108,737	58,350	50,387	73,386	27,023	46,363

Notes: OLS estimates. Each cell represents a separate regression. All reg. control for municipality of residence and upper secondary school starting year fixed effects as well as compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average. "Pilot intensity" is measured as the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

Table A 5. Effects of enrolling in a longer and more general vocational program. Results for regressions including linear and quadratic county-specific trends.

	All	Male students		Female students	
		Low GPA	High GPA	Low GPA	High GPA
Outcome variable:	(1)	(2)	(3)	(4)	(5)
A. ≥ 3yrs of upper sec. educ. (2008)					
Main results (no trends)	.389***	.496***	.398***	.297***	.225***
	(.022)	(.033)	(.038)	(.074)	(.050)
Reg. incl. linear trends	.345***	.477***	.329***	.136	.277***
	(.042)	(.064)	(.076)	(.137)	(.091)
Reg. incl. quadratic trends	.363***	.489***	.343***	.186	.281***
	(.046)	(.066)	(.082)	(.157)	(.105)
Number of obs.	182,863	58,636	50,601	27,118	46,508
B. Unempl. ≥90 days (2008–2010)					
Main results (no trends)	.011	.041*	-.024	.027	.004
	(.012)	(.023)	(.021)	(.060)	(.028)
Reg. incl. linear trends	.047	.106*	-.007	.107	.001
	(.029)	(.054)	(.048)	(.136)	(.057)
Reg. incl. quadratic trends	.049	.114**	-.021	.124	.006
	(.032)	(.058)	(.052)	(.161)	(.064)
Number of obs.	186,871	60,032	51,677	27,627	47,535
C. Unemp. ≥180 days (2008–2010)					
Main results (no trends)	.019	.052***	-.010	.014	.011
	(.012)	(.020)	(.018)	(.055)	(.025)
Reg. incl. linear trends	.059**	.130***	-.002	.106	.009
	(.028)	(.049)	(.040)	(.122)	(.050)
Reg. incl. quadratic trends	.061**	.129**	-.013	.150	.014
	(.030)	(.051)	(.042)	(.142)	(.057)
Number of obs.	186,871	60,032	51,677	27,627	47,535
D. Unempl. ≥360 days (2008–2010)					
Main results (no trends)	.017*	.034**	.005	-.014	.017
	(.010)	(.013)	(.013)	(.052)	(.019)
Reg. incl. linear trends	.057***	.099***	.002	.110	.036
	(.020)	(.032)	(.029)	(.106)	(.039)
Reg. incl. quadratic trends	.064***	.097***	.005	.145	.048
	(.022)	(.035)	(.032)	(.126)	(.044)
Number of obs.	186,871	60,032	51,677	27,627	47,535
E. Employed (2008 –2010)					
Main results (no trends)	-.007	-.016	.008	-.013	.009
	(.015)	(.025)	(.020)	(.073)	(.032)
Reg. incl. linear trends	-.018	-.052	.026	-.106	.045
	(.027)	(.049)	(.045)	(.148)	(.068)
Reg. incl. quadratic trends	-.017	-.053	.032	-.127	.053
	(.030)	(.052)	(.047)	(.160)	(.076)
Number of obs.	182,123	58,350	50,387	27,023	46,363

Notes: IV estimates. Each cell represents a separate regression. All reg. control for municipality of residence and upper secondary school starting year fixed effects, compulsory school GPA, foreign background, age at enrolment (dummies), the parents' highest education (6 levels), whether both parents are foreign-born, and missing data on parents' education. "Low GPA" is defined as having a compulsory school GPA below the average among all vocational students; and "high GPA" as having a GPA at least corresponding to the average among the vocational students. The (potentially) endogenous variable takes the value one if the individual enrolled in a three-year vocational program and zero if he/she enrolled in a two-year vocational program. The instrument is the share of available vocational programs in the municipality of residence at the time of enrolment which constituted three-year programs. Robust standard errors in parentheses allow for clustering by municipality of residence. */**/*** denotes significance on the 10/5/1 percent level.

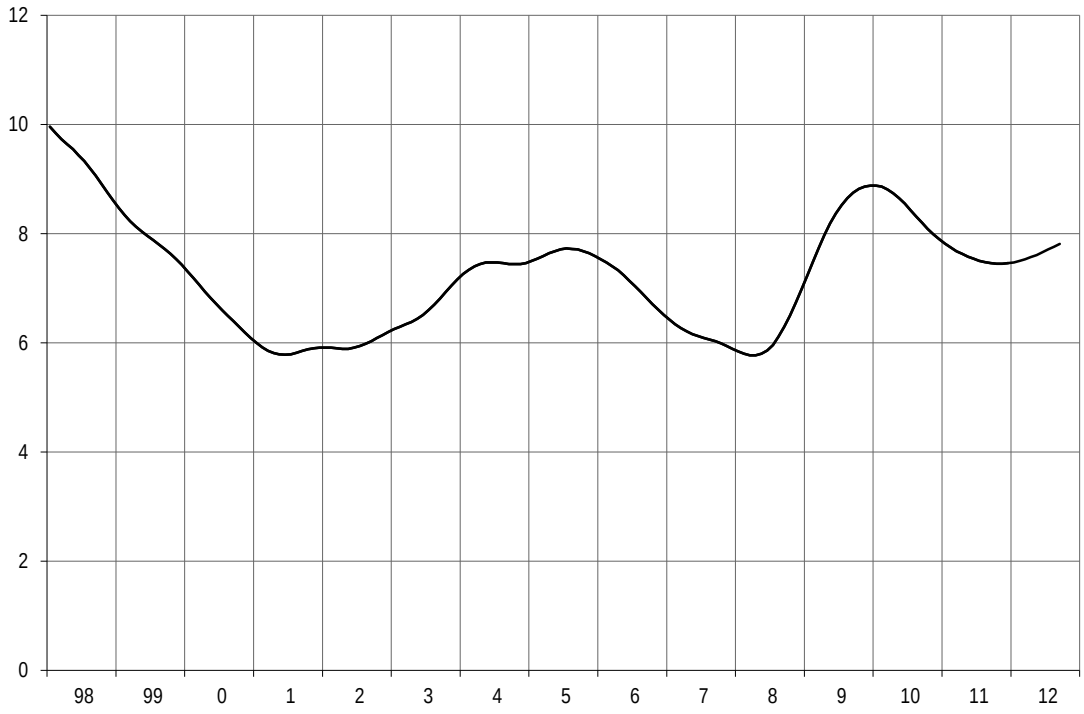

Figure A 1. Unemployment rate in Sweden 1998–2012 (ages 16–64)

Source: Labor Force Surveys, Statistics Sweden

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