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Title: A tale of two trade-offs : Effects of opening pathways from vocational to higher education

Year: 2021

Version: Accepted version (Final draft)

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Please cite the original version:

Ollikainen, J.-P., & Karhunen, H. (2021). A tale of two trade-offs : Effects of opening pathways from vocational to higher education. *Economics Letters*, 205, Article 109945.
<https://doi.org/10.1016/j.econlet.2021.109945>

Highlights

A tale of two trade-offs: Effects of opening pathways from vocational to higher education

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- Finland's vocational school reform made all graduates eligible for higher education.
- Two-year programs were extended to three-year programs.
- We identify the reform's effects using a difference-in-differences setup.
- We find an increase of 1.8 p.p. in dropout probability.
- No significant difference in enrollment in higher education or labor market outcomes.

A tale of two trade-offs: Effects of opening pathways from vocational to higher education

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Abstract

This paper studies the effects of a vocational secondary school reform implemented in Finland between 1999 and 2001. The reform extended vocational two-year programs to three years and made all graduates eligible to apply for university. For identification, we exploit the gradual implementation of the reform, and use a differences-in-differences approach and administrative register data up to 13 years after the reform. We find no long-term effect on enrollment in further education or labor market outcomes. However, our results illustrate that the reform increased the dropout probability. Thus, the benefits of opening pathways from vocational to higher education may be outweighed by the cost of a more demanding curriculum.

Keywords: vocational education, reform, dropout, difference-in-differences

JEL Classifications: I21, I28

1. Introduction

Compared to general education, vocational education offers students an easier entry into the labor market. However, in a changing economy, job-specific skills are argued to be at a risk of becoming obsolete, which may lead to worse labor market prospects later (Hanushek et al., 2017; Krueger and Kumar, 2004). To alleviate this trade-off, countries have implemented reforms that open pathways

**Declaration of Competing Interests:* None

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from vocational to higher education. Allowing vocational school students access to further education could make switching occupations easier, thus reducing the risks associated with vocational education. However, if, as a result of providing access to higher education, the vocational programs grow more demanding, another trade-off may emerge: students might be more likely to struggle in the studies and drop out (Hall, 2016).

In this paper, we study the consequences of Finland’s vocational education reform that sought to ease the transition from vocational to higher education. We identify the reform’s effects using a difference-in-differences strategy based on the reform’s gradual implementation across vocational school tracks. Our analysis makes extensive use of the Finnish administrative register data on study completion, higher education enrollment, and labor market outcomes.

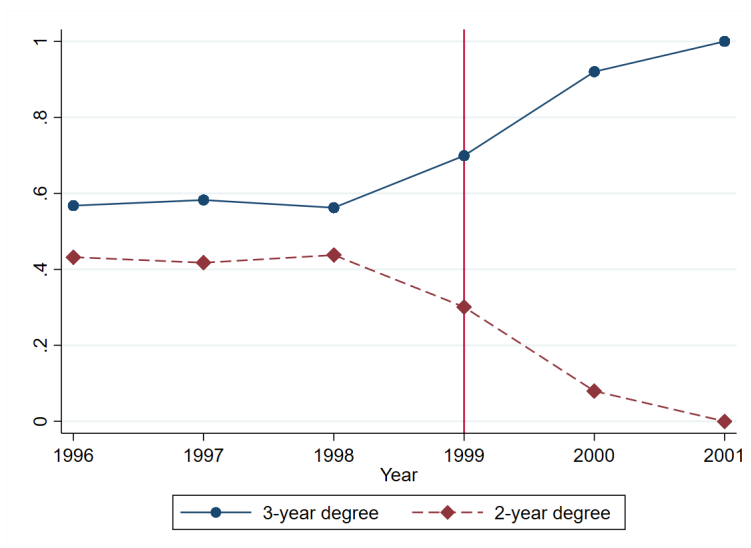
We find that the reform did not affect vocational students’ enrollment in higher education. However, our results show an increase of 1.8 p.p. in dropout probability (6.5% increase relative to the mean). Further, we find negative effects on the probability of employment and annual earnings 2 to 4 years after enrollment and no significant effects up to 13 years after enrollment. Our results are consistent with studies on similar reforms (Bertrand et al., 2019; Felgueroso et al., 2014; Hall, 2012, 2016; Oosterbeek and Webbink, 2007; Zilic, 2018).

2. Vocational qualifications reform 1999-2001

The vocational secondary education reform changed vocational qualifications and their respective National Core Curricula. It caused two visible structural changes in vocational education. First, it combined 77 narrow study programs to 55 broader ones. Second, all two-year programs were extended to three years. Before the reform, the two-year programs gave eligibility to apply only for vocational higher education (known as polytechnic universities) in the same field while three-year programs gave eligibility for vocational higher education in any field. After the reform, graduates were eligible to apply for polytechnics or to universities regardless of their educational field.

On average, around 48 percent of the cohort graduating comprehensive school attended vocational education in the years 1998-2001. Compared to students in general education, vocational students have much lower GPA from the comprehensive school (see Figure S1 in the supplementary material). Figure 1 illustrates that, between 1996 and 1998, on average, 42 percent of enrolled students in vocational education started studying in two-year programs. The reform was implemented

Figure 1: Shares of two- and three-year degrees of vocational degrees by enrollment year. *Note:* The vertical line represents the first phase of the reform.



in three waves between 1999 and 2001 to ease institutional challenges. Table S1 in the supplementary material depicts the number of new students enrolled in new programs by the reform year.

In addition to enabling vocational graduates continue their higher education studies, the reform sought to increase the quality of vocational education so that graduates' skills better align to firms' needs. To achieve these somewhat conflicting goals, the new programs included six months of on-the-job learning, while the other six months consisted of vocational and optional studies depending on student preferences and the specific program. As a result, the new programs resembled the three-year programs before the reform. Surprisingly, though higher education was made more accessible, the amount of general education in vocational programs did not increase. Additionally, to support students' individualized development and learning, hoping it would result in a decrease in dropout rates, the new programs included a personalized study plan to give more attention to their individual development.

3. Data and methodology

We use data from the Finnish National Board of Education (the Joint Application Registry) and Statistics Finland (Register of Completed Education and Degrees, Finnish Longitudinal Census Files, and the Longitudinal Employment Statistics Files). Our analysis focuses on applicants aged 15 to 17 who were admitted for the first time to vocational track between 1998 to 2001 and who had passed through the basic education syllabus in the comprehensive school. Table A1 presents the descriptive statistics of our estimation sample.

We use a difference-in-differences approach to estimate the effect of the vocational program reform on study completion, subsequent education, and labor market outcomes. Our identification strategy exploits the staggered implementation of the reform across different study programs between 1999 and 2001. Our baseline estimates are based on the following regression model:

$$y_{ijt} = \gamma_j + \delta_t + \beta D_{jt} + \zeta' X_i + \epsilon_i, \quad (1)$$

where y_{ijk} is the outcome of interest y for individual i who enrolled in study program j in year t . γ_j and δ_t are the study program and enrollment year fixed effects, respectively. D_{jt} is an indicator variable for the reform, and X_i is a vector of controls.

β identifies the average causal effect of the reform under the assumption that the timing of the reform in different programs is unrelated to other program-specific changes in the outcome variables. Note, that by including study program fixed effects, we don't assume similarity of the programs or random assignment of the reform years. To relax our identifying assumption somewhat, we add program-specific linear trends to our model in Table S3 and Figure S2 in the supplementary material. Adding these trends has little effect on our estimates and does not alter our conclusions.

During the implementation period, depending on which study track they choose, the students have the option to apply to a two-year or a three-year program. The reform could have caused students with lower academic skills to choose a shorter program to minimize their effort. To ensure that selection on observables does not drive our results, we add controls for parental education, 9th grade GPA, and gender. Since the reform had little effect on the content of these programs, we also add a dummy to indicate the study programs that were three-year programs before the reform. The reform could also have impacted students' decisions on whether to attend vocational school at all. To address these concerns, we show in Table S4 that the reform did not impact

student characteristics in the reformed programs. However, we still cannot rule out the possibility that selection on the unobservable characteristics is reflected in our estimates. Our estimates, we believe, are still relevant for educational policy since vocational education is not compulsory in most countries. As such, changes in educational policy could cause changes in students' educational choices.

4. Results

Table 1 reports the estimated effects of the reform on dropout probability. Panel A presents our main results. Column 1 is the most basic model with fixed effects for study programs and enrollment year. Column 1 suggests that, as a result of the reform, students were 1.3 percentage points more likely to drop out. Column 2 adds controls to the regression model. According to these estimates, the reform increased the probability of dropout by 1.8 p.p. (6.5% in relation to the mean). The estimate is statistically significant at the 5% level. In columns 3 and 4, we add municipality-specific fixed effects and trends as robustness checks which leave the estimates virtually unchanged. We also estimate the reform's effect on the probability of graduating at different times in Table S2 in the supplementary material. These estimates demonstrate a negative effect on the probability of graduating up to seven years after enrollment, suggesting that the reform did indeed cause an increase in dropout rates instead of merely postponing graduation.

We interact the reform dummy with gender in Panel B of Table 1 to allow for heterogeneous effects. The results illustrate a greater effect of the reform on the dropout probability for males. However, this effect is only significant at the 10% level, and it disappears if we instead define dropout as no degree in six or seven years (see Table S2). These results suggest that, after the reform, though men were slower to graduate than women, they were not more likely to entirely drop out.

Table 2 estimates the effect of the reform on further education using our preferred model (column 2 of Table 1). We find no effect of the reform on completing a general secondary degree or enrolling in higher education. Before the reform, applying to universities was only possible with the general degree, and we hypothesized that the reform might have led to a decrease in the share of vocational students completing it in addition to a vocational degree. The fact that easing transition from vocational to higher education had no effect on enrollment could indicate that most students chose

Table 1: Effects of the vocational program reform on study completion

<i>Dependent variable:</i> Dropout (no degree in five years=1, otherwise=0)	(1)	(2)	(3)	(4)
<i>Panel A: Average effect</i>				
Reform	0.013 (0.010)	0.018** (0.007)	0.015* (0.008)	0.018** (0.007)
<i>Panel B: Interaction with gender</i>				
Reform	0.029** (0.011)	0.027*** (0.008)	0.024** (0.009)	0.027*** (0.008)
Reform \times female	-0.027*** (0.009)	-0.013* (0.007)	-0.013 (0.009)	-0.015* (0.008)
Observations	107,455	107,455	107,455	107,455
Outcome mean	0.276	0.276	0.276	0.276
Year dummies	YES	YES	YES	YES
Program dummies	YES	YES	YES	YES
Other controls	NO	YES	YES	YES
Municipality fixed effects	NO	NO	YES	YES
Municipality specific trends	NO	NO	NO	YES

Notes: The standard errors clustered by study program. Other controls include parental education, 9th grade GPA, gender and age dummies, and a dummy indicating if the study program was a three-year program before the reform. Panel B also includes the interactions between gender and year and program dummies. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

vocational education because of its relevance to the labor market, and the possibility of further studies does not factor into this decision. In our data, 11.3% of vocational students were enrolled in a polytechnic university and only .03% in a university by age 24 (see Table A1). These results could also suggest that vocational education even after the reform did not provide the necessary skills for further studies.

Lastly, we examined the effects of the reform on labor market outcomes up to 13 years after enrollment. The estimates from our preferred model (column 2 of Table 1) are presented in Figure 2. The results for the entire sample (Panel A) show that the reform reduced the probability of employment by 7 p.p. (25% in relation to the mean) two years after enrollment and 3 p.p. (8% in relation to the mean) after three years. Annual labor earnings reduced by around 1000 euros two to four years after enrollment (14% to 30% in relation to the mean). After these years, none of the estimates differ significantly from zero. The results reflect the fact that the two-year degrees were

Table 2: Effects of the vocational program reform on further education

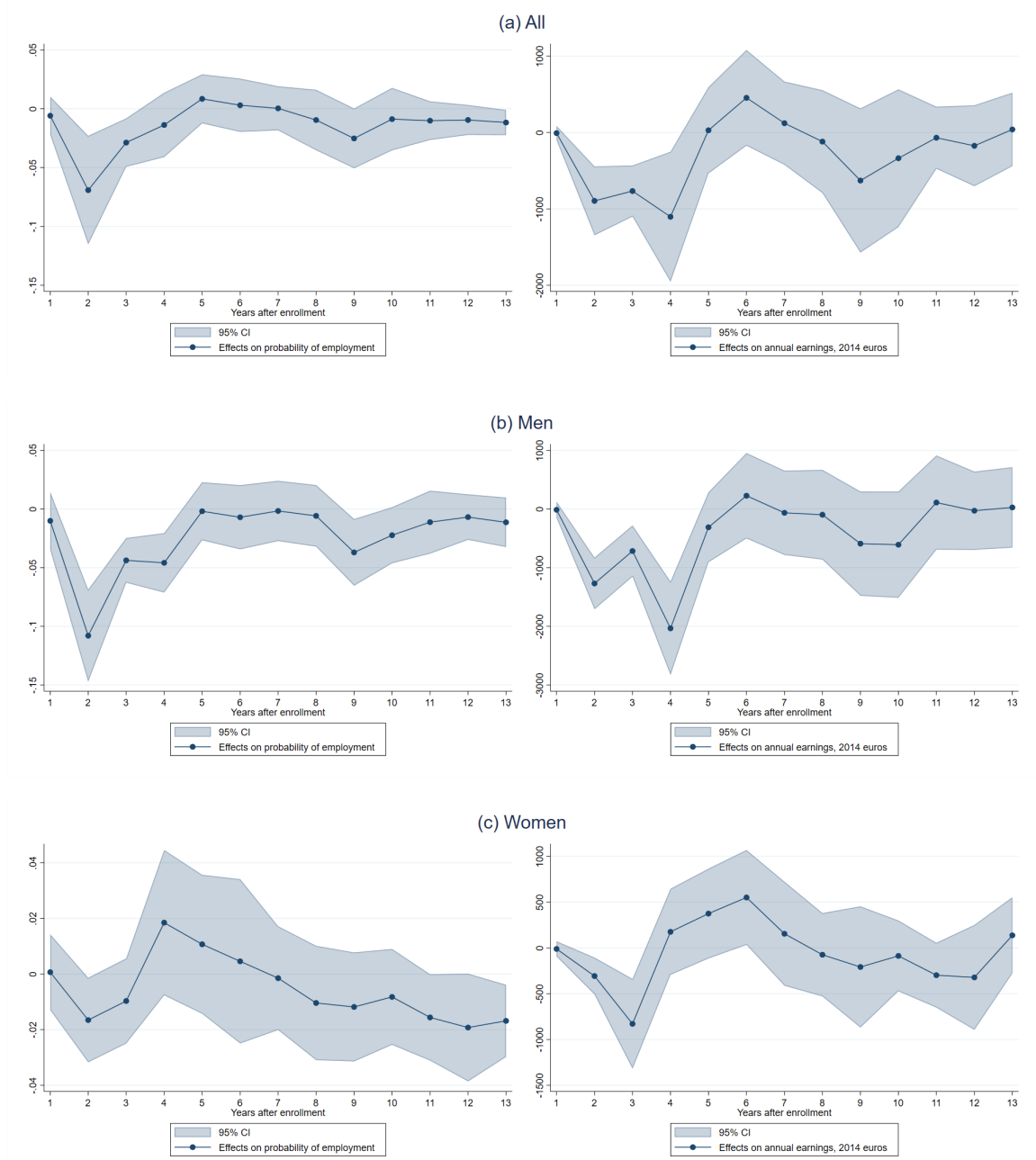
<i>Dependent variable:</i>	General secondary degree by age 24	Enrolled in poly-technic university by age 24	Enrolled in university by age 24
<i>Panel A: Average effect</i>			
Reform	-0.000 (0.004)	-0.007 (0.006)	-0.001 (0.000)
<i>Panel B: Interaction with gender</i>			
Reform	0.004 (0.005)	-0.007 (0.007)	-0.001 (0.001)
Reform \times female	-0.009 (0.006)	0.001 (0.010)	0.000 (0.001)
Observations	107,455	107,455	107,455
Outcome mean	0.065	0.113	0.003

Notes: The standard errors clustered by study program. Regressions include program and enrollment year fixed effects and controls for parental education, 9th grade GPA, gender and age dummies, and a dummy indicating if the study program was a three-year program before the reform. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

extended to three-year programs and, thus, entry to the labor market was postponed. The negative effects also suggest that the increased dropout we observed in Table 1 is not due to the students entering the labor market.

The reform's short-term effects on labor market outcomes are different for men (Panel B) and women (Panel C). For men, there are significant negative effects on employment probability and annual earnings two to four years after enrollment. For women, these effects are smaller in size and only significant two to three years after enrollment. These differences could be caused by the slower graduation time for men, which, we observe, is a consequence of the reform. Five or more years after enrollment, the effects for both men and women are found to be insignificant. The reform having zero effect on labor market outcomes could be explained by the increased dropout probability. The results could also imply that the extra year of vocational education was no more beneficial in terms of labor market outcomes than one-year work experience, a result also found by Hall (2012) in a similar reform in Sweden.

Figure 2: Effects of the reform on labor market outcomes by years after enrollment. *Notes:* Point estimates of the school reform's effect with 95% confidence intervals from separate regressions for each year after enrollment. The dependent variable is the employment status at the end of the year (=1 if employed, 0 otherwise) on the left-hand side and annual labour earnings (deflated to 2014 euros using the CPI) on the right-hand side. Regressions include program and enrollment year fixed effects and controls for parental education, 9th grade GPA, gender and age dummies, and a dummy indicating if the study program was a three-year program before the reform. The standard errors are clustered at the study program level.



5. Conclusions

This paper investigates the consequences of a Finnish vocational school reform which made all graduates eligible to apply for university by extending two-year programs to three years. To improve the relevance of vocational education in the labor market, the reform introduced workplace learning. Our identification strategy exploits the gradual implementation of the reform. We estimate the reform’s effects on the probability of dropout, subsequent educational attainment, and labor market outcomes.

Based on our results, the reform did not achieve its goals and, in fact, had negative consequences. The reform increased the probability of dropout by 1.8 percentage points, and no effect on later employment, income, or educational attainment was found. The results highlight a trade-off between higher demands placed on students and increased dropout rates, which should be acknowledged by policy makers when designing educational reforms.

Acknowledgements

We thank Roope Uusitalo, Hanna Virtanen, Artturi Björk, Mika Haapanen, and an anonymous referee for valuable comments. We would like to acknowledge that any errors are our own. This study is a part of the project “My Path” (grant No. 293445), funded by the Strategic Research Council of the Academy of Finland.

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Appendix A. Tables and Figures

Table A1: Descriptive statistics for the estimation sample.

	Men	Women	All
Reform	0.488 (0.500)	0.510 (0.500)	0.497 (0.500)
Dropout	0.285 (0.452)	0.263 (0.440)	0.276 (0.447)
Enrolled in polytechnic by age 24	0.107 (0.310)	0.121 (0.327)	0.113 (0.316)
Enrolled in university by age 24	0.002 (0.045)	0.004 (0.064)	0.003 (0.053)
General secondary degree by age 24	0.046 (0.209)	0.094 (0.291)	0.065 (0.246)
Employed at age 27	0.759 (0.428)	0.696 (0.460)	0.734 (0.442)
Labor earnings at age 27	24052.65 (16377.57)	15195.87 (12920.53)	20578.92 (15722.51)
Age when applying to vocational school	16.193 (0.397)	16.251 (0.438)	16.215 (0.415)
9th grade GPA	6.525 (0.789)	6.986 (0.840)	6.706 (0.840)
Parents with no higher than compulsory education	0.141 (0.348)	0.156 (0.363)	0.147 (0.354)
Observations	65471	42249	107720

Note: The sample consists of individuals aged between 15 and 17 who enrolled for the first time in vocational secondary education between 1998 and 2001. The cells report the mean and standard deviation (in parenthesis) of the variable.

Supplementary material – A tale of two trade-offs: Effects of
opening pathways from vocational to higher education

Jani-Petteri Ollikainen & Hannu Karhunen

May 28, 2021

Table S1: Number of slots in the new 3-year programs by track and year

Vocational Qualification Programs		Number of slots		
		1999	2000	2001
1	Study Programme in Construction	1317	1465	1326
2	Study Programme in Land Survey Technology	65	29	34
3	Study Programme in Building Maintenance Technology	598	899	539
4	Study Programme in Social and Health Services	1837	1805	1712
5	Study Programmes in Textiles and Clothing		449	340
6	Study Programme in Metalwork and Machinery		2067	2282
7	Study Programmes in Vehicle Technology & Logistics		2181	1954
8	Study Programme in Electrical Engineering		3827	3448
9	Study Programme in Wood Processing		537	479
10	Study Programmes in Surface Treatment Tech. and Painting		248	259
11	Study Programmes in Paper and Chemical Engineering		434	408
12	Study Programme in Food Production		451	383
13	Study Programme in Business and Administration		2917	2695
14	Study Programme in Hotel and Restaurant Services		1494	1580
15	Study Programme in Catering and Customer Services		2138	1894
16	Study Programme in Household and Cleaning Services		282	158
17	Study Programmes in Hairdressing and Cosmetics		553	669
18	Study Programme in Agriculture			500
19	Study Programmes in Fishery, Forestry and Env. Protection			495
20	Study Programme in Publishing and Printing			209
21	Study Programme in Audio-Visual Communication			326
22	Study Programmes in Youth and Leisure Instruction			238
23	Study Programme in Crafts and Design			499
		3699	21611	22327

Source: Number of slots were calculated from the Finnish National Board of Education Joint Application Registry data using the number new students 15 to 17 years old.

Note: To conserve space, some smaller study programs are excluded or included in to the larger tracks. Study Programmes in boat-building, cutter maintenance and draping are included in to the Study Programme in Wood Processing; Study Programmes in Textiles and Clothing includes programs for footwear, milliner and dressmaker.

Table S2: Effects of the vocational program reform on graduation

<i>Dependent variable:</i>	Graduated in two years	Graduated in three years	Graduated in four years	Graduated in five years	Graduated in six years	Graduated in seven years
<i>Panel A: Average effect</i>						
Reform	-0.377*** (0.037)	-0.060*** (0.013)	-0.030*** (0.009)	-0.018** (0.007)	-0.017** (0.007)	-0.017** (0.007)
<i>Panel B: Interaction with gender</i>						
Reform	-0.404*** (0.033)	-0.074*** (0.014)	-0.043*** (0.008)	-0.027*** (0.008)	-0.022** (0.008)	-0.020** (0.007)
Reform × female	0.052 (0.032)	0.021 (0.014)	0.021** (0.010)	0.013* (0.007)	0.005 (0.007)	0.002 (0.007)
Outcome mean	0.110	0.598	0.688	0.724	0.746	0.762
Observations	107,455	107,455	107,455	107,455	107,455	107,455

Notes: Standard errors clustered by study program. All regressions include program and enrollment year fixed effects. Other controls include parental education, 9th grade GPA, gender and age dummies and a dummy indicating if the study program was a three-year program already before the reform. Panel B also includes interactions between gender and year and program dummies. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table S3: Effects of the reform on educational outcomes with program-specific linear time trends.

<i>Dependent variable:</i>	Dropout (no degree in five years)	General secondary degree by age 24	Enrolled in polytechnic university by age 24	Enrolled in university by age 24
Reform	0.013* (0.007)	-0.001 (0.004)	-0.006 (0.006)	-0.001 (0.001)
Observations	107,455	107,455	107,455	107,455
Outcome mean	0.276	0.065	0.113	0.003

Notes: The standard errors clustered by study program. Regressions include program and enrollment year fixed effects and controls for parental education, 9th grade GPA, gender and age dummies, a dummy indicating if the study program was a three-year program before the reform, and program-specific linear time trends. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table S4: Effects of the reform on study program characteristics.

<i>Dependent variable:</i>	Parental education	9th grade GPA	Application age	Female	Native speaker
Reform	-0.006 (0.004)	-0.042 (0.028)	-0.002 (0.042)	0.008 (0.007)	-0.001 (0.001)
Observations	92	92	92	92	92

Notes: Robust standard errors. All dependent variables are yearly program-level means from 1998 to 2001. Regressions include the reform dummy and program and enrollment year fixed effects. We use the number of students in each program-year combination as weights in the regressions. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure S1: Distributions of grade point averages from 9th grade of comprehensive school for vocational and general education. *Notes:* We use data on applicants aged 15 to 17 who were admitted for the first time to secondary education between 1998 to 2001.

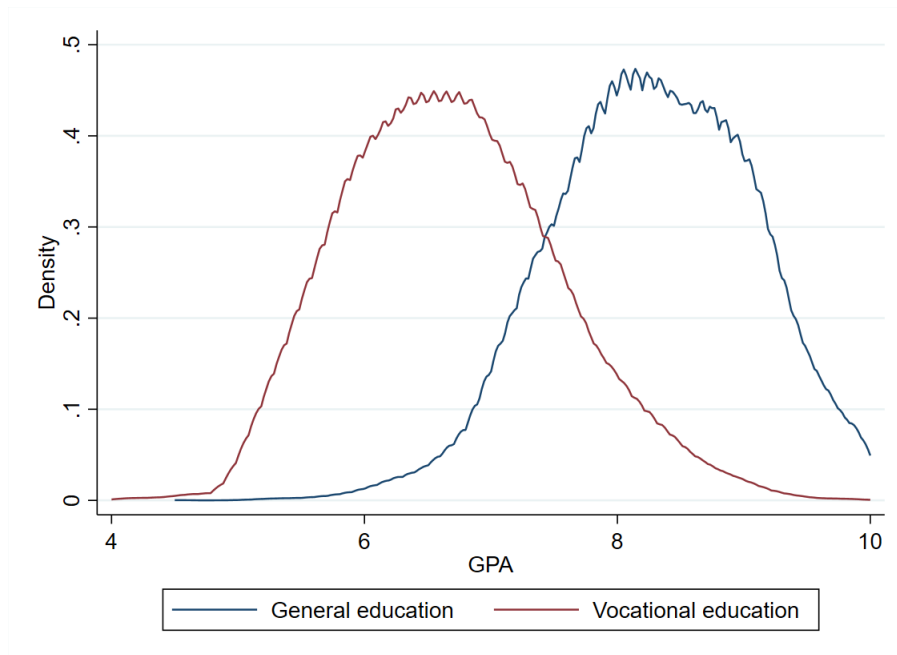


Figure S2: Effects of the reform on labor market outcomes by years after enrollment with program-specific linear time trends. *Notes:* Point estimates of the school reform's effect with 95% confidence intervals from separate regressions for each year after enrollment. The dependent variable is the employment status at the end of the year (=1 if employed, 0 otherwise) on the left-hand side and annual labour earnings (deflated to 2014 euros using the CPI) on the right-hand side. Regressions include program and enrollment year fixed effects and controls for parental education, 9th grade GPA, gender and age dummies, a dummy indicating if the study program was a three-year program before the reform, and program-specific linear time trends. The standard errors are clustered at the study program level.

