

Effects of Vocational Education on the Labor Market and Beyond

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The Second International Leading House Conference on the Economics of
Vocational Education and Training
June 12, 2024

Content of the talk

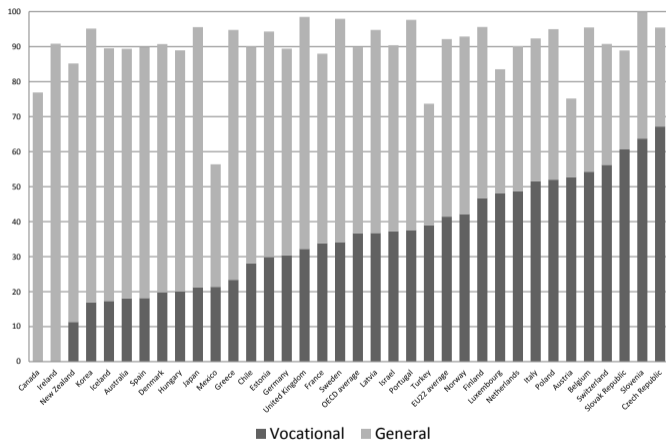
Published and ongoing work

- ▶ Labor Market Returns to Vocational Secondary Education, with Mikko Silliman, AEJ: Applied Economics, 2022, 14(1), pp. 197-224.
- ▶ Effect of Secondary Education on Cognitive and Non-cognitive Skills, Jani-Petteri Ollikainen, Tuomas Pekkarinen, and Roope Uusitalo, IZA Discussion Paper, 2022, No. 15318.
- ▶ "Social Worlds" project, with Mikko Silliman, ongoing.

Supplementary literature:

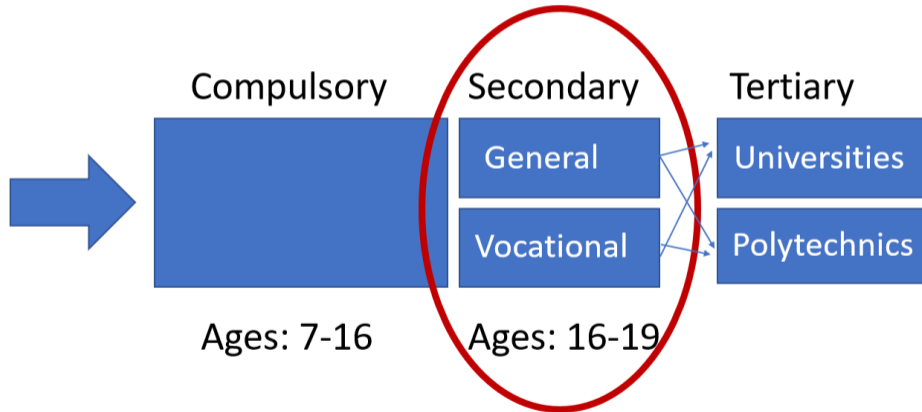
- ▶ Returns to Vocational Education and Training, with Sandra McNally and Guglielmo Ventura, In Handbook of Labor, Human Resources and Population Economics, 2022, pp. 1-30.
- ▶ Lost boys? Secondary Education and Crime, with Kristiina Huttunen, Tuomas Pekkarinen, and Roope Uusitalo, Journal of Public Economics, 2023, 218, 104804.

Enrollment in vocational and general education in OECD countries, age 17



Source: OECD Education at a Glance 2017 Database

The Finnish educational system



What are the labor market returns to vocational secondary education?

Theoretical arguments for and against vocational education

Benefits in the short term

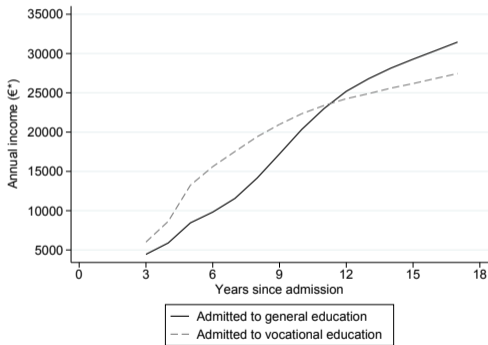
- ▶ Facilitates transition to the labor market
- ▶ Better matches the varied abilities and aspirations of students

Adverse impacts in the longer term

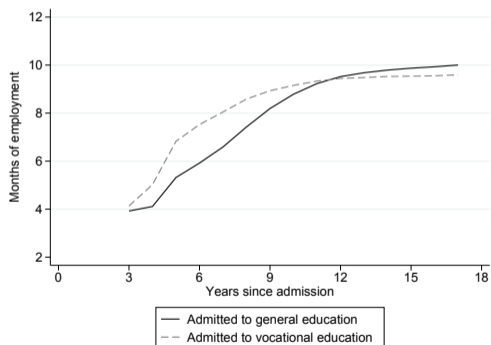
- ▶ Fewer opportunities for further studies
- ▶ Harder to adapt to changes in technology
- ▶ Skills become obsolete in the long-run

Mean income and employment profiles

Annual income



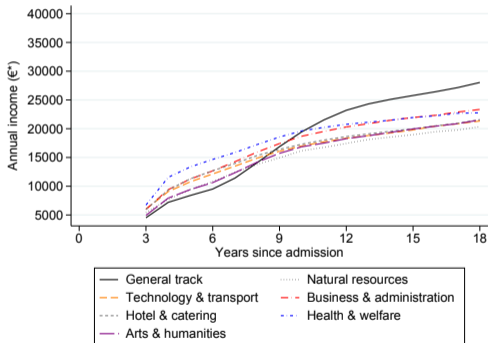
Months of employment



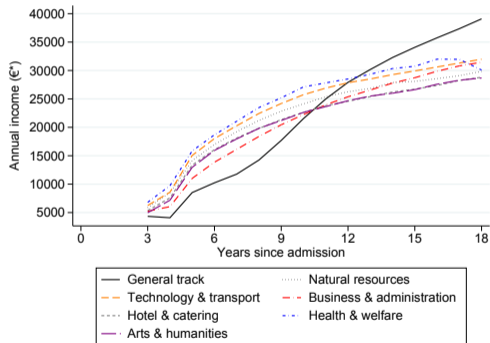
Data on cohorts applying to secondary education between 1996 and 2000 (N=286,000)

Mean income profiles by gender and field of studies

Women

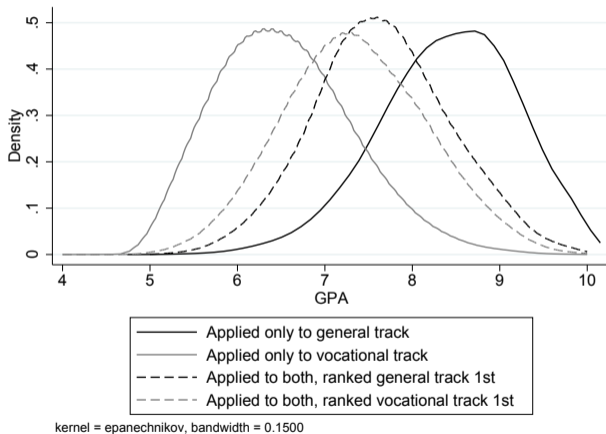


Men



Data on cohorts applying to secondary education between 1996 and 2000 (N=286,000)

Application preferences and GPA

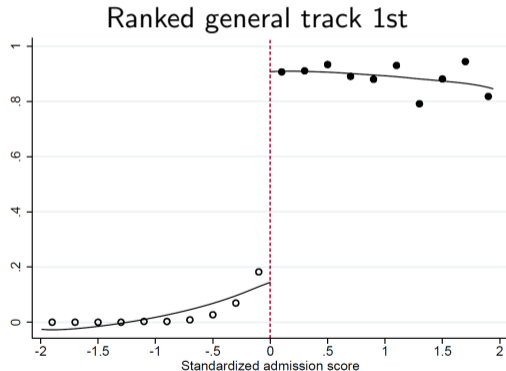
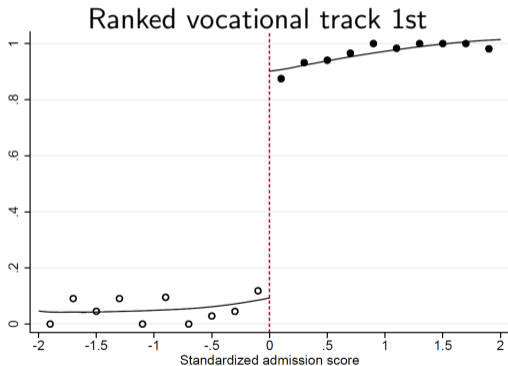


Data on cohorts applying to secondary education between 1996 and 2000 (N=286,000)

Empirical strategy

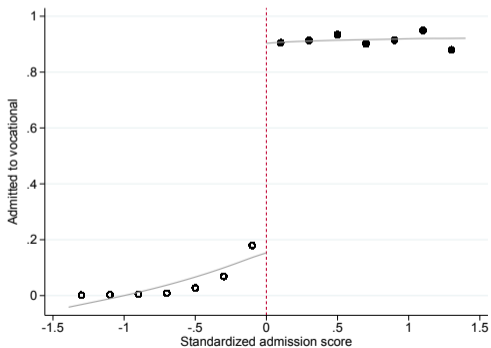
- ▶ Use regression discontinuity design created by admission cutoffs to secondary schools.
- ▶ Estimation sample:
 - ▶ Those who apply to both, vocational and general education:
N=61,000 (22% of applicants)
 - ▶ Applicants above the cutoff to their 2nd request
 - ▶ Oversubscribed schools critical in determining the access
 - ▶ Final sample: N=22,000 (36% of those who apply to both tracks)
- ▶ Employ non-parametric estimation
- ▶ Instrument admission to or enrollment in vocational education by crossing cutoff

Admission to the vocational track

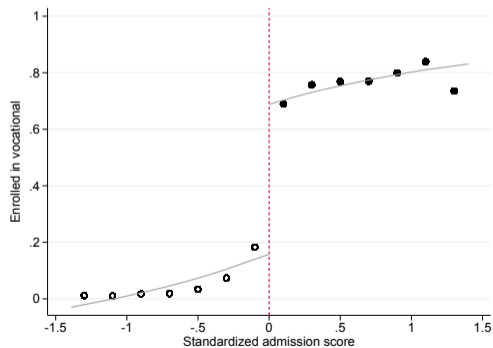


First stage graphically

Admission

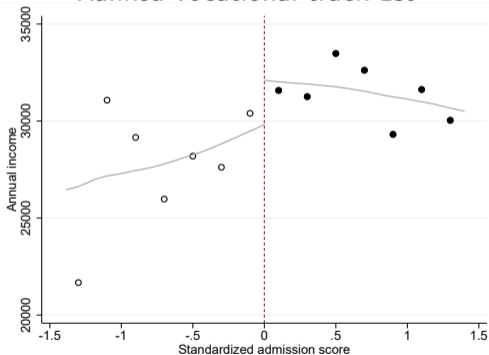


Enrollment

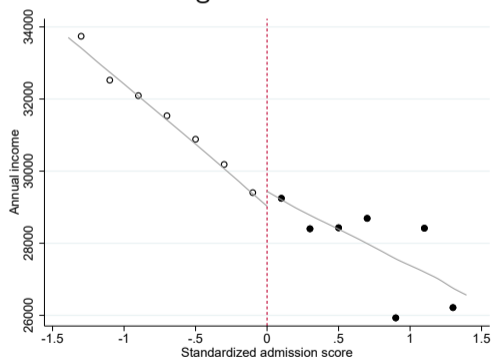


Income 17 years after admission, age 33

Ranked vocational track 1st

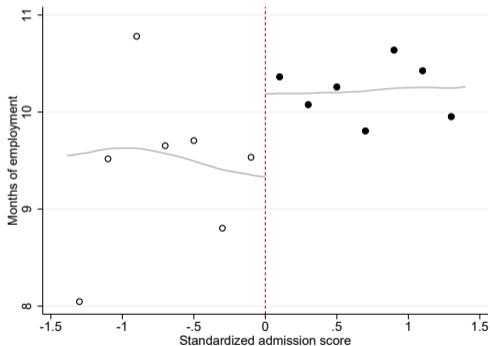


Ranked general track 1st

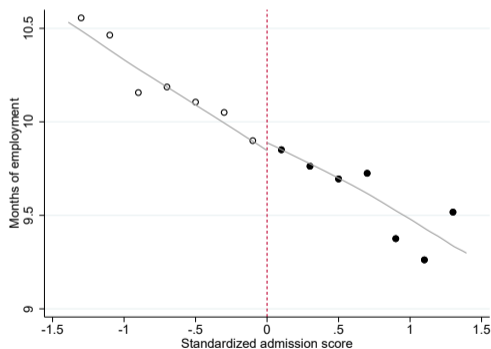


Employment 17 years after admission, age 33

Ranked vocational track 1st

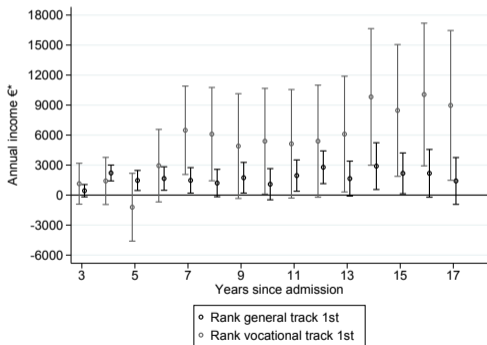


Ranked general track 1st

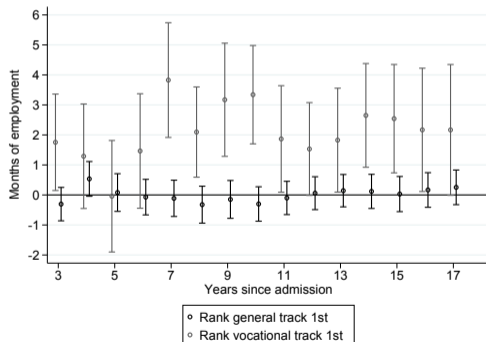


Year-by-year RDD estimates by preference group

Annual income



Month of employment

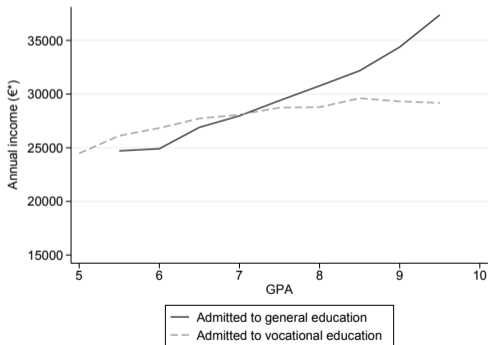


Discussion on labor market effects

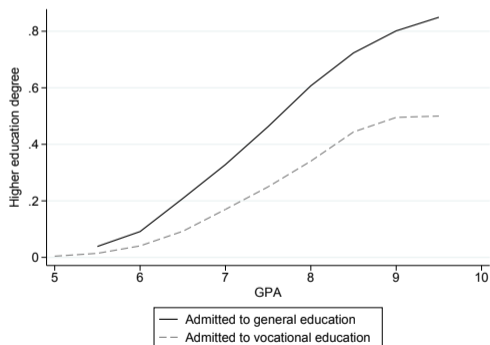
- ▶ Vocational education can improve labor market outcomes also in the long run
 - ▶ Benefits do not show a trend of going away
 - ▶ As likely to complete higher education
 - ▶ No more likely to be employed in occupations at risk of automation or offshoring
 - ▶ Very little prior credible evidence regarding long-term outcomes (see e.g., McNally et al., 2022)
- ▶ Vocational education may offer an important pathway, even in the face of rapid technological change
 - ▶ Other dimensions of skills may better capture the nature of changing demand for skills, such as routine vs. non-routine (e.g., Acemoglu and Autor, 2011) or social skills (e.g., Deming, 2017)
- ▶ Vocational education may provide valuable skills - particularly for those who are unlikely to graduate from higher education.

Education and labor market outcomes by track and GPA (approx. age 30)

Annual income



HE degree



Does the Choice of Education Track Impact Cognitive and Non-Cognitive Skills?

Differences in the curriculum by track

- ▶ Both tracks have requirements in math, languages and other theoretical subjects but their share much larger in general schools
- ▶ Instead vocational education students have vocational coursework including one to two month work-placements

Minimum requirements by track

Subject	General track		Vocational track		Ratio gen/voc
	N	%	N	%	
Finnish language	6	8 %	4	3 %	2,4
Other languages	11	15 %	3	3 %	5,9
Math (basic level)	6	8 %	3	3 %	3,2
Math (advanced)	10	13 %			
Other academic subjects	15	20 %	1	1 %	24,0
Elective academic courses	10	13 %	8	7 %	2,0
Arts, physical education etc.	7	9 %	1	1 %	11,2
Total number of studying units	75	100 %	120	100 %	
Total academic subject with basic math	48	64 %	19	16 %	4,0

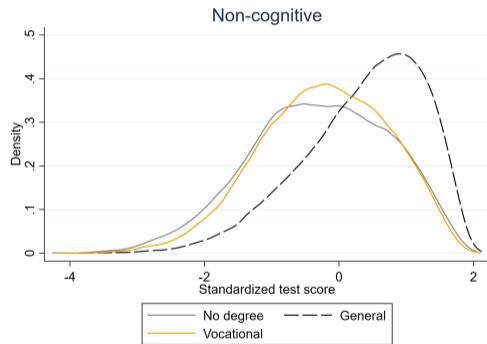
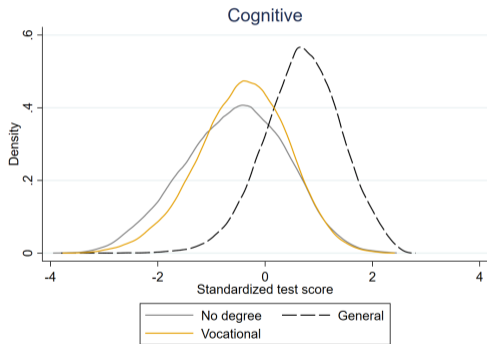
Empirical strategy

- ▶ Exploit admission cutoffs to **general schools** to evaluate the effect of (type of) education on the basic skills measured at age around 20
- ▶ Use data from Finnish Defense Forces basic skills test taken at the beginning of compulsory military service.
- ▶ All Finnish men are required to participate in either military service or civil service
 - ▶ Draft at age 19, service typically at age 20
 - ▶ Exemptions possible for health-related reasons or because of an ethical conviction.
 - ▶ Approx. 70% of men in our data were in military training for either 8 or 11 months
 - ▶ The weakest students underrepresented in data, but exceeding admission threshold has no effect on likelihood of serving in military and taking the test

Measured skills from army basic skills test

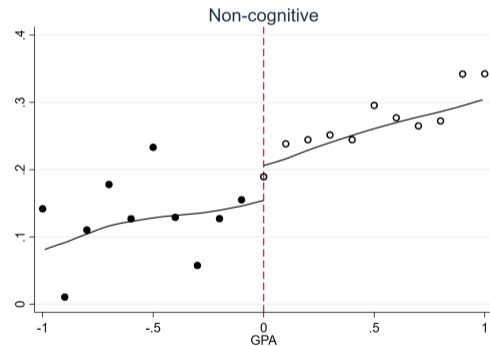
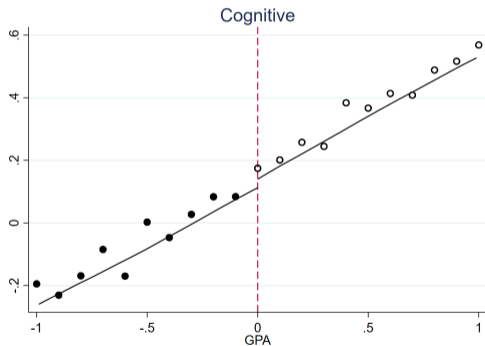
- ▶ All conscripts tested with a battery of cognitive and non-cognitive tests during first two weeks in service.
- ▶ Test results used in task placement, particularly in selection to officer training
- ▶ **Cognitive test contains three sections:** arithmetic and verbal ability and visuospatial reasoning
- ▶ **Non-cognitive test measures eight personality traits:** leadership motivation, activity energy, achievement striving, self-confidence, deliberation, sociability, dutifulness, masculinity
- ▶ Both cognitive and non-cognitive test scores have substantial predictive power in the earnings regressions (Jokela et al. (2017))
- ▶ To reduce dimensionality and to rescale the test scores we use factor analysis approach

Distribution of skills by secondary degree



Data on cohorts applying to secondary education between 1991 and 1995

Effect of admission to general track on skills



Effects on personality traits

	Leadership motivation	Activity- energy	Achievement striving	Self- confidence
Reduced form:	0.057 (0.057)	-0.005 (0.059)	0.030 (0.054)	-0.033 (0.051)
<i>Effect of admission:</i>				
First stage:	0.643*** (0.022)	0.643*** (0.022)	0.643*** (0.022)	0.643*** (0.022)
LATE:	0.089 (0.089)	-0.009 (0.092)	0.046 (0.084)	-0.051 (0.079)
N	8317	8317	8317	8317

Effects on personality traits

	Deliberation	Sociability	Dutifulness	Masculinity
Reduced form:	0.039 (0.062)	-0.011 (0.055)	0.037 (0.059)	-0.134*** (0.050)
<i>Effect of admission</i>				
First stage:	0.643*** (0.022)	0.643*** (0.022)	0.643*** (0.022)	0.643*** (0.022)
LATE:	0.061 (0.096)	-0.017 (0.086)	0.058 (0.091)	-0.209*** (0.079)
N	8317	8317	8317	8317

Discussion on the effects on skills

- ▶ Large gaps in raw test scores by education track – however, no evidence of a causal effect
- ▶ Interpreting of the results
 - ▶ Basic skills may be fixed at a relatively young age?
 - ▶ Prior research evaluating the effects of education on skills focuses on earlier years (Almlund et al. , 2011; Brinch and Galloway, 2012; Pekkala-Kerr et al., 2013)
 - ▶ Or only marginal applicants (i.e. weaker students in the general tracks) are not affected?
- ▶ Find effects on social preferences
 - ▶ Track choice has implications beyond the content of the education; it also affects the peers and social worlds that students are exposed to

Effect of admission to general track on peers

Ollikainen et al. (2022)

GPA (scale 4 to 10)	0.818***	(0.058)
Share of women	0.149***	(0.017)
Cognitive test score	0.433**	(0.034)
Non-cognitive test score	0.204**	(0.021)
Mother's earnings	9 600***	(1 200)
Mother has a secondary degree	0.071***	(0.009)
Father's earnings	18 200***	(3 100)
Father has a secondary degree	0.083***	(0.010)

Huttunen et al. (2023)

	Reduced form		Mean below
Average GPA among peers	0.943***	(0.045)	6.8
Share of male students	-0.150***	(0.013)	0.663
Share of peers with prior convictions	-0.014***	(0.001)	0.026
Share of peers with highly educated fathers	0.101***	(0.006)	0.070
Share of peers with highly educated mothers	0.071***	(0.004)	0.052

Does Vocational Education Affect Social Capital?

Education and social participation

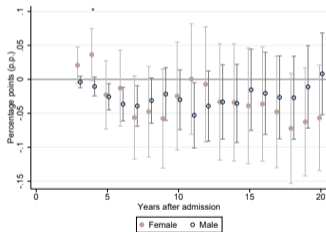
- ▶ In addition to building human capital, education is often considered as central to formation of social capital and the basis of many of our social ties (e.g. Lochner, 2011; Helliwell and Putnam, 1999; Goldin and Katz, 1999; Coleman, 1988).
- ▶ Dividing individuals to different schooling paths may increase the social distance between them (Gradstein and Justman, 2002).

Education and social participation

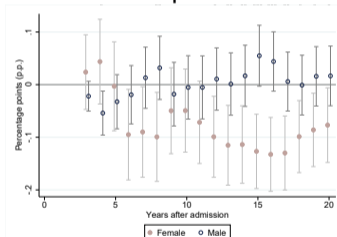
- ▶ In addition to building human capital, education is often considered as central to formation of social capital and the basis of many of our social ties (e.g. Lochner, 2011; Helliwell and Putnam, 1999; Goldin and Katz, 1999; Coleman, 1988).
- ▶ Dividing individuals to different schooling paths may increase the social distance between them (Gradstein and Justman, 2002).
- ▶ In the next project we plan to use admission cutoffs to study the effects of education track on
 - ▶ Social participation
 - ▶ *Negative indicators:* crime, in NEET
 - ▶ *Positive indicators:* votes, has a family (spouse, children)
 - ▶ Social connections
 - ▶ Characteristics of partner, neighborhood, coworkers
 - ▶ What does the social network look like? How homogeneous it is? How does it compare to one's own background?

Effects of admission to general track on family formation and crime

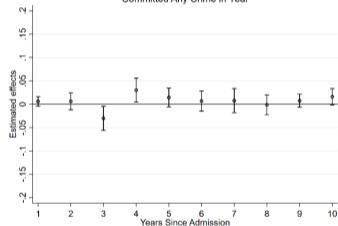
Has children



Has a partner

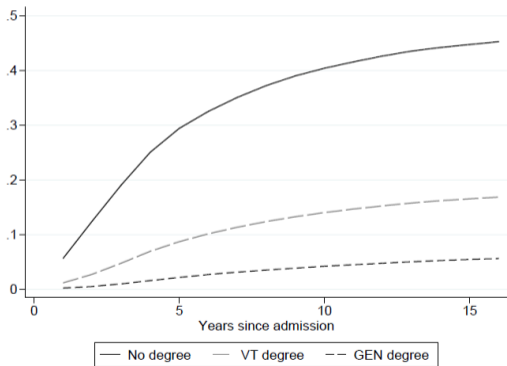


Committed Any Crime in Year

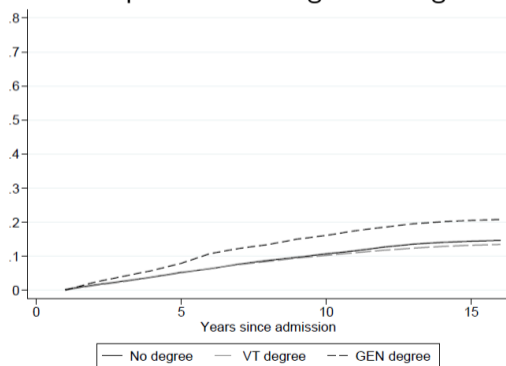


Education track and crime behavior

Has a criminal sentence



Crime partner with a general degree



Discussion

Conclusions from our analysis so far

- ▶ There is a sustained demand for vocational skills, even in Finland, where nearly half of all cohorts enroll in the vocational track.
- ▶ Consistent with the idea of comparative advantage we find heightened benefits for those who indicate a preference for vocational education
- ▶ Track choice also has implication for social outcomes.

Other ideas for future work

- ▶ How does vocational education adapt to various economic shocks?
- ▶ The role of vocational education for adults
- ▶ Spillovers for siblings

Specification

Instrument admission to vocational education by crossing cutoff

- ▶ Reduced form:

$$y_{ik} = \rho Z_{ik} + (1 - Z_{ik})f_{0k}(r_{ik}) + Z_{ik}f_{1k}(r_{ik}) + \alpha_k + \epsilon_{ik}$$

y_{ik} : outcome variable (for applicant i to program k)

Z_{ik} : above/below admissions cutoff

r_{ik} : running variable (standardized admission score)

α_k : cutoff specific fixed effects

- ▶ Employ non-parametric estimation
 - ▶ Local linear regression with triangular kernel weights
 - ▶ Use optimal bandwidths based on the selection procedure in Calonico et al. (2014)

Covariate balance

Baseline specification	Full Est. Sample		Prefer General		Prefer Vocational	
	Discontinuity		Discontinuity		Discontinuity	
Individual characteristics						
GPA	0.001	(0.004)	-0.001	(0.000)	-0.019	(0.049)
Male	-0.011	(0.016)	-0.018	(0.018)	-0.020	(0.038)
Finnish nationality	-0.002	(0.003)	-0.003	(0.003)	0.000	(0.011)
Age at graduation	0.002	(0.007)	0.002	(0.008)	0.012	(0.015)
Native language Finnish	-0.007*	(0.004)	-0.007	(0.004)	-0.010	(0.016)
Native language Swedish	0.001	(0.002)	0.001	(0.002)	0.003	(0.003)
Non-Finnish or Swedish Speaker	0.006**	(0.003)	0.006	(0.004)	0.001	(0.014)
Urban	-0.011	(0.011)	-0.015	(0.012)	0.050	(0.046)
Semiurban	-0.000	(0.007)	0.000	(0.008)	-0.001	(0.040)
Rural	0.008	(0.010)	0.014	(0.011)	-0.047	(0.037)
Parent characteristics						
Father's income	2,401.371	(2,070)	4,264	(2,806)	-786	(2,304)
Father in NEET	-0.011	(0.012)	-0.004	(0.014)	-0.014	(0.039)
Father has secondary degree	0.028*	(0.016)	0.020	(0.018)	0.008	(0.057)
Father has HE degree	-0.039***	(0.015)	-0.038**	(0.017)	-0.050	(0.049)
Mother's income	412.511	(337.097)	-721*	(421)	-515	(1191)
Mother in NEET	0.008	(0.012)	0.008	(0.013)	0.047	(0.045)
Mother has secondary degree	0.034**	(0.016)	0.042**	(0.020)	0.059	(0.063)
Mother has HE degree	-0.045***	(0.015)	-0.051***	(0.017)	-0.049	(0.066)
N/McCrary density test	-115	(209)	-14	(26)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Completed degrees 13 years after admission

	Vocational degree	General degree	Secondary degree	Tertiary degree
Reduced form	0.166 (0.023)	-0.208 (0.027)	0.006 (0.019)	0.004 (0.020)
IV				
1st stage	0.412 (0.020)	0.385 (0.023)	0.440 (0.018)	0.447 (0.019)
LATE	0.403 (0.050)	-0.539 (0.062)	0.014 (0.042)	0.008 (0.044)
Potential outcome for compliers	0.440 (0.040)	0.754 (0.048)	0.254 (0.031)	0.279 (0.034)
Optimal bw (below/above)	0.71/0.56	0.53/0.34	0.97/0.95	1.00/0.65
<i>N</i>	12,616	9,329	13,824	15,945

Table adapted from Jokela et al. 2017

Trait	Description
Leadership motivation	measures how much the person prefers to take charge in groups and influence other people
Activity energy	measures how much the person exerts physical effort in everyday activities and how quickly the person prefers to execute activities
Achievement striving	measures how strongly the person wants to perform well and achieve important life goals
Self-confidence	measures the person's self-esteem and beliefs about his abilities
Deliberation	measures how much the person prefers to think ahead and plan things before acting
Sociability	measures the person's level of gregariousness and preference for socializing with others
Dutifulness	measures how closely the person follows social norms and considers them to be important
Masculinity	measures the person's occupational and recreational interests that are traditionally considered as masculine