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Secondary School Admission and Adolescent Mental Health: Evidence from a Regression Discontinuity Design

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Abstract

We study the causal effect of secondary school admission on adolescents' mental health using extensive Finnish register data and a regression discontinuity design. Focusing on two separate margins among first-time applicants in 2008–2013—admission to vocational secondary education versus no admission, and admission to general versus vocational education—we examine short- and medium-term mental health impacts measured by healthcare utilization and psychotropic drug use.

We find that admission to vocational education, relative to rejection by all applied secondary schools, reduces psychotropic drug use by 6.3 percentage points (-21%) within seven years of admission. While access to vocational education slightly increases healthcare visits in some areas, it substantially decreases visits for substance use. Moreover, we observe that admission to general rather than vocational education decreases specialized healthcare visits for mental health by 4.5 percentage points (-21%) within seven years of admission.

The effects of admission to vocational education versus no admission emerge primarily after completing vocational education, possibly related to simultaneous labor market integration. Conversely, the effects of admission to general versus vocational education mostly appear already during the immediate years after admission, potentially driven by changes in peer characteristics and living arrangements. While causal mechanisms behind the mental health effects remain unclear, our results highlight important short- and medium-term mental health benefits of secondary education. These findings point to the potential value of policies that ensure access to secondary education, such as extensions of compulsory education, and that support mental health during critical educational transitions.

Keywords: Secondary education, mental health, regression discontinuity design
JEL classification: I14, I21, I24, I26, H75

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1 Introduction

The worsening mental health among adolescents and young adults has become a growing public health and economic concern, particularly in high-income countries. Recent years have seen sharp increases in reported symptoms of depression, anxiety, and psychological distress among youth (Keyes et al., 2019; Liu et al., 2025; Ranta et al., 2024; Yang et al., 2024). Globally, nearly 50% of those who will ever receive a mental health diagnosis are first diagnosed in late adolescence, by age 18 (Solmi et al., 2022). Besides the adverse effects on individual well-being, these trends are related to substantial economic consequences through reduced human capital accumulation, lower labor market productivity, and increased healthcare utilization (Dalsgaard et al., 2020; Lundborg et al., 2014; Mousteri et al., 2019; Pitkänen et al., 2023). Previous research has comprehensively documented a strong positive association between education and mental health, and suggests that this relationship may also extend across generations (Amin et al., 2023; Araya, 2003; Cornaglia et al., 2015; Dalgard et al., 2007; Fletcher, 2010; Sonego et al., 2013; Vaalavuo et al., 2022). However, whether the association is causal or driven by selection of mentally healthier individuals into higher levels of education remains a subject of ongoing debate.

We address the issue of causality by studying the impact of secondary school admission on mental health using a regression discontinuity (RD) design and extensive Finnish register data. Prior causal evidence primarily focuses on the health effects of nationwide educational reforms as the source of exogenous variation, reporting effects varying from insignificant (Böckerman et al., 2021; Johnston et al., 2015; Meghir et al., 2018) to positive (Brunello et al., 2016; Dang et al., 2026; Gathmann et al., 2015; Kondirolli & Sunder, 2022; Li & Powdthavee, 2015). Closer to our application, recent studies have found that getting access to the most selective general secondary schools (Bütikofer et al., 2023; Kuuppelomäki, 2021) or to one's preferred secondary school (Johnsen & Jansen, 2024) may have positive impact on mental health. Nevertheless, there is still limited evidence to draw broader causal inferences on how admission to secondary education and placement on its different type of tracks shape mental health, even though similar tracked systems are common in many high-income countries (OECD, 2023a). Given the high rates of attendance to secondary education in developed countries, as well as rising mental health challenges among adolescents, answering these questions is highly relevant for education and health policy in countries where similar secondary school systems are in place.

Methodologically, we build on the previous related research (Bütikofer et al., 2023; Dobbie & Fryer, 2014; Huttunen et al., 2023; Kuuppelomäki, 2021; Ollikainen et al., 2024; Pop-Eleches & Urquiola, 2013; Silliman & Virtanen, 2022; Virtanen et al., 2024) and rely on a quasi-experimental approach based on admission thresholds in the Finnish secondary education system. By utilizing data on the Finnish Joint Application Registry, covering the centralized application system at the individual level, we define the annual program-specific admission thresholds based on the lowest scoring applicant admitted to a particular program. Specifically, we focus on two margins among the first-time applicants during the years 2008–2013: (1) admission to vocational secondary education versus no admission (*vocational margin*), through

which we aim to gain insights into the potential mental health effects of secondary education among the most vulnerable individuals at risk of entirely dropping out from education; and (2) admission to academically oriented general secondary education versus vocational education (*general margin*), which allows us to examine how track placement affects mental health, as in this margin we focus on individuals who applied to both type of tracks but ranked the general track as their preferred option. We link the application data with nationwide Finnish registers on health care utilization and reimbursed drugs. After testing the assumption that there are no systematic differences between individuals just above and below the thresholds, we are able to credibly identify the impact of secondary school admission on mental health by comparing outcomes for applicants who barely gained admission, at the respective margin, to those who narrowly failed to get admitted.

The proposed mechanisms between education and better health outcomes include improved resources and information, behavior, access to prestigious occupations and better working conditions, as well as social networks (Hamad et al., 2018). In the context of secondary education, however, admission to secondary school in general or to a specific track (general vs. vocational) is likely to affect mental health also through additional channels, particularly during the immediate years after admission. First, peer effects, referring to the influence of classmates and schoolmates, can affect mental health both positively and negatively as mental health symptoms may be socially transmitted within peer networks (Alho et al., 2024; Gong et al., 2021; Kiessling & Norris, 2022). Secondary school admission has been shown to positively affect 'peer quality' in terms of academic performance and parental background (Huttunen et al., 2023; Ollikainen et al., 2024), which may in turn improve students' own academic achievement, later labor market outcomes, as well as mental health. On the other hand, access to secondary school, especially academic track, might also be a stressful experience, particularly for students who barely meet the admission criteria. For instance, work pace and being surrounded by better performing students might challenge one's academic self-concept (Marsh, 1987; Pop-Eleches & Urquiola, 2013). Second, admission to secondary education may affect living arrangements, such as parental co-residence, and transition to independent living, which may be linked to mental well-being (Hikichi et al., 2020; Howard et al., 2023; Wu & Grundy, 2023). Third, access to secondary school environment may protect against poor life choices, such as criminal behavior (Huttunen et al., 2023) or substance use (Eisenberg et al., 2014; Gaviria & Raphael, 2001; Powell et al., 2005), which may in turn associate with mental health issues.

Our paper presents several important findings. First, we find that crossing the vocational admission threshold on first attempt increases the likelihood of completing any secondary education within three years by around 20 percentage points. Second, we observe that a narrow admission to vocational education reduces psychotropic drug use by 6.3 percentage points (-21%) within seven years of admission. Furthermore, we find that the admission increases healthcare visits in some areas, but remarkably decreases visits related to substance use disorders. These effects mostly emerge after completing vocational education of typical duration. As a potential explanation, we find that admission to vocational education positively affects labor market outcomes during the post-graduation years.

Third, we observe that being barely admitted to general instead of vocational secondary education has a strong and persistent positive effect of around 27 percentage points on completed general secondary degree. Fourth, we find that admission to general secondary school instead of vocational school decreases the probability of mental health related healthcare use by 4.5 percentage points (-21%) within seven years of admission. The effect primarily emerges already during the first four years after admission. Our exploration of the potential channels reveals that admission to general school has a clear positive effect on 'peer quality' in terms of grade points, prior mental health symptoms, and parental background. Additionally, it increases the likelihood of co-residing with parents during the first five years after applying, while decreasing the likelihood of living alone or in cohabitation. On the other hand, admission to general education appears to delay labor market participation and decrease labor income within nine-years long follow-up period. Based on these findings, we consider that the mechanisms behind the mental health effects of secondary education may differ across tracks of the secondary education system.

Our study contributes to the literature in several ways. First, using rich Finnish register data, we shed light on how secondary education impacts mental health, particularly among individuals at risk of exclusion from education or being rejected by one's preferred, academically oriented educational track. Second, we provide novel evidence on the short- and medium-term mental health effects following admission to secondary education. Unlike most existing studies—which assess health impacts of education only after a considerable delay and often lack complete baseline health data—our approach captures early changes in mental health at a younger age and among recent birth cohorts. Therefore, our estimates may better reflect the effects of education in the contemporary setting. Third, we explore several mechanisms, such as peer characteristics, living arrangements, and labor market outcomes, that may explain the mental health impacts in the immediate years following admission to secondary education. Finally, our contribution is also methodological, as we employ RD-design, which has been more rarely used in previous literature to investigate health impacts of education. As RD-designs may generally suffer from issues of external validity, we study two separate margins among secondary school applicants, which allows broader assessment across the secondary education system.

Our findings indicate that secondary education, both vocational and general, can have a beneficial impact on adolescent mental health. This is indeed an important result in light of recent reforms that have expanded compulsory education to age 18 in Finland and other OECD countries (OECD, 2024). Our results suggest that ensuring access to secondary education through such reforms may help alleviate the mental health burden among adolescents. On the other hand, challenges related to track allocation, dropout, and disengagement persist despite the extensions of compulsory education. Given the increasing prevalence of youth mental health challenges, the allocation of targeted support to students at risk of exclusion during critical educational transitions may yield important mental health returns. Particularly, targeted policies aimed at first-time applicants who are at risk of completely dropping out of secondary education, or being allocated to a track other than they initially preferred, may

further improve the future mental health trajectories among youth.

2 Institutional background in Finland

2.1 Educational system

Finland is a comprehensive Nordic welfare state with a low level of inequality and poverty. The educational system of Finland has been widely praised for having some of the highest PISA scores (Programme for International Student Assessment) and low levels of inequality between students (OECD, 2023b). In Finland, comprehensive education (grades 1-9) is free of charge and mainly organized by municipalities. Compulsory schooling begins in the calendar year in which a person turns seven. For the comprehensive school graduates examined in this paper (2008-2013), compulsory education ended upon completion of comprehensive school, typically at age 16. In 2021, the scope of compulsory education was extended to continue until the individual turns 18 years old, or until the completion of secondary education if that occurs earlier (OECD, 2024).

Secondary education refers to post-comprehensive education and is divided into two main tracks: general secondary education and vocational education, which are both free of charge and publicly funded, and typically last 2-4 years. General secondary education does not provide an occupational competence, but rather a broad, academically oriented curriculum preparing students for the matriculation examination (*ylioppilastutkinto*), which qualifies them for higher education. Vocational education, on the other hand, focuses on preparing students for specific occupations through several alternative programs while also giving eligibility to apply to universities, polytechnics or further vocational education. According to our data, there were 620 secondary schools in Finland between 2008 and 2013, of which 67 percent were general and 33 percent vocational schools. General schools typically provided single program for all students, whereas vocational schools had, on average, nine different programs per school in 2008-2013.

The application process to secondary education is largely centralized and managed through a national joint application system, administered by the Finnish National Agency for Education. Students typically apply in early spring (February-March) during the final year of comprehensive school. In the joint application, students submit their ranked list of preferences for various schools and programs. Each applicant is allowed to list up to five programs across both general and vocational tracks. The number of available slots per program is announced prior the application process.

Admission decisions are largely based on academic performance in the final years of comprehensive education, measured by the grade point average (GPA), which is recorded on a scale from 4 to 10. General secondary schools typically use GPA directly as the admission score.[1] Instead, vocational programs use different scale and criteria for admission scores, such

[1]There exists some exceptions, such as sports- or music-oriented general schools, which may use alternative scoring scales and weighting schemes. Thus, we need to rescale admission scores into comparable GPA units in our general margin analyses. This is described more in detail in Section 3.3

as entrance exams or prior work experience. As these scores are calculated separately by each vocational program, applicants may receive different scores for each program they apply. Since 2004, however, vocational schools have applied similar weighting to GPAs from comprehensive education (Kalmbach, 2024), implying that the admission scores across vocational schools are comparable in terms of GPA.[2] According to our data, the admission scores for vocational scores range from 0 to 48, with a mean of 21.

Students submit their applications before completing comprehensive school and prior to receiving their final grades. As a result, applicants lack full information about their exact admission score or the admission thresholds at the time of application. Since thresholds vary annually with the number of available slots and the academic performance of applicants, opportunities for potential strategic behavior in the application process are limited. In vocational programs, however, preference points have been applied since 2004: applicants receive three extra points for the program ranked first and one extra point for the second choice. This system may enable strategic ranking in the application. According to a recent study, the reform reduced the likelihood that applicants rank oversubscribed schools first or second, but affected applicants from both low- and high-socioeconomic backgrounds similarly (Kalmbach, 2024). In Section 3.3, we assess the validity of our study design and find, for instance, that background characteristics are well balanced around the admission thresholds. Thus, we consider that adoption of priority points is not likely to affect the validity of our research design.

The admission mechanism proceeds in three stages. First, applicants are considered for their top-ranked program under an automated deferred acceptance (DA) algorithm. Each program ranks applicants by admission score and tentatively admits them up to the number of available slots. Those ranked below the last admitted applicant are rejected, after which the algorithm proceeds to consider them for their next preferred program. In following rounds, rejected applicants are compared with tentatively admitted students and may replace them if they have higher admission scores. The automated stage terminates once all the applicants are either matched to a program or rejected by every schools they have applied to.

Second, the admission results are announced in June. Admitted students may accept or turn down their offers, while rejected applicants are placed on a waiting list. At this stage, students on the waiting list might also receive and accept offers from their higher-ranked programs, and thereby free slots for lower-ranked applicants. Thus, applicants who were rejected by all the schools they applied to may eventually be admitted as these slots become available. As a results of such replacements, the ultimate admission thresholds of some programs may be lower than those in the first automated stage. Finally, a supplementary application rounds take place, where any remaining open slots are filled using the same DA algorithm. Final enrollment decisions are made in August, prior to the start of the academic year.

Primary alternative for students who fail to receive admission to general track is vocational

[2]This is an important detail for our design, as in the vocational margin, described in Section 3.2, we compare applicants who have applied only to vocational programs. As the weighting of GPAs was unified with the 2004 reform, we do not need to perform any rescaling for the admission scores in the vocational margin to make them comparable across different programs with respect to GPA.

school. Typically, main alternatives for students failing to get access to vocational education, or any other type of secondary education, is optional 10th grade of comprehensive school or preparatory education for upper secondary qualifications. However, some applicants completely drop out of further education at this stage, if they fail to gain access to any secondary education on their first attempt. Over 2008-2013, on average 4 percent of first-time applicants were annually rejected by all the secondary schools they applied, according to our data.

2.2 Healthcare system

In Finland, students enrolled in secondary education, either general or vocational, have access to primary healthcare through student health services (*opiskeluterveydenhuolto*). Consequently, adolescents in secondary education may have more systematic and timely access to mental health services compared to their peers who rely solely on general primary healthcare. Specialized healthcare—one of the key sources of mental health indicators used in this study—can be accessed after a referral by a primary care physician or through emergency departments. Since primary care acts as the main gatekeeper to specialized healthcare, access to student healthcare services may lead to a higher prevalence of recorded mental health diagnoses among secondary school students relative to non-students with similar underlying needs. Both student health services and general primary care are free of charge for individuals under 18 years of age; thereafter, user fees with an annual ceiling apply.

Pharmaceutical reimbursements are administered by the Social Insurance Institution of Finland (Kela). Most physician-prescribed medicines, including psychotropic drugs, are reimbursed directly at pharmacies under the national health insurance system. Reimbursements are granted once the initial annual deductible is met. However, the initial deductible does not apply to individuals under the age of 19. As with public healthcare services, there is an annual ceiling on out-of-pocket payments for reimbursable drugs. Once this ceiling is exceeded, additional drug purchases incur only a minimal co-payment. The majority of mental health related drugs are reimbursed either at the basic rate of reimbursement (40%) or, in case of severe conditions such as schizophrenia, at the higher special rate of reimbursement (100%).

Prior evidence from Finland shows that individuals with a higher socioeconomic background are more likely to use specialized healthcare services, even after accounting for needs (Van Doorslaer et al., 2006). These disparities are partly driven by differences in access to primary care through occupational healthcare (relevant mainly for employed adults). The use of private services is partly reimbursed by the national health insurance. However, the level of compensation is relatively low, and higher-income individuals are therefore overrepresented among private service users (Blomgren et al., 2013). Furthermore, the uptake of voluntary private health insurance for children has increased over time and is also stratified by socioeconomic status (Sointu et al., 2021). In our study, we do not observe the mental health diagnoses recorded exclusively in private health care, which may lead to a slight underestimation of overall prevalence, particularly among higher-income groups.

3 Empirical Approach

3.1 Data

In this paper, we utilize individual-level register data on the entire Finnish population. Our primary source of data is the Finnish Joint Application Registry administrated by Statistics Finland (EDUC-TYHR), through which we observe all the secondary school applicants in years 2008-2013 (N=433,920). We obtain the applicants' grade point average (GPA) received from the final year of comprehensive education, as well as program-specific identifiers, applicants' admission scores and decision for each program applied, and their preferred order in the application list. We focus on the first-time applicants applying in spring (N=361,932), which covers the majority of all comprehensive school graduates.[3]

We link the Application Registry with other nationwide registries, including information on completed degrees, labor market position and income, as well as parents, cohabitation and marriage, living conditions and demographic characteristics (FOLK-modules of Statistics Finland). As our primary outcomes, we obtain psychotropic drug use from the register of dispensed medicines reimbursable under the national health insurance scheme (hereafter prescription register) maintained by Social Insurance Institution of Finland (Kela) and mental health related healthcare use from the Care Register for Health Care of the Finnish Institute for Health and Welfare (THL). All medicines purchased in Finland and eligible for reimbursement by the national health insurance are covered in the prescription register, while the Care Register includes all in- and outpatient visits in the public specialized health care. In this study, we focus solely on outpatient visits related to mental health, since the prevalence in inpatient care for mental health related reasons is very small in our sample. To simplify interpretations, we define the outcomes as binary indicators, reflecting whether an individual used psychotropic drugs or mental health related specialized healthcare services at least once during a calendar year. Detailed list of ATC- and ICD-10 codes used to define these outcomes is provided in Table A.1.

3.2 Estimation samples

We employ a regression discontinuity (RD) design exploiting the cut-off-based assignment into secondary education, building on earlier literature utilizing similar setting (Bütikofer et al., 2023; Dobbie & Fryer, 2014; Huttunen et al., 2023; Johnsen & Jansen, 2024; Kuuppelomäki, 2021; Ollikainen et al., 2024; Pop-Eleches & Urquiola, 2013; Silliman & Virtanen, 2022). We define the school-program-year specific thresholds of admission by the admission score of the last applicant admitted to a given program. We exclude applicants for whom we are unable to assign an appropriate admission score and threshold for each school they have applied to.[4]

[3] From this sample, we have already excluded individuals who were admitted to secondary education based on discretionary grounds (N=8,703), such as health or social reasons, in order to focus on applicants for whom the admission thresholds are decisive in terms of admission.

[4] These are applicants having at least one missing program identifier, those having at least one missing admission score or threshold, and those applying to programs that base admissions solely on criteria other than GPA (N=22,306).

Table 1 Summary statistics

	All applicants	Vocational margin	General margin
Application			
GPA	7.69	6.76	7.78
Admission score	16.42	23.81	8.10
Applied to general track	0.65	0.00	1.00
Applied to vocational track	0.59	1.00	1.00
Applied to both types of tracks	0.24	0.00	1.00
Background characteristics			
Female	0.50	0.40	0.43
Lives in urban area	0.66	0.81	0.77
Mother has secondary degree	0.87	0.76	0.90
Mother has higher education degree	0.21	0.08	0.24
Mother's income (€)	34,170	31,235	35,342
Father has secondary education	0.78	0.65	0.81
Father has higher education degree	0.20	0.07	0.22
Father's income (€)	41,372	35,021	43,207
Foreign background	0.03	0.06	0.03
Mental health			
Ever used psychotropic drugs	0.14	0.17	0.13
Ever visited healthcare for mental health	0.12	0.20	0.09
Observations	361,932	19,141	17,155

Notes: This table shows descriptive statistics for all the secondary school applicants who have applied immediately after completing compulsory education, as well as for the main estimation samples referred to as the vocational margin and general margin. Background characteristics are measured one year prior to application to secondary education. Mental health indicators are measured as cumulative incidence from birth until the year preceding application. Income has been converted to 2023 euros.

We focus on two separate margins among the first-time applicants. First, we study applicants who are at risk of completely dropping out from secondary education, referred to as the *vocational margin*. In this margin, we focus on individuals who apply only to vocational track (N=115,098), and based on their admission score, are close to the admission threshold of the least selective vocational school listed in their application. This threshold determines whether they gain access to secondary education at all.[5] For each applicant, we select the vocational

[5]The restriction to vocational schools is due to two reasons: first, vocational schools have applied similar, comparable, weighting to GPAs from comprehensive education since 2004 (Kalmbach, 2024). Including general schools would require a rescaling of admission scores into comparable GPA units, as general and vocational schools apply different scales (see e.g. Huttunen et al. (2023)). Given the 2004 reform, we consider that including only vocational school students and using the raw admission scores as such remarkably simplifies our vocational margin analysis and interpretations. Second, vocational education is typically the main option for those who have performed poorly in comprehensive school. By looking only at vocational school applicants at the threshold, we clearly compare those who only just get access to secondary education to those who do not, among the most disadvantaged group of applicants.

program with the lowest threshold among those listed in their application (i.e., the school with maximum value of the centered running variable), reflecting the applicant's strongest opportunity for admission to secondary education. Scoring below this threshold indicates rejection by all the secondary schools an applicant has applied to. Once we only have one observation per individual for this critical program in the data, we require that each program has at least two applicants on both sides of each threshold. (N=19,141).[6] Table 1 shows that the vocational margin sample corresponds to around 9 percents of first-time applicants who have applied to vocational education. Compared to an average first-time applicant, applicants in the vocational margin have performed significantly poorer in comprehensive education, have parents with lower income and education, and have remarkably higher rates of mental health events prior to application. This implies that our vocational margin sample effectively captures more disadvantaged group of applicants.

Second, we follow Huttunen et al. (2023) and examine applicants who applied to both types of tracks but ranked the general track as their first preference, referred to as the *general margin*. In the general margin analyses, we limit the sample to applicants who are above the threshold of at least one vocational school they have applied to (N=32,477). This ensures that crossing the threshold of the least selective general school primarily influences track placement, rather than overall access to secondary education. For each applicant in the general margin, we identify the general secondary school with the lowest threshold among their listed choices (i.e., the general school with maximum value of the centered running variable), representing their greatest opportunity for admission to general secondary education. Individuals who have scored below this threshold have been rejected by all the general secondary schools listed in their application. Finally, we require that each program has at least two applicants, for whom the threshold is decisive for admission, on both side of the threshold (N=17,155). According to Table 1, the general margin sample represents around 20 percent of those who applied to both types of tracks. Applicants in the general margin tend to have parents with higher income and education compared to an average applicant, respectively. They are also more likely to reside in urban areas and less likely to have prior mental health disorders.

3.3 Identification strategy

Our RD design compares applicants who have been quasi-randomly assigned to different educational tracks based on the program-year-specific admission thresholds. In the simplest form, the running variable is defined as the distance of each individual from the cutoff, measured in admission score units. The design relies on the key assumption that, within a small window of admission score, the assignment is 'as good as random', which implies that there are no sys-

[6]The limitation to oversubscribed schools is required for the credibility of our design, as it ensures that an applicant's lowest threshold is actually critical for admission, and that the local polynomials are properly estimated on both sides of the threshold for each program. Consequently, our analysis effectively focuses on applicants who did not apply to any schools that admitted all applicants in a given year. Despite this potential source of bias in the full samples, we also report estimates without this restriction (N=115,098 in vocational margin and N=32,477 in general margin) in Table A.6.

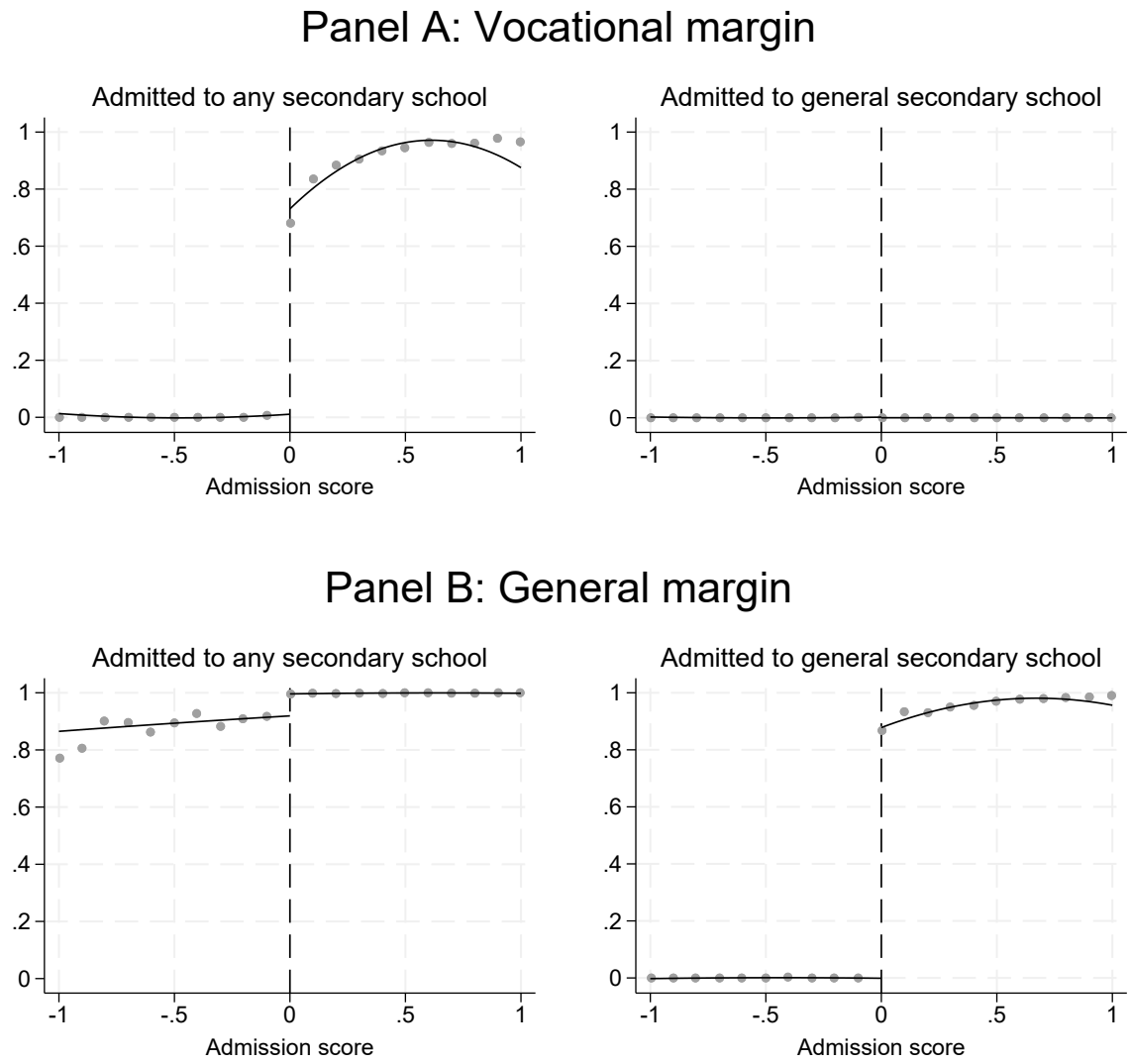

Figure 1 The effect of crossing the threshold on the probability of secondary school admission

Notes: This figure shows how crossing the threshold affects the probability of admission on first attempt. Each dot represents the average outcome for individuals within 0.1-point bins of the admission score. Cutoff points have been normalized to zero for each school. The RD-plots include linear fits of degree two, estimated separately on either side of the threshold. For consistency across margins, we have divided the admission scores by 10 in the vocational margin analyses, so that the running variable lies on a comparable -1 to 1 scale in both margins. This implies that, in vocational margin, the results are shown within raw scores ranging from -10 to 10.

tematic differences in any characteristics between individuals on either side of the thresholds. Therefore, the mental health outcomes of individuals just under the thresholds provide insights into how mental health outcomes of individuals just above the thresholds would have developed in the absence of the secondary school admission. That is, the differences between later outcomes of these individuals can be interpreted as causal effects of secondary school admission for students at the margin.

The majority of general secondary schools directly apply GPA, scaled from 4 to 10, as the primary criterion for admission. However, some exceptions exist, such as sports- or music-oriented general schools, which may use alternative scoring scales and weighting schemes. Consequently,

a one-point increase in GPA does not have comparable impact on admission scores across all the general schools. Thus, we need to rescale admission scores into comparable GPA units in our general margin analyses, following Huttunen et al. (2023). In visualizations, we present the results within the rescaled admission score ranging from -1 to 1 relative to the cutoff points.[7] In contrast, vocational schools typically apply a different scoring scale and may include additional criteria, such as entrance exams or prior work experience, in determining admission scores, resulting in scores that exceed the standard GPA scale (see Table 1). Fortunately, given the 2004 reform, which unified the scoring system for vocational schools (Kalmbach, 2024), admission scores across vocational schools are comparable in terms of GPA. Thus, we use the raw admission scores as such in our vocational margin analyses without further rescaling. In practice, we show the results within these raw scores ranging from -10 to 10. However, for consistency across margins, we divide the admission scores by 10 in the vocational margin analyses, so that the running variable lies on a comparable -1 to 1 scale in both margins.

Figure 1 displays the probability of secondary school admission near the cut-offs in both margins, in terms of the admission score. Panel A shows that applicants in the vocational margin who barely exceed the cut-off for their least selective vocational school are over 60 percentage points more likely to be admitted to any secondary school. However, none of them have gained admission to general education. According to Panel B, majority of the applicants in the general margin, even those below the admission threshold, have been admitted to some type of secondary education. However, individuals who only just exceed to cut-off are over 80 percentage points more likely to be admitted to a general school. Notably, the probability of admission to any secondary school or general secondary school does not jump to one in either of the margins, as the threshold is crossed. This is mostly due to fact that some applicants—particularly those close to being rejected and potentially placed on a waiting list—might ultimately decline their offers, which results in an admission status 'cancelled' in the data. According to our data, the probability of such cancellations appears to be higher the closer an applicant is to the threshold. However, to address this incomplete treatment assignment, we additionally employ an instrumental variable approach by scaling the reduced form estimates by the change in the probability of admission and report the local average treatment effect (LATE). In practice, the LATE estimate represents the actual effect of secondary school admission.

Note also that a small share of applicants below the cutoff gain access to a secondary school by the end of the year despite an initial rejection. Furthermore, not all admitted applicants enroll in the school to which they were admitted. However, we consider the initial admission status from the automatic selection stages displayed in Figure 1 to be most plausibly quasi-random. After the primary application rounds, admissions are no longer granted in order and

[7] We rescale the admission scores to comparable GPA units by estimating program-year-specific regressions, where the admission score is the dependent variable and GPA is the explanatory variable. We then divide each applicants' admission score by the program-year-specific coefficient of GPA, obtained from these regressions. By this procedure, a one-point increase in GPA affects the rescaled admission scores similarly across different types of general secondary schools. We rely on these rescaled admission scores throughout the general margin analyses.

some applicants may gain access by directly contacting schools. Such applicant behavior may, in turn, be associated with certain background characteristics. However, Table A.5 reports differences in final enrollment status by the end of the first year, showing that the initial admission thresholds generate substantial discontinuities in final enrollment as well.

We utilize the discontinuities shown in Figure 1 to estimate the causal effect of secondary school admission on mental health separately within both, vocational and general margins. Formally, to estimate how crossing the threshold affects the given mental health outcome, we estimate the reduced form regression function based on the following equation:

$$y_{ikt} = \beta_0 + \beta_1 Z_{ikt} + \beta_2 Z_{ikt}(score_{ikt} - c_{kt}) + \beta_3(1 - Z_{ikt})(score_{ikt} - c_{kt}) + \lambda \mathbf{X'_{ikt}} + e_{ikt}, \quad (1)$$

where y_{ikt} is the mental health outcome of interest for individual i applying to program k in year t, Z_{ikt} is the indicator taking the value of 1 if the individual is at or above the cutoff c_{kt} and 0 otherwise, and β_1 captures the treatment effect of interest. We include separate trends on each side of the cutoff, represented by β_2 (for those above the cutoff) and β_3 (for those below the cutoff), as well as the vector of control variables $\mathbf{X'_{ikt}}$ including a full set of cutoff fixed effects and year-of-birth fixed effects to allow for distinct effects across programs and birth year cohorts. To obtain the first stage, implying how crossing the threshold affects the probability of admission, we estimate the following equation:

$$D_{ikt} = \alpha_0 + \alpha_1 Z_{ikt} + \alpha_2 Z_{ikt}(score_{ikt} - c_{kt}) + \alpha_3(1 - Z_{ikt})(score_{ikt} - c_{kt}) + \lambda \mathbf{X'_{ikt}} + u_{ikt}, \quad (2)$$

where D_{ikt} is the treatment indicator taking the value of 1 if the individual is admitted to a given type of secondary education and α_1 captures the discontinuity in the admission probability at the cutoff. To address the incomplete treatment assignment and gain insights into actual mental health effect of admission (LATE), we scale the reduced form with the first stage and estimate the following second stage equation:

$$y_{ikt} = \gamma_0 + \gamma_1 D_{ikt} + \gamma_2 Z_{ikt}(score_{ikt} - c_{kt}) + \gamma_3(1 - Z_{ikt})(score_{ikt} - c_{kt}) + \lambda \mathbf{X'_{ikt}} + \eta_{ikt}. \quad (3)$$

where γ_1 captures LATE of admission at the given margin.

We report robust bias corrected 95% confidence intervals suggested by Calonico et al. (2014), which are clustered at the cutoff level. In our main specification, we use triangular kernel weights and a fixed bandwidth of 0.5 admission score points to ensure comparability of results and sample sizes across different outcomes. However, we test the robustness of our results using several alternative estimation windows, including the data-driven, mean square error (MSE)–optimal bandwidth (Calonico et al., 2014, 2017).

To contextualize our findings and gain additional insights into how crossing the threshold affects subsequent schooling outcomes, we replace the outcome of interest in Equation (1) with completed degree. Figure 2 shows how crossing the threshold affects the likelihood of completing a degree within nine years of admission to vocational or to general education. In the vocational margin sample, crossing the threshold increases the probability of any completed secondary degree within three years of admission by around 20 percentage points. Thereafter,

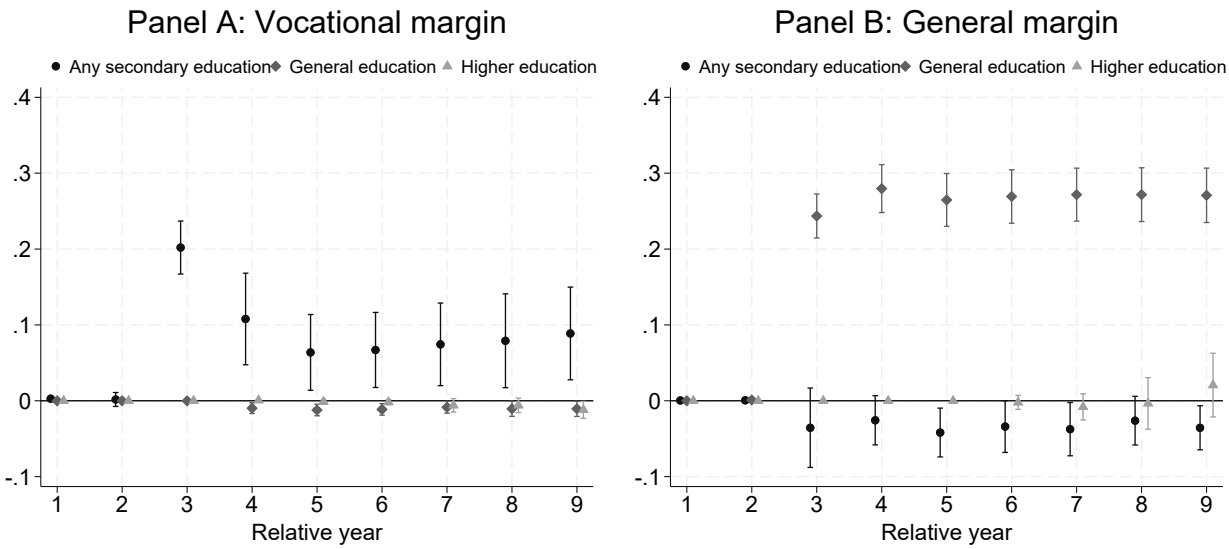

Figure 2 The effect of crossing the threshold on completed degree

Notes: This figure shows how crossing the threshold affects the completed degree. Annual estimates are obtained following Equation (1), using a fixed bandwidth of 0.5 admission score point and a triangular kernel. Higher education refers to at least a bachelor's level degree.

however, the effect diminishes toward zero. Clearly, the initial rejection does not necessarily imply completely dropping out from further education, as those who were rejected appear to nearly catch up in terms of education with those accepted on their first attempt. However, being admitted on the first attempt still significantly predicts the completed secondary degree on the longer term as well.

In the general margin sample, in contrast, we observe that crossing the threshold on the type of secondary education appears to permanently increase the probability of completed general secondary degree by 27 percentage points, on average. In other words, those being rejected by their preferred general track and admitted to a vocational track instead are likely to remain in that track and pursue their secondary education in vocational school.

A common concern in RD designs is the potential manipulation of the treatment assignment. In case of our setting, this could appear if, for instance, applicants followed certain type of strategic behavior during the application process, and this behavior was associated with specific background characteristics. However, as the ninth-grade students in Finland receive their final grades in May, approximately two months after applying to secondary education, they do not know their exact admission score at the time of applying. Moreover, the admission thresholds vary across years, as we also observe from our data, which further challenges the strategic behavior.

We consider the validity of the design by displaying the deviation of the sample across the admission score. Figure A.1 shows some bunching at the cutoff in the general margin sample. This is partly due to the fact that the cutoffs are defined by the last admitted applicant, which is why the cutoffs are the only points of the running variable, where each school has at least one applicant. However, we cannot rule out the possibility that the bunching was due

to rounding of final grades by comprehensive schools. When we exclude applicants exactly at the cutoffs in parts (ii) and (iv) of Figure A.1, these spikes mostly disappear, and both samples pass the RD manipulation test proposed by Cattaneo et al. (2018). To ensure that this spiking does not bias our estimates, we show the main results by excluding applicants exactly at the cutoffs in Table A.6. In Table A.2, we check the covariate balance at the threshold, finding that applicants close to the admission threshold appear to be very similar on both sides of the cutoff. We find only a few minor differences in pre-determined characteristics. To ensure that none of the background factors drive our estimates, we additionally report our main results controlling for the observable characteristics in Table A.6. Moreover, Figures A.2 and A.3 visually show the unadjusted means of pre-determined characteristics for both margins, supporting the assumption that there are no clear discontinuities at the cutoffs.

4 Results

4.1 Main results on mental health

We begin by visually examining the unadjusted means of mental health outcomes. In Figure 3, Panels A and B display the cumulative incidence of mental health outcomes as a standard unadjusted RD-plots, within 3, 5, 7, and 9 years of admission. In both margins, we find that the likelihood of mental health outcomes correlates mostly negatively with the admission score, although more clearly in the vocational margin. This implies that higher admission score predicts lower likelihood of mental health outcomes. In Panel A, we observe slight discontinuities in psychotropic drug use, while healthcare visits for mental health appear stable around the threshold. That is, applicants who barely crossed the admission threshold of their least selective *vocational* school may have a lower likelihood of psychotropic drug use within 7-9 years of admission, compared with those who were rejected by all secondary schools listed in their application. Notably, given that secondary education typically lasts 2-4 years, these discontinuities emerge only after potential graduation from vocational school.

In contrast, in Panel B of Figure 3, we observe slightly sharper discontinuities in the probabilities of psychotropic drug and mental health related healthcare use. This indicates that applicants who barely crossed the threshold for their least selective *general* secondary school are less likely to experience negative mental health outcomes in the following years, compared to those who were only just rejected by their preferred general school and admitted to vocational school instead. Specifically, discontinuities in healthcare visits emerge already within three years of admission.

Table 2 presents the main estimates within 3, 5, 7, and 9 years of applying for first time, following Equations (1)–(3). In the vocational margin, the LATE estimate suggest that admission to vocational school versus no admission statistically significantly decreases psychotropic drug use by 6.3 percentage points within seven years of admission. In the general margin, in contrast, the LATE estimate implies that admission to a general school instead of a vocational school reduces healthcare visits for mental health by 4.5 percentage points within seven years

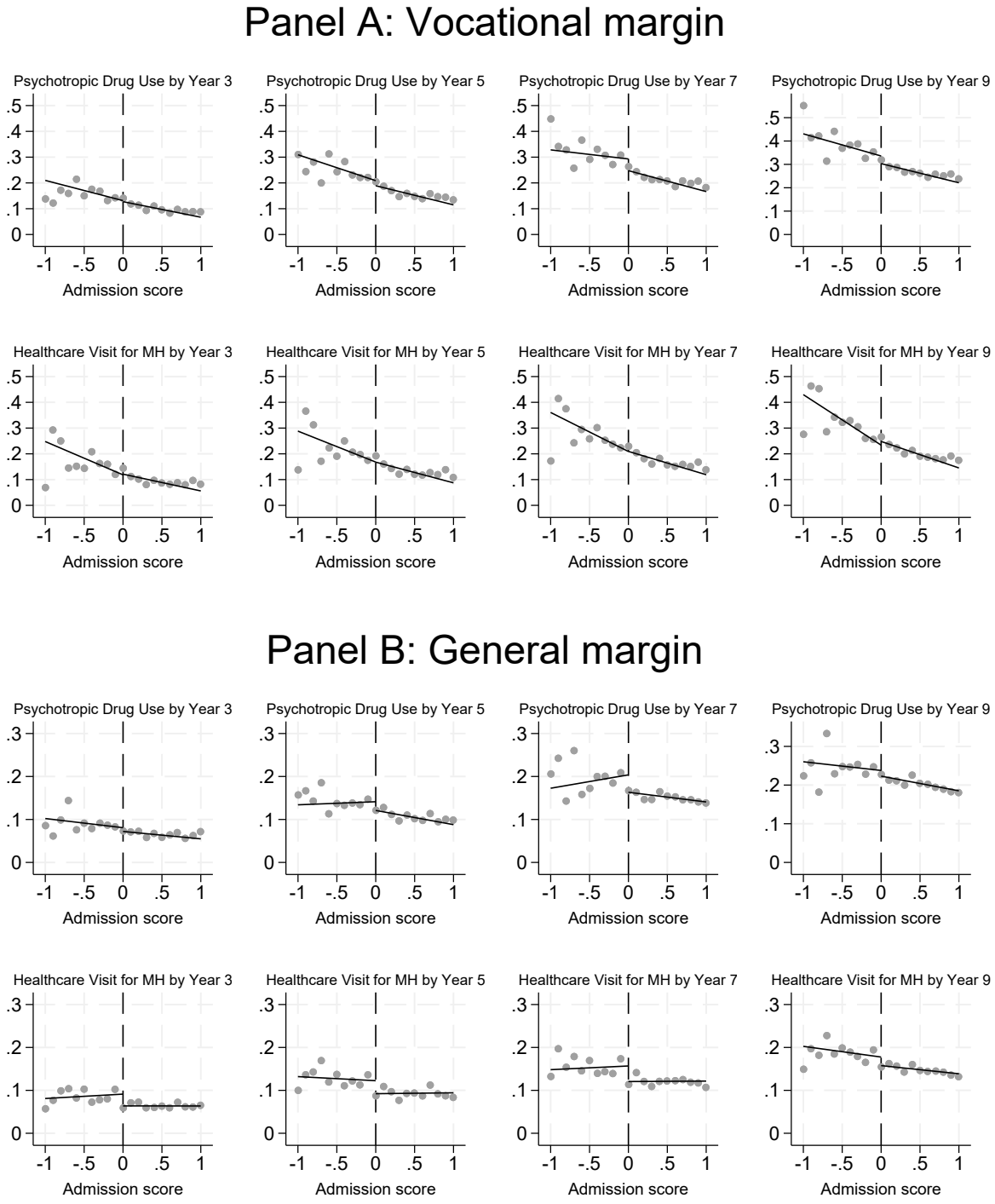

Figure 3 Mental health outcomes and secondary school admission

Notes: This figure shows standard RD-plots for the cumulative incidence of mental health outcomes within 3, 5, 7, and 9 years of the application year. Each dot represents the average outcome for individuals within 0.1-point bins of the admission score. Cutoff points have been normalized to zero for each school. The RD-plots include linear fits of degree one, estimated separately on either side of the threshold. For consistency across margins, we have divided the admission scores by 10 in the vocational margin analyses, so that the running variable lies on a comparable -1 to 1 scale in both margins. This implies that, in vocational margin, the results are shown within raw scores ranging from -10 to 10.

Table 2 Main estimates on mental health outcomes (cumulative incidence)

	Year 3	Year 5	Year 7	Year 9
Panel A: Vocational margin				
Psychotropic drug use				
Reduced form	.008 (-.071, .034)	-.002 (-.11, .043)	-.038*** (-.183, -.029)	-.019* (-.138, .008)
Counterfactual outcome	.129	.207	.301	.337
First stage	.605*** (.489, .57)	.605*** (.489, .57)	.605*** (.489, .57)	.605*** (.489, .57)
LATE: Admitted	.014 (-.115, .058)	-.003 (-.181, .071)	-.063*** (-.31, -.056)	-.031* (-.231, .009)
Observations	8274	8252	8228	8209
Healthcare visit for mental health				
Reduced form	.043* (-.007, .128)	.033 (-.039, .097)	.022 (-.073, .073)	.034 (-.078, .093)
Counterfactual outcome	.096	.155	.203	.23
First stage	.605*** (.489, .57)	.605*** (.489, .57)	.605*** (.489, .57)	.605*** (.489, .57)
LATE: Admitted	.071* (-.004, .221)	.054 (-.058, .168)	.036 (-.116, .125)	.056 (-.121, .161)
Observations	8274	8252	8228	8209
Panel B: General margin				
Psychotropic drug use				
Reduced form	-.007 (-.059, .021)	-.014 (-.079, .024)	-.035 (-.122, .043)	-.015 (-.104, .084)
Counterfactual outcome	.088	.151	.215	.249
First stage	.841*** (.771, .862)	.841*** (.771, .862)	.841*** (.771, .862)	.841*** (.771, .862)
LATE: Admitted	-.009 (-.071, .025)	-.017 (-.094, .028)	-.042 (-.146, .049)	-.017 (-.124, .099)
Observations	6023	5998	5976	5938
Healthcare visit for mental health				
Reduced form	-.033*** (-.105, -.024)	-.029** (-.103, -.005)	-.038*** (-.145, -.032)	-.016 (-.111, .014)
Counterfactual outcome	.109	.14	.179	.196
First stage	.841*** (.771, .862)	.841*** (.771, .862)	.841*** (.771, .862)	.841*** (.771, .862)
LATE: Admitted	-.039*** (-.127, -.029)	-.035** (-.123, -.007)	-.045*** (-.174, -.039)	-.019 (-.133, .016)
Observations	6023	5998	5976	5938

Notes: *p<0.1; **p<0.05; ***p<0.01. This table presents the conventional RD estimates for cumulative incidence of mental health outcomes 3, 5, 7, and 9 years after admission. Each estimate is obtained using a triangular kernel with a fixed bandwidth of 0.5 admission-score points, and includes cutoff and birth-year fixed effects. The robust bias corrected 95% confidence intervals, clustered at the cutoff level, are shown in parentheses (Calonico et al., 2014). Note that the robust confidence intervals are not necessarily centered around the conventional RD estimates, which may occasionally fall outside the reported intervals when the bias correction is large. Reduced form denotes the effect of crossing the threshold on a given mental health outcome, counterfactual outcome denotes the conventional local polynomial left estimate indicating the estimated outcome for the control group at the threshold, first stage denotes the effect of crossing the threshold on admission, and LATE denotes the local average treatment effect of admission on the mental health outcome. Reduced form estimates from alternative specifications are reported in Table A.6.

of admission. Given the counterfactual outcomes just below the threshold, both of these effects correspond to declines of 21%.

In Table A.3, we further examine the effects of admission on the most prevalent types of psychotropic drug use and healthcare visits. In summary, while crossing the threshold to vocational education tends to increase visits in some areas, such as anxiety-related visits, we find that admission significantly reduces healthcare visits related to substance use disorders. In contrast, crossing the threshold to general education reduces particularly visits related to

mood, depressive, and anxiety disorders.

In Table A.4, we additionally consider gender differences in the effects of secondary school admission. Overall, a narrow admission to vocational education has a broadly similar effect on mental health outcomes for women and men. In contrast, admission to general rather than vocational education tends to reduce mental health visits more among men.

4.2 Potential channels

Our main findings on mental health outcomes raise the question on the potential mechanisms behind the effects. We aim to descriptively gain insights into these mechanisms by exploring several potential channels that we can identify from register data. First, in Table A.5, we show that students who cross the admission cut-off of their least selective *general school* tend to end up being surrounded by more advantaged group of peers. In contrast, barely gaining access to vocational education on first attempt tends to have much weaker effect on peer composition, when considering the school within which an applicant is enrolled by the end of the first year.[8] It is important to note that these findings on peer effects cannot be interpreted as causal channels between secondary school admission and mental health, although the potential influence of surrounded peers on mental health has been extensively discussed in recent literature (Alho et al., 2024; Bütikofer et al., 2023; Eisenberg et al., 2014; Frijters et al., 2019; Gong et al., 2021; Johnsen & Jansen, 2024; Kiessling & Norris, 2022; A. Zhang, 2019). However, our examination still reveals that the short-term mental health effects emerging already during secondary education strongly correlate with changes in peer characteristics.

Figure A.4 displays the annual estimates for labor market effects. Panel A shows that crossing the threshold in the vocational margin remarkably increases labor market participation and labor income while decreasing reliance on social benefits, particularly during the typical post graduation years. These differences occur around the same time as the declining effects of vocational school admission on psychotropic drug use and healthcare visits related to substance use. On the other hand, the observed positive estimates in other areas of healthcare use may be partially explained by improved access to student healthcare following secondary school admission, as discussed in Section 2.2, as well as by access to occupational healthcare upon graduation, given these findings on labor market outcomes.

In Panel B of Figure A.4, we find that crossing the threshold on the general margin increases the probability of being enrolled in studies, while shrinking labor market outcomes after admission. Interestingly, we also observe a modest increase in the likelihood of receiving social assistance in Years 6 and 7, which may potentially reflect financial strain during higher education studies. In the context of admission to general instead of vocational education, the observed short-term effects on mental health are clearly not driven by higher income or

[8]Since in this context 'peers' refer to individuals attending the same school, peer effects can only be measured for those who actually enroll, i.e., these estimations do not capture any peer effects outside the school environment. Consequently, for the vocational margin, we can only analyze those who eventually gain access to secondary education by the end of the first year, despite the potential rejection on the first attempt.

improved labor market status. These results on labor market outcomes align with previous Finnish evidence (Huttunen et al., 2023; Silliman & Virtanen, 2022).

In Figure A.5, we additionally examine how living arrangements are affected by secondary school admission. In both margins, crossing the threshold associates with a higher probability of living with parents shortly after admission. Interestingly, these effects appear stronger and more significant in the general margin, within which we also find negative effect on the probability of living alone or in cohabitation. The strongest effects on living arrangements occur roughly at the same time as the positive effects on mental health in the general margin. While mental health can be simultaneously affected through several other channels, thus limiting causal inferences, these findings provide novel suggestive evidence on the potential influence of living arrangements on mental health and contribute to prior descriptive evidence (Hikichi et al., 2020; Howard et al., 2023; Wu & Grundy, 2023).

4.3 Robustness

We perform several robustness checks to ensure the validity of our findings in Appendix A.4. First, in Figure A.6, we check the sensitivity of our main estimates using several alternative bandwidths. We find that the magnitude of our main findings do not remarkably change as the window size is modified. Second, to consider the sensitivity of the results for model specification, we report the main reduced form estimates using alternative specifications in Table A.6. We find that adding controls, excluding fixed effects, excluding applicants exactly at the cutoffs, using the outcome-specific MSE-optimal bandwidth suggested by Calonico et al. (2014), or using full samples in the estimation does not remarkably affect the inference. Our main estimates are rather more conservative compared to most of the those produced with other specifications. Overall, the key conclusions are robust to alternative specifications.

5 Discussion

Amid growing concerns about health disparities and rising prevalence of mental health problems among children and adolescents over the past decade, it is increasingly important to understand how institutions and structural factors shape mental well-being across the life course. At the same time, many countries are making substantial investments in education and human capital accumulation, often under the shadow of declining fertility rates and population aging. From an economic perspective, the extent to which education shapes adolescent mental health is of particular relevance, as mental health associates not only with individual welfare but also with labor market outcomes and long-run productivity. The transition from compulsory to post-compulsory education is a particularly critical point: it combines vulnerable age for the onset of mental disorders (Solmi et al., 2022) with crucial choices on human capital formation, making it an important period to investigate.

This study provides novel evidence on mental health effects of secondary education. Using rich Finnish register data, we examine how admission to vocational secondary education

(vocational margin) and separately, how admission to general secondary education instead of vocational education (general margin) affect mental health outcomes. We use a regression discontinuity design (RD) exploiting quasi-random variation in secondary school admissions. That is, we compare individuals who barely exceed the program-year-specific admission cutoff with those who narrowly fail to get admitted based on their admission score. Our design builds particularly on prior research that has used similar identification strategy in the Finnish context (Huttunen et al., 2023; Kuuppelomäki, 2021; Ollikainen et al., 2024; Silliman & Virtanen, 2022; Virtanen et al., 2024).

Our results show that immediate admission to vocational education after completing comprehensive education may positively affect mental health by reducing psychotropic drug use by 6.3 percentage points (-21%) within seven years of admission. While access to vocational education tends to increase healthcare visits in some areas, we find that admission remarkably decreases visits for substance use. We demonstrate that these effects mostly emerge after the completion of a secondary education of typical duration. In contrast, we find that admission to a general secondary school instead of vocational school decreases mental health related healthcare use by 4.5 percentage points (-21%) within seven years of admission, with the effect primarily occurring during the first years after admission. These findings to some extent align with previous RD-based evidence on the mental health effects of the most selective general secondary schools (Bütikofer et al., 2023; Kuuppelomäki, 2021) and supply restrictions in secondary education (Johnsen & Jansen, 2024), although our setting and target population slightly differ from those used in earlier studies. Overall, our findings complement the existing literature on the health effects of education and educational reforms by providing evidence for recent birth cohorts and immediate mental health effects of secondary education (Böckerman et al., 2021; Brunello et al., 2016; Dang et al., 2026; Gathmann et al., 2015; Johnston et al., 2015; Kondirolli & Sunder, 2022; Li & Powdthavee, 2015; Meghir et al., 2018).

We consider that the channels behind the mental health effects of secondary education may differ across levels of the secondary education system. For instance, we find that vocational education improves labor market outcomes, compared to both completely rejected applicants and those admitted to general education, aligning with prior Finnish evidence (Huttunen et al., 2023; Silliman & Virtanen, 2022). This may potentially drive the observed post-graduation mental health benefits of vocational education to some extent. However, based on these results, we cannot make any causal claims about the association between mental health and, for instance, income. In fact, the existing causal evidence regarding this association is mixed, with some papers reporting null results regarding health effects of income (Cesarini et al., 2016; Miller et al., 2024), whereas some showing that higher personal income positively affects health (Kim & Koh, 2021; Lindahl, 2005). Moreover, admission to general instead of vocational education appears to be beneficial for mental health already during secondary education, unrelated to labor market outcomes.

Indeed, when comparing the access to two main tracks of the secondary education system, general and vocational, the mechanisms underlying the mental health effects may be slightly different. According to our results, the type of track an individual is placed on appears to have a

significantly positive effect on peer characteristics, measured by performance in comprehensive school, parental background, and prior mental health events. While these findings do not identify causal mechanisms between peer characteristics and mental health, they contribute to the discussion on potential positive influence of peers on mental health (Alho et al., 2024; Bütikofer et al., 2023; Johnsen & Jansen, 2024). Furthermore, these results align with previous causal evidence showing that peer composition may positively affect mental health (Gong et al., 2021; Kiessling & Norris, 2022), although some studies report negligible effects (Eisenberg et al., 2014; Frijters et al., 2019; A. Zhang, 2019). Our gender-specific results additionally add to the discussion that male applicants may be generally more strongly affected by peer composition (Eisenberg et al., 2014; Griffith & Rask, 2014), as our findings suggest that admission to general education has a larger negative effect on visits related to mental health among men.

In addition to potential peer effect, our findings on living arrangements suggest that prolonged parental co-residence might contribute to the observed short-term benefits in mental health. To speculate, this may emerge through continued social and emotional support but also through reduced financial strain during years lived with parents, given that those admitted to general school tend to take part on the labor market later compared to those admitted to vocational school. Prior evidence on co-residence and mental health is, however, relatively scarce, mixed, and rather descriptive (Hikichi et al., 2020; Howard et al., 2023; Wu & Grundy, 2023).

Overall, our findings contribute to the previous literature in several ways. Prior studies on the health impacts of education have typically focused on nationwide reforms and long-term impacts. We use RD-design that more closely resembles experimental design and focus on immediate mental health effects of secondary school admission. Furthermore, we focus on recent cohorts, potentially better reflecting the current educational system and mental health challenges of today's youth. Additionally, our comprehensive examination of heterogeneous effects and potential mechanisms illustrates which types of mental health issues are most affected by secondary education and through which channels these issues may be affected. Finally, rather than focusing only on one narrow group of applicants, we examine two distinct margins within the secondary education system to gain broader insights into mental health effects of secondary education. One of these, vocational margin, captures the mental health effects of vocational education among the relatively disadvantaged group of applicants, regarding which the evidence is particularly scarce in the existing literature.

Our study has a few limitations. First, similar to experimental designs, a quasi-experimental RD-design is also subject to concerns about external validity. Our results apply to individuals very close to the admission thresholds and are not necessarily generalizable to a wider population. However, as we focus on two separate margins, we aim to partially address this issue by focusing on individuals close to different admission cutoffs, and with different characteristics and preferences. Second, our mental health data is based on specialized health care use and purchases of prescribed medicines, which indicates that we mainly account for more severe mental health issues that require treatment in specialized care or medication. This can also be considered as a strength of the study, as these indicators are clinically validated and not

affected by reporting bias. Third, we are not able to fully explain the differences in results regarding medication and healthcare service use. They may reflect distinct gate keeping practices in the system and available alternatives. On the other hand, these differences highlight the importance of examining multiple indicators of mental health. We consider that medication use complements the results on specialized health care as psychotropics can also be prescribed in private sector and public primary care.

Finally, while we examine several possible channels, such as peer effects and living arrangements, our reliance on register data may overlook more qualitative aspects behind the observed mental health effects, such as disappointment, stress, or exclusion due to academic mismatch, particularly among those who are only just rejected by their preferred general track. Indeed, failing to gain access to a preferred track—potentially affecting one's future career prospects, sense of belonging and self-confidence—might play a role in shaping later mental health, along with observable changes in school environment and other outcomes. For instance, our findings in the general margin sample do not necessarily imply that admission to vocational school causes mental health problems as such. Rather, part of the effect might be explained by the adverse effects of getting rejected from the preferred track. In fact, this interpretation is partly supported by our vocational margin analyses, which show that admission to vocational education has also beneficial effect on mental health.

Recent OECD guidance highlights practices for preventing mental health issues among children and youth, such as tailored school-based programs and improved access to mental health services (OECD, 2025). More specifically, a meta-analysis based on randomized controlled trials (RCT) summarizes that school-based mental health interventions may effectively reduce depression and anxiety, particularly when implemented in secondary school environment (Q. Zhang et al., 2023). Our results point to the potential value of providing such targeted mental health support particularly for those who are at risk of entirely dropping out of secondary education, or being academically mismatched to a track other than they initially preferred. However, implementing mental health interventions requires considering trade-offs with other educational investments, such as investments in performance, which are often prioritized by many governments (OECD, 2022). Given the resource constraints of education budgets, any decision to invest in school-based mental health programs should focus scarce resources on evidence based approaches.

In summary, our results imply that secondary education, both vocational and general, can have a beneficial impact on adolescent mental health. This is a significant finding given the recent reforms that have expanded compulsory education to age 18 in Finland and other OECD countries (OECD, 2024). Our results suggest that ensuring access to secondary education through such reforms may help alleviate the mental health burden among adolescents. However, challenges related to track allocation, dropout, and disengagement persist despite the extensions of compulsory education. As mental health issues among youth continue to rise, along with the related treatment costs and potential productivity losses, supporting students during critical educational transitions may be an important component of effective mental health and education policy.

Data availability

The study uses licensed data from Statistics Finland, Finnish Institute for Health and Welfare (THL), and Social Insurance Institution of Finland (KELA). Access to the data is not restricted to a specific institution or research group. Researchers from universities and research institutes within the EU can use the data through Statistics Finland's remote access system, given they meet the required data security approvals. Information on the application process can be found on the Statistics Finland and Findata websites.

References

Alho, J., Gutvilig, M., Niemi, R., Komulainen, K., Böckerman, P., Webb, R. T., Elovainio, M., & Hakulinen, C. (2024). Transmission of Mental Disorders in Adolescent Peer Networks. *JAMA Psychiatry*, *81*(9), 882. https://doi.org/10.1001/jamapsychiatry.2024.1126

Amin, V., Fletcher, J. M., Lu, Q., & Song, J. (2023). Re-examining the relationship between education and adult mental health in the UK: A research note. *Economics of Education Review*, *93*, 102354. https://doi.org/10.1016/j.econedurev.2023.102354

Araya, R. (2003). Education and income: Which is more important for mental health? *Journal of Epidemiology & Community Health*, *57*(7), 501–505. https://doi.org/10.1136/jech.57.7.501

Blomgren, J., Martikainen, P., Kolk, A., Talala, K., Lähemaa, T., Saarni, S., & Ristikari, T. (2013). Income-related differences in private doctor visits in finland, 2005 and 2011. *European Journal of Public Health*, *23*(suppl_1), ck124.077. https://doi.org/10.1093/eurpub/ckt124.077

Böckerman, P., Haapanen, M., Jepsen, C., & Roulet, A. (2021). School Tracking and Mental Health. *Journal of Human Capital*, *15*(2), 291–345. https://doi.org/10.1086/712728

Brunello, G., Fort, M., Schneeweis, N., & Winter-Ebmer, R. (2016). The Causal Effect of Education on Health: What is the Role of Health Behaviors? *Health Economics*, *25*(3), 314–336. https://doi.org/10.1002/hec.3141

Bütikofer, A., Ginja, R., Løken, K. V., & Landaud, F. (2023). Higher-Achievement Schools, Peers and Mental Health. *The Economic Journal*, *133*(655), 2580–2613. https://doi.org/10.1093/ej/uead048

Calonico, S., Cattaneo, M. D., Farrell, M. H., & Titiunik, R. (2017). Rdrobust: Software for Regression-discontinuity Designs. *The Stata Journal: Promoting communications on statistics and Stata*, *17*(2), 372–404. https://doi.org/10.1177/1536867X1701700208

Calonico, S., Cattaneo, M. D., & Titiunik, R. (2014). Robust Nonparametric Confidence Intervals for Regression-Discontinuity Designs: Robust Nonparametric Confidence Intervals. *Econometrica*, *82*(6), 2295–2326. https://doi.org/10.3982/ECTA11757

Cattaneo, M. D., Jansson, M., & Ma, X. (2018). Manipulation testing based on density discontinuity. *The Stata Journal*, *18*(1), 234–261. https://doi.org/10.1177/1536867X1801800115

Cesarini, D., Lindqvist, E., Östling, R., & Wallace, B. (2016). Wealth, Health, and Child Development: Evidence from Administrative Data on Swedish Lottery Players *. *The Quarterly Journal of Economics*, *131*(2), 687–738. https://doi.org/10.1093/qje/qjw001

Cornaglia, F., Crivellaro, E., & McNally, S. (2015). Mental health and education decisions. *Labour Economics*, *33*, 1–12. https://doi.org/10.1016/j.labeco.2015.01.005

Dalgard, O. S., Mykletun, A., Rognerud, M., Johansen, R., & Zahl, P. H. (2007). Education, sense of mastery and mental health: Results from a nation wide health monitoring study in Norway. *BMC Psychiatry*, *7*(1), 20. https://doi.org/10.1186/1471-244X-7-20

Dalsgaard, S., McGrath, J., Østergaard, S. D., Wray, N. R., Pedersen, C. B., Mortensen, P. B., & Petersen, L. (2020). Association of Mental Disorder in Childhood and Adolescence With Subsequent Educational Achievement. *JAMA Psychiatry*, *77*(8), 797. https://doi.org/10.1001/jamapsychiatry.2020.0217

Dang, T., Haapanen, M., & Suhonen, T. (2026). The long-term health consequences of expanding access to higher education. *Economics of Education Review*, *112*, 102794. https://doi.org/10.1016/j.econedurev.2026.102794

Dobbie, W., & Fryer, R. G. (2014). The Impact of Attending a School with High-Achieving Peers: Evidence from the New York City Exam Schools. *American Economic Journal: Applied Economics*, *6*(3), 58–75. https://doi.org/10.1257/app.6.3.58

Eisenberg, D., Golberstein, E., & Whitlock, J. L. (2014). Peer effects on risky behaviors: New evidence from college roommate assignments. *Journal of Health Economics*, *33*, 126–138. https://doi.org/10.1016/j.jhealeco.2013.11.006

Fletcher, J. M. (2010). Adolescent depression and educational attainment: Results using sibling fixed effects. *Health Economics*, *19*(7), 855–871. https://doi.org/10.1002/hec.1526

Frijters, P., Islam, A., & Pakrashi, D. (2019). Heterogeneity in peer effects in random dormitory assignment in a developing country. *Journal of Economic Behavior & Organization*, *163*, 117–134. https://doi.org/10.1016/j.jebo.2019.04.025

Gathmann, C., Jürges, H., & Reinhold, S. (2015). Compulsory schooling reforms, education and mortality in twentieth century Europe. *Social Science & Medicine*, *127*, 74–82. https://doi.org/10.1016/j.socscimed.2014.01.037

Gaviria, A., & Raphael, S. (2001). School-based peer effects and juvenile behavior. *The Review of Economics and Statistics*, *83*(2), 257–268. https://doi.org/10.1162/00346530151143798

Gong, J., Lu, Y., & Song, H. (2021). Gender Peer Effects on Students' Academic and Noncognitive Outcomes: Evidence and Mechanisms. *J. Human Resources*, *56*(3), 686–710. https://doi.org/10.3368/jhr.56.3.0918-9736R2

Griffith, A. L., & Rask, K. N. (2014). Peer effects in higher education: A look at heterogeneous impacts. *Economics of Education Review*, *39*, 65–77. https://doi.org/10.1016/j.econedurev.2014.01.003

Hamad, R., Elser, H., Tran, D. C., Rehkopf, D. H., & Goodman, S. N. (2018). How and why studies disagree about the effects of education on health: A systematic review and meta-analysis of studies of compulsory schooling laws. *Social Science & Medicine*, *212*, 168–178. https://doi.org/10.1016/j.socscimed.2018.07.016

Hikichi, H., Ni, M. Y., & Leung, G. M. (2020). Parental cohabitation and mental well-being amongst young adults in the world's densest population with least affordable housing: Evidence from the FAMILY cohort. *Journal of Affective Disorders*, *274*, 698–703. https://doi.org/10.1016/j.jad.2020.05.060

Howard, A., Li, A., & Bentley, R. (2023). Parental co-residence and young adults' mental health (E. P. H. Lau, Ed.). *PLoS ONE*, *18*(11), e0294248. https://doi.org/10.1371/journal.pone.0294248

Huttunen, K., Pekkarinen, T., Uusitalo, R., & Virtanen, H. (2023). Lost boys? Secondary education and crime. *Journal of Public Economics*, *218*, 104804. https://doi.org/10.1016/j.jpubeco.2022.104804

Johnsen, J., & Jansen, H. (2024). Adverse Impacts of Supply Restrictions in Secondary Schooling. https://doi.org/10.2139/ssrn.4865049

Johnston, D. W., Lordan, G., Shields, M. A., & Suziedelyte, A. (2015). Education and health knowledge: Evidence from UK compulsory schooling reform. *Social Science & Medicine*, *127*, 92–100. https://doi.org/10.1016/j.socscimed.2014.10.026

Kalmbach, A. (2024). Essays in economics of education and migration. *Elinkeinoelämän tutkimuslaitos, Sarja A*, (52). https://www.etla.fi/julkaisut/kirjat/essays-in-economics-of-education-and-migration/

Keyes, K. M., Gary, D., O'Malley, P. M., Hamilton, A., & Schulenberg, J. (2019). Recent increases in depressive symptoms among US adolescents: Trends from 1991 to 2018. *Soc Psychiatry Psychiatr Epidemiol*, *54*(8), 987–996. https://doi.org/10.1007/s00127-019-01697-8

Kiessling, L., & Norris, J. (2022). The Long-Run Effects of Peers on Mental Health. *The Economic Journal*, *133*(649), 281–322. https://doi.org/10.1093/ej/ueac039

Kim, S., & Koh, K. (2021). The effects of income on health: Evidence from lottery wins in Singapore. *Journal of Health Economics*, *76*, 102414. https://doi.org/10.1016/j.jhealeco.2020.102414

Kondirolli, F., & Sunder, N. (2022). Mental health effects of education. *Health Economics*, *31*(S2), 22–39. https://doi.org/10.1002/hec.4565

Kuuppelomäki, T. (2021). School selectivity and mental health: Evidence from regression discontinuity design. *Working papers / Työn ja talouden tutkimus LABORE*, (333). https://labore.fi/en/publications/school-selectivity-and-mental-health-evidence-from-regression-discontinuity-design/

Li, J., & Powdthavee, N. (2015). Does more education lead to better health habits? Evidence from the school reforms in Australia. *Social Science & Medicine*, *127*, 83–91. https://doi.org/10.1016/j.socscimed.2014.07.021

Lindahl, M. (2005). Estimating the effect of income on health and mortality using lottery prizes as an exogenous source of variation in income. *The Journal of Human Resources*, *40*(1), 144–168. Retrieved September 19, 2025, from http://www.jstor.org/stable/4129568

Liu, Y., Ren, Y., Liu, C., Chen, X., Li, D., Peng, J., Tan, L., & Ma, Q. (2025). Global burden of mental disorders in children and adolescents before and during the COVID-19 pandemic: Evidence from the Global Burden of Disease Study 2021. *Psychol. Med.*, *55*, e90. https://doi.org/10.1017/S0033291725000649

Lundborg, P., Nilsson, A., & Rooth, D.-O. (2014). Adolescent health and adult labor market outcomes. *Journal of Health Economics*, *37*, 25–40. https://doi.org/10.1016/j.jhealeco.2014.05.003

Marsh, H. W. (1987). The big-fish-little-pond effect on academic self-concept [Place: US Publisher: American Psychological Association]. *Journal of Educational Psychology*, *79*(3), 280–295. https://doi.org/10.1037/0022-0663.79.3.280

Meghir, C., Palme, M., & Simeonova, E. (2018). Education and Mortality: Evidence from a Social Experiment. *American Economic Journal: Applied Economics*, *10*(2), 234–256. https://doi.org/10.1257/app.20150365

Miller, S., Rhodes, E., Bartik, A., Broockman, D., Krause, P., & Vivalt, E. (2024, July). *Does Income Affect Health? Evidence from a Randomized Controlled Trial of a Guaranteed Income* (tech. rep. No. w32711). National Bureau of Economic Research. Cambridge, MA. https://doi.org/10.3386/w32711

Mousteri, V., Daly, M., Delaney, L., Tynelius, P., & Rasmussen, F. (2019). Adolescent mental health and unemployment over the lifespan: Population evidence from Sweden. *Social Science & Medicine*, *222*, 305–314. https://doi.org/10.1016/j.socscimed.2018.12.030

OECD. (2022, November). *Value for Money in School Education: Smart Investments, Quality Outcomes, Equal Opportunities*. https://doi.org/10.1787/f6de8710-en

OECD. (2023a, September). *Education at a Glance 2023: OECD Indicators*. https://doi.org/10.1787/e13bef63-en

OECD. (2023b, December). *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*. https://doi.org/10.1787/53f23881-en

OECD. (2024). *Education at a glance 2024: Oecd indicators*. https://doi.org/10.1787/c00cad36-en

OECD. (2025, April). *Promoting good mental health in children and young adults: Best practices in public health* (tech. rep.). https://doi.org/10.1787/ebb8aa47-en

Ollikainen, J.-P., Pekkarinen, T., Uusitalo, R., & Virtanen, H. (2024). Effect of secondary education on cognitive and non-cognitive skills. *Economics of Education Review*, *103*, 102603. https://doi.org/10.1016/j.econedurev.2024.102603

Pitkänen, J., Junna, L., & Martikainen, P. (2023). Adolescent psychiatric inpatient treatment and subsequent labor market trajectories. *European Journal of Public Health*, *33*, 1175–1183. https://doi.org/10.1093/eurpub/ckad160.194

Pop-Eleches, C., & Urquiola, M. (2013). Going to a Better School: Effects and Behavioral Responses. *American Economic Review*, *103*(4), 1289–1324. https://doi.org/10.1257/aer.103.4.1289

Powell, L. M., Tauras, J. A., & Ross, H. (2005). The importance of peer effects, cigarette prices and tobacco control policies for youth smoking behavior. *Journal of Health Economics*, *24*(5), 950–968. https://doi.org/10.1016/j.jhealeco.2005.02.002

Ranta, K., Aalto-Setälä, T., Heikkinen, T., & Kiviruusu, O. (2024). Social anxiety in Finnish adolescents from 2013 to 2021: Change from pre-COVID-19 to COVID-19 era, and mid-pandemic correlates. *Soc Psychiatry Psychiatr Epidemiol*, *59*(1), 121–136. https://doi.org/10.1007/s00127-023-02466-4

Silliman, M., & Virtanen, H. (2022). Labor Market Returns to Vocational Secondary Education. *American Economic Journal: Applied Economics*, *14*(1), 197–224. https://doi.org/10.1257/app.20190782

Sointu, L., Lehtonen, T.-K., & Häikiö, L. (2021). The public, the private and the changing expectations for everyday welfare services: The case of finnish parents seeking private health care for their children. *Social Policy & Society*, *20*(2), 232–246. https://doi.org/10.1017/S1474746420000287

Solmi, M., Radua, J., Olivola, M., Croce, E., Soardo, L., Salazar De Pablo, G., Il Shin, J., Kirkbride, J. B., Jones, P., Kim, J. H., Kim, J. Y., Carvalho, A. F., Seeman, M. V., Correll, C. U., & Fusar-Poli, P. (2022). Age at onset of mental disorders worldwide: Large-scale meta-analysis of 192 epidemiological studies. *Mol Psychiatry*, *27*(1), 281–295. https://doi.org/10.1038/s41380-021-01161-7

Sonego, M., Llácer, A., Galán, I., & Simón, F. (2013). The influence of parental education on child mental health in Spain. *Qual Life Res*, *22*(1), 203–211. https://doi.org/10.1007/s11136-012-0130-x

Vaalavuo, M., Niemi, R., & Suvisaari, J. (2022). Growing up unequal? Socioeconomic disparities in mental disorders throughout childhood in Finland. *SSM - Population Health*, *20*, 101277. https://doi.org/10.1016/j.ssmph.2022.101277

Van Doorslaer, E., Masseria, C., & Koolman, X. (2006). Inequalities in access to medical care by income in developed countries. *Canadian Medical Association Journal*, *174*(2), 177–183. https://doi.org/10.1503/cmaj.050584

Virtanen, H., Silliman, M., Kuuppelomäki, T., & Huttunen, K. (2024). Education, Gender, and Family Formation. (116). https://www.etla.fi/julkaisut/working-papers/education-gender-and-family-formation/

Wu, J., & Grundy, E. (2023). 'Boomerang' moves and young adults' mental well-being in the United Kingdom. *Advances in Life Course Research*, *56*, 100531. https://doi.org/10.1016/j.alcr.2023.100531

Yang, C.-h., Lv, J.-j., Kong, X.-m., Chu, F., Li, Z.-b., Lu, W., & Li, X.-y. (2024). Global, regional and national burdens of depression in adolescents and young adults aged 10–24 years, from 1990 to 2019: Findings from the 2019 Global Burden of Disease study. *Br J Psychiatry*, *225*(2), 311–320. https://doi.org/10.1192/bjp.2024.69

Zhang, A. (2019). Peer Effects on Mental Health: Evidence from Random Assignment into Classrooms. *SSRN Journal*. https://doi.org/10.2139/ssrn.3685374

Zhang, Q., Wang, J., & Neitzel, A. (2023). School-based Mental Health Interventions Targeting Depression or Anxiety: A Meta-analysis of Rigorous Randomized Controlled Trials for School-aged Children and Adolescents. *J Youth Adolescence*, *52*(1), 195–217. https://doi.org/10.1007/s10964-022-01684-4

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Ethics declarations

Conflict of interest

The authors state that they have no conflicts of interest to disclose.

Ethical approval

An ethics approval is not required as the research project is solely based on register data.

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Appendices

A.1 Descriptive information and balanced covariates

Table A.1 Classification of Mental Health Outcomes by ATC and ICD Codes

Psychotropic drug use		
	ATC	
Any psychotropic drug	N05A–N05C, N06A, N06CA	
Antipsychotics	N05A	
Anxiolytics	N05B	
Antidepressants	N06A	
Healthcare visits for mental health		
	ICD-9	**ICD-10**
Any mental disorder	291*–316*	F04*–F69*, F80*–F99*
Substance-use disorders	291–292, 303–305	F10–F19
Mood disorder	296, 3004	F30*–F39
Depressive disorders	2961, 3004A	F32–F33, F341
Anxiety disorder (incl. dissociative, stress-related, somatoform, and other nonpsychotic mental disorders)	300*	F40*–F489

Notes: This table lists the ATC and ICD codes used to define psychotropic drug use (ATC) and healthcare visits for mental health (for years 1970-1995 inpatient admissions only defined by ICD-9, and from 1996 onward for both inpatient and outpatient admissions defined by ICD-10). In our main analyses, we use only ICD-10 to identify mental health related healthcare visits, as our follow-up period begins in 2009. However, ICD-9 codes are used to extract information on mental health admissions prior to the follow-up period for cohorts born before 1996. Our main estimates are based on any psychotropic drug use and any mental disorder. In Table A.3, we report estimates for the most prominent ATC groups and sub-diagnoses listed here (defined as having a prevalence above one percent at the cutoff by year three in either estimation sample).

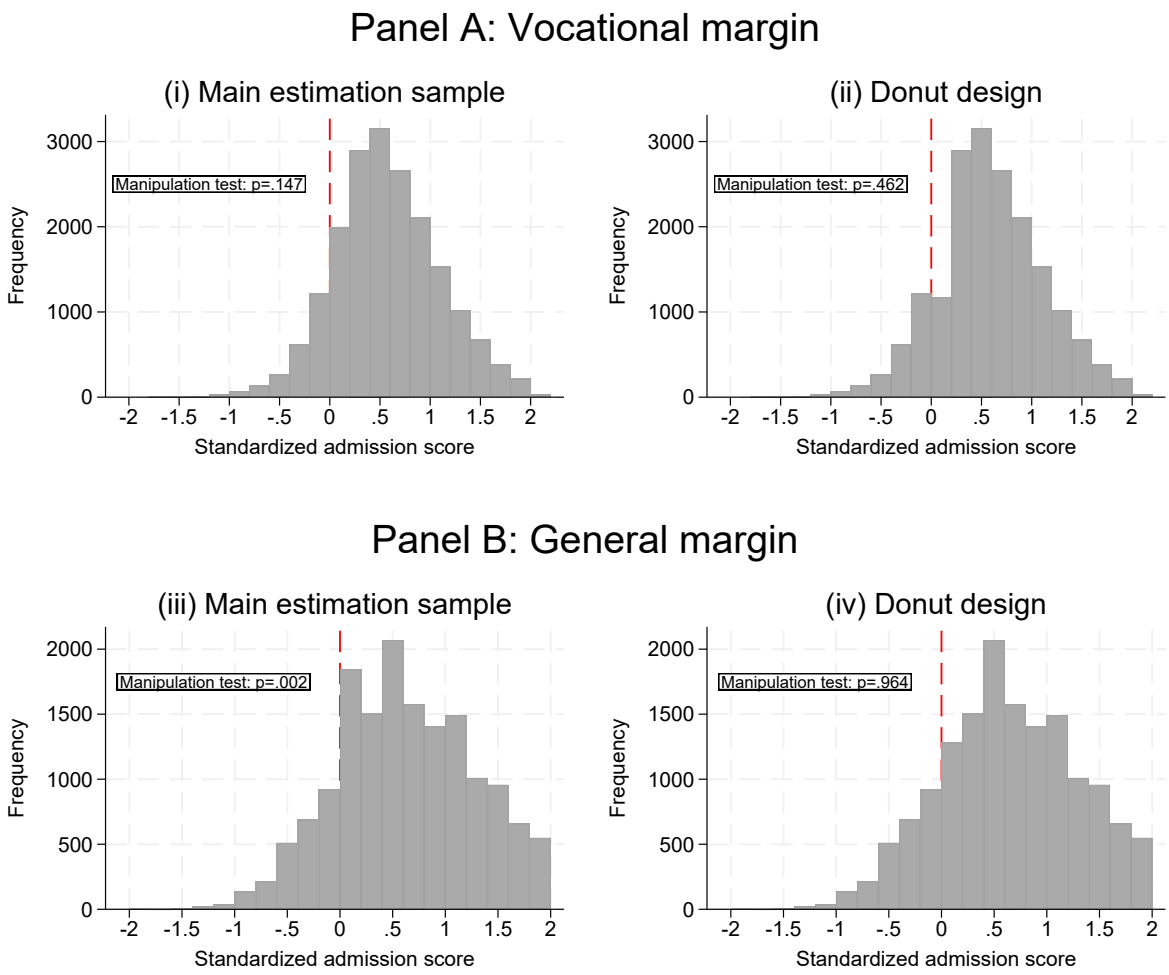

Figure A.1 Distribution of the estimation samples across the admission score

Notes: This figure shows how the estimation samples are distributed across the admission score. The donut design refers to the exclusion of individuals at the cutoffs. P-values produced by the RD manipulation test proposed by Cattaneo et al. (2018) are reported in the figure. For consistency across margins, we have divided the admission scores by 10 in the vocational margin analyses, so that the running variable lies on a comparable scale in both margins. This implies that, in vocational margin, the frequencies are shown within raw scores ranging from -20 to 20.

Table A.2 Effect of crossing the threshold on pre-determined characteristics

	Vocational margin	**General margin**
GPA	.035 (-.052, .11)	.002 (-.004, .011)
Female	.007 (-.109, .12)	-.038 (-.122, .022)
Lives in urban area	-.002 (-.023, .181)	.001 (-.14, .023)
Mother has secondary degree	-.019 (-.091, .105)	-.001 (-.065, .044)
Mother has higher education degree	-.002 (-.03, .082)	.019 (-.036, .08)
Mother's income	609.429 (-1414.493, 4704.208)	1052.982 (-3784.637, 3403.087)
Father has secondary education	-.059 (-.188, .044)	.02 (-.037, .114)
Father has higher education degree	-.008* (-.003, .059)	.011 (-.062, .067)
Father's income	-741.017 (-2576.757, 5659.998)	-1323.089 (-5131.065, 2228.006)
Ever used psychotropic drugs	.028 (-.051, .151)	.014* (-.004, .1)
Ever visited healthcare for mental health	.016 (-.037, .149)	-.006 (-.062, .05)
Observations	8302	6036

Notes: This table presents the reduced form estimates of the effect of crossing the threshold on each characteristic. All characteristics have been measured one year prior to the application year. Each estimate is obtained using a triangular kernel with a fixed bandwidth of 0.5 admission-score points, and includes cutoff and birth-year fixed effects. The robust bias corrected 95% confidence intervals, clustered at the cutoff level, are shown in parentheses. Note that the robust confidence intervals are not necessarily centered around the conventional RD estimates, which may occasionally fall outside the reported intervals when the bias correction is large. Income has been converted to 2023 euros.

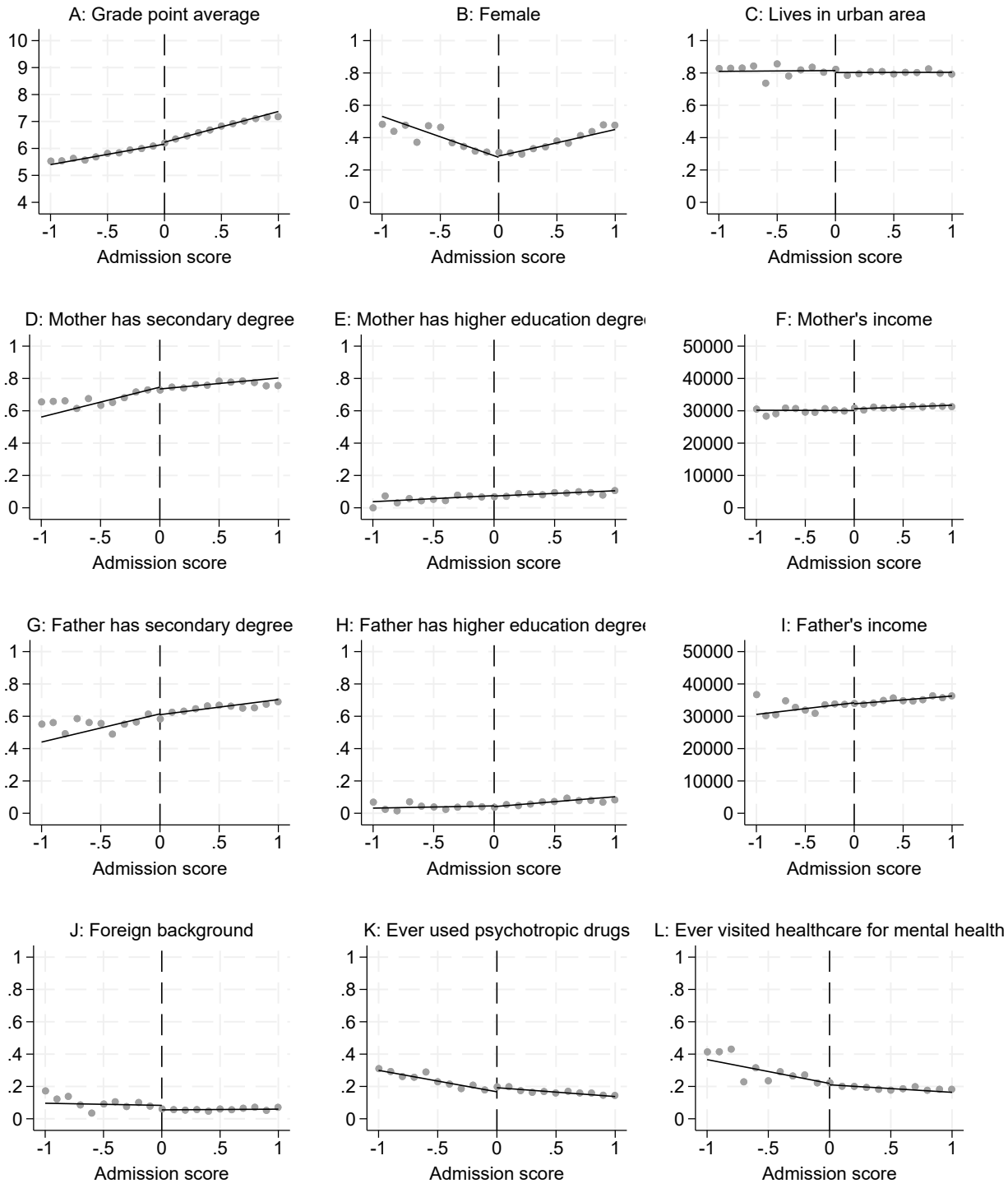

Figure A.2 Vocational margin: pre-determined characteristics and secondary school admission

Notes: This figure shows how crossing the threshold is associated with pre-determined characteristics in the vocational margin. Each dot represents the average outcome for individuals within 0.1-point bins of the admission score. Cutoff points have been normalized to zero for each school. The RD-plots include linear fits of degree one, estimated separately on either side of the threshold. Income has been converted to 2023 euros. For consistency across margins, we have divided the admission scores by 10 in the vocational margin analyses, so that the running variable lies on a comparable -1 to 1 scale in both margins. This implies that, in vocational margin, the results are shown within raw scores ranging from -10 to 10.

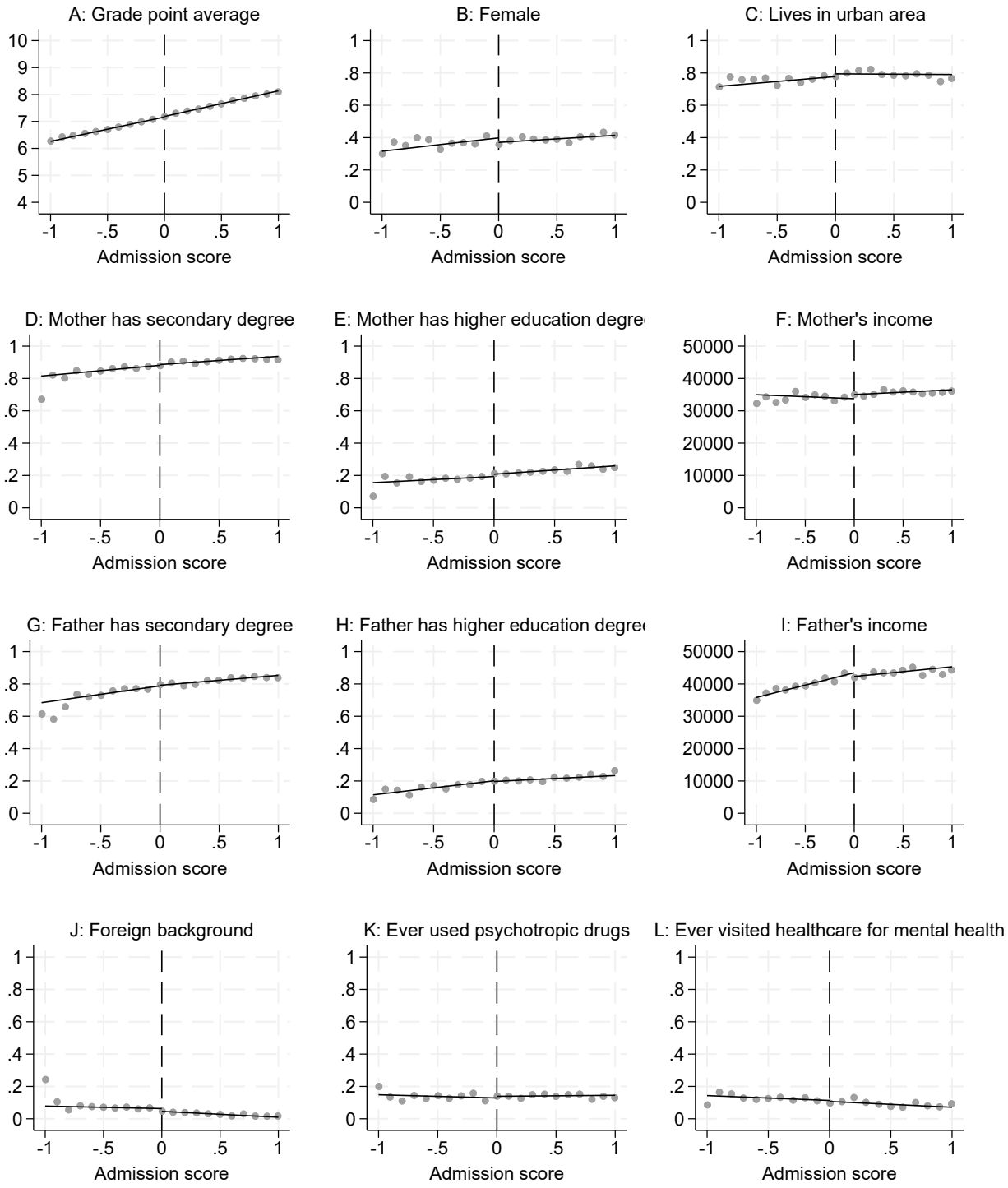

Figure A.3 General margin: pre-determined characteristics and secondary school admission

Notes: This figure shows how crossing the threshold is associated with pre-determined characteristics in the general margin. Each dot represents the average outcome for individuals within 0.1-point bins of the admission score. Cutoff points have been normalized to zero for each school. The RD-plots include linear fits of degree one, estimated separately on either side of the threshold. Income has been converted to 2023 euros. For consistency across margins, we have divided the admission scores by 10 in the vocational margin analyses, so that the running variable lies on a comparable -1 to 1 scale in both margins. This implies that, in vocational margin, the results are shown within raw scores ranging from -10 to 10.

A.2 Main results

Table A.3 Estimates on specific mental health outcomes (cumulative incidence)

	Year 3	Year 5	Year 7	Year 9
Panel A: Vocational margin				
Psychotropic drug use				
Any (main estimate)	.008 (-.071, .034)	-.002 (-.11, .043)	-.038*** (-.183, -.029)	-.019* (-.138, .008)
Counterfactual outcome	.129	.207	.301	.337
Antipsychotics	.004 (-.016, .064)	.003 (-.049, .028)	-.004* (-.098, .002)	-.005* (-.12, .002)
Counterfactual outcome	.048	.081	.115	.141
Anxiolytics	.000 (-.033, .021)	.003 (-.028, .038)	-.008* (-.111, .002)	-.006 (-.133, .015)
Counterfactual outcome	.028	.044	.082	.099
Antidepressants	.012 (-.09, .052)	.002 (-.111, .071)	-.028 (-.144, .023)	-.002 (-.096, .057)
Counterfactual outcome	.096	.166	.239	.268
Healthcare visits for mental health				
Any (main estimate)	.043* (-.007, .128)	.033 (-.039, .097)	.022 (-.073, .073)	.034 (-.078, .093)
Counterfactual outcome	.096	.155	.203	.23
Substance-use disorders	-.014 (-.035, .031)	-.022** (-.069, -.001)	-.033*** (-.114, -.024)	-.025* (-.107, .003)
Counterfactual outcome	.028	.053	.071	.078
Mood disorders	-.003 (-.051, .028)	.001 (-.076, .047)	-.008 (-.094, .023)	-.015 (-.128, .018)
Counterfactual outcome	.051	.081	.106	.13
Depressive disorders	.002 (-.049, .044)	.008 (-.056, .054)	-.005 (-.072, .026)	-.012 (-.1, .033)
Counterfactual outcome	.046	.071	.098	.119
Anxiety disorders	.022** (.008, .097)	.02 (-.027, .082)	.021 (-.062, .057)	.03 (-.043, .086)
Counterfactual outcome	.031	.06	.083	.092
Panel B: General margin				
Psychotropic drug use				
Any (main estimate)	-.007 (-.059, .021)	-.014 (-.079, .024)	-.035 (-.122, .043)	-.015 (-.104, .084)
Counterfactual outcome	.088	.151	.215	.249
Antipsychotics	-.006 (-.044, .021)	-.005 (-.038, .034)	-.027 (-.07, .023)	-.022 (-.062, .042)
Counterfactual outcome	.031	.044	.078	.097
Anxiolytics	-.008 (-.036, .017)	-.002 (-.042, .033)	-.027 (-.099, .01)	-.012 (-.083, .015)
Counterfactual outcome	.018	.031	.069	.082
Antidepressants	-.001 (-.049, .029)	-.003 (-.067, .045)	-.017 (-.104, .086)	-.011 (-.1, .097)
Counterfactual outcome	.071	.121	.176	.215
Healthcare visits for mental health				
Any (main estimate)	-.033*** (-.105, -.024)	-.029** (-.103, -.005)	-.038*** (-.145, -.032)	-.016 (-.111, .014)
Counterfactual outcome	.109	.14	.179	.196
Substance-use disorders	-.004 (-.014, .015)	-.006 (-.028, .012)	-.003 (-.026, .013)	-.009 (-.038, .008)
Counterfactual outcome	.006	.015	.019	.031
Mood disorders	-.014** (-.073, -.008)	-.013* (-.07, .003)	-.024** (-.101, -.008)	-.005 (-.066, .029)
Counterfactual outcome	.062	.08	.099	.103
Depressive disorders	-.012** (-.074, -.009)	-.011* (-.067, .004)	-.016** (-.093, -.002)	.001 (-.062, .032)
Counterfactual outcome	.061	.076	.091	.096
Anxiety disorders	-.02* (-.06, .001)	-.02 (-.062, .008)	-.034*** (-.088, -.012)	-.024** (-.094, -.002)
Counterfactual outcome	.044	.058	.091	.101

Notes: This table presents the conventional reduced form RD estimates for cumulative incidence of mental health outcomes 3, 5, 7, and 9 years after admission, estimated separately for psychotropic drug use and healthcare visits related to most prominent ATC-groups and sub-diagnoses (see Table A.1). Reduced form denotes the effect of crossing the threshold on a given mental health outcome and the counterfactual outcome denotes the conventional local polynomial left estimate indicating the estimated outcome for the control group at the threshold. The robust bias corrected 95% confidence intervals, clustered at the cutoff level, are shown in parentheses. Note that the robust confidence intervals are not necessarily centered around the conventional RD estimates, which may occasionally fall outside the reported intervals when the bias correction is large.

Table A.4 Main estimates on mental health outcomes, separately for women and men (cumulative incidence)

		Year 3	Year 5	Year 7	Year 9
Panel A: Vocational margin					
Psychotropic drug use					
Women	Reduced form	-.023 (-.192, .114)	-.001 (-.229, .171)	-.057 (-.282, .091)	-.03 (-.261, .122)
	Counterfactual outcome	.228	.336	.446	.482
	Observations	2409	2401	2391	2387
Men	Reduced form	.005 (-.089, .04)	-.005 (-.099, .08)	-.038* (-.198, .003)	-.03* (-.183, .01)
	Counterfactual outcome	.087	.154	.239	.276
	Observations	5050	5038	5028	5014
Healthcare visits for mental health					
Women	Reduced form	.031 (-.041, .254)	.037 (-.105, .279)	.023 (-.101, .258)	.016 (-.122, .267)
	Counterfactual outcome	.149	.211	.286	.324
	Observations	2409	2401	2391	2387
Men	Reduced form	.03 (-.06, .129)	.014 (-.086, .097)	.007 (-.125, .082)	.024 (-.146, .092)
	Counterfactual outcome	.074	.131	.166	.189
	Observations	5050	5038	5028	5014
Panel B: General margin					
Psychotropic drug use					
Women	Reduced form	-.015 (-.161, .015)	-.016 (-.19, .056)	-.079 (-.285, .025)	.012 (-.122, .217)
	Counterfactual outcome	.115	.196	.285	.295
	Observations	2067	2054	2048	2029
Men	Reduced form	-.026 (-.095, .01)	-.04** (-.147, -.011)	-.046 (-.144, .029)	-.054 (-.199, .026)
	Counterfactual outcome	.069	.118	.165	.214
	Observations	3397	3387	3372	3356
Healthcare visits for mental health					
Women	Reduced form	-.013** (-.172, -.018)	.007 (-.15, .047)	-.004 (-.198, .033)	.037 (-.119, .147)
	Counterfactual outcome	.145	.163	.205	.217
	Observations	2067	2054	2048	2029
Men	Reduced form	-.045*** (-.135, -.027)	-.042** (-.144, -.017)	-.049*** (-.195, -.031)	-.055** (-.187, -.019)
	Counterfactual outcome	.083	.122	.159	.18
	Observations	3397	3387	3372	3356

Notes: This table presents the conventional reduced form RD estimates for cumulative incidence of mental health outcomes 3, 5, 7, and 9 years after admission, estimated separately for women and men. Reduced form denotes the effect of crossing the threshold on a given mental health outcome and the counterfactual outcome denotes the conventional local polynomial left estimate indicating the estimated outcome for the control group at the threshold. The robust bias corrected 95% confidence intervals, clustered at the cutoff level, are shown in parentheses. Note that the robust confidence intervals are not necessarily centered around the conventional RD estimates, which may occasionally fall outside the reported intervals when the bias correction is large.

A.3 Potential channels

Table A.5 Effect of crossing the threshold on enrollment status and peer characteristics by the end of the first year

	Vocational margin	**General margin**
Enrollment		
Enrolled in any secondary school	.355*** (.212, .4)	.096*** (.094, .222)
Enrolled in general secondary school	-.022 (-.064, .01)	.485*** (.399, .545)
Enrolled in vocational secondary school	.377*** (.227, .438)	-.388*** (-.398, -.23)
Peer characteristics		
GPA among peers	-.05 (-.181, .119)	.566*** (.463, .64)
Peers with secondary educated mothers	-.008 (-.039, .07)	.037*** (.017, .045)
Peers with highly educated mothers	-.005 (-.042, .061)	.081*** (.068, .099)
Average income among peers' mothers	675.072 (-3530.608, 2684.048)	2224.392*** (1453.086, 2838.154)
Peers with secondary educated fathers	.018 (-.039, .09)	.064*** (.046, .076)
Peers with highly educated fathers	-.009 (-.096, .026)	.082*** (.061, .097)
Average income among peers' fathers	320.861 (-7007.811, 2583.745)	3860.531*** (2529.207, 4474.102)
Peers with prior psychotropic drug use	.018 (-.025, .088)	-.01 (-.018, .008)
Peers with prior healthcare visits for mental health	-.009 (-.121, .093)	-.033*** (-.049, -.015)
Observations	5030	5616

Notes: This table presents the reduced form estimates of the effect of crossing the threshold on the enrollment status and average characteristics of peers at the school in which the individual is enrolled in by the end of the application year. Note that these estimations only include applicants who eventually gain access to secondary education by the end of the year despite the potential rejection in the fist round. Individual level characteristics have been measured one year prior to the application year. Each estimate is obtained using a triangular kernel with a fixed bandwidth of 0.5 admission-score points, and includes cutoff and birth-year fixed effects. The robust bias corrected 95% confidence intervals, clustered at the cutoff level, are shown in parentheses. Note that the robust confidence intervals are not necessarily centered around the conventional RD estimates, which may occasionally fall outside the reported intervals when the bias correction is large. Income has been converted to 2023 euros.

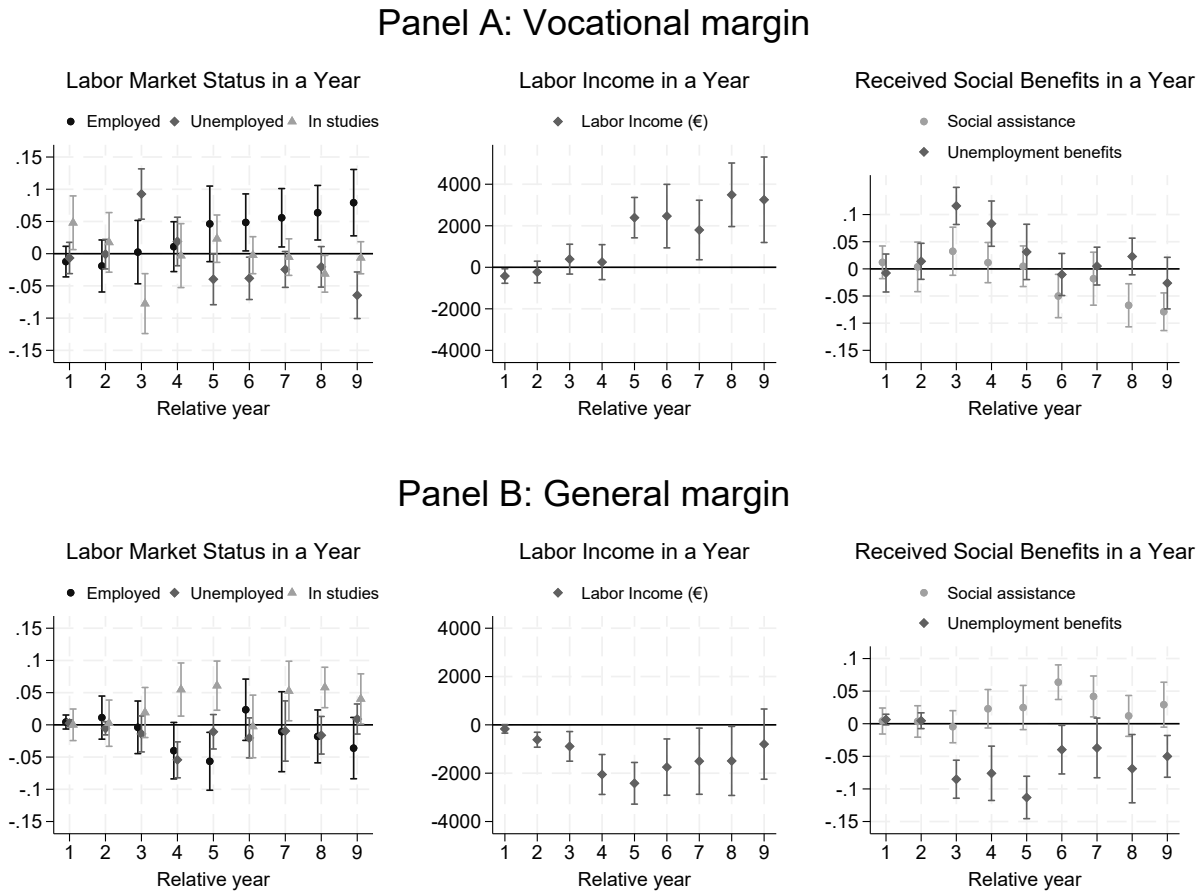

Figure A.4 Labor market outcomes and secondary school admission

Notes: This figure shows the conventional RD estimates and their 95% confidence intervals for annual labor market outcomes. Annual estimates are obtained following Equation (1), using a fixed bandwidth of 0.5 admission score point and a triangular kernel. Income has been converted to 2023 euros. Social assistance refers to a last-resort, means-tested benefit intended to secure a minimum level of income and is available also to students. Unemployment benefits are more generous and not means-tested, but eligibility requires registration as a jobseeker and active job seeking.

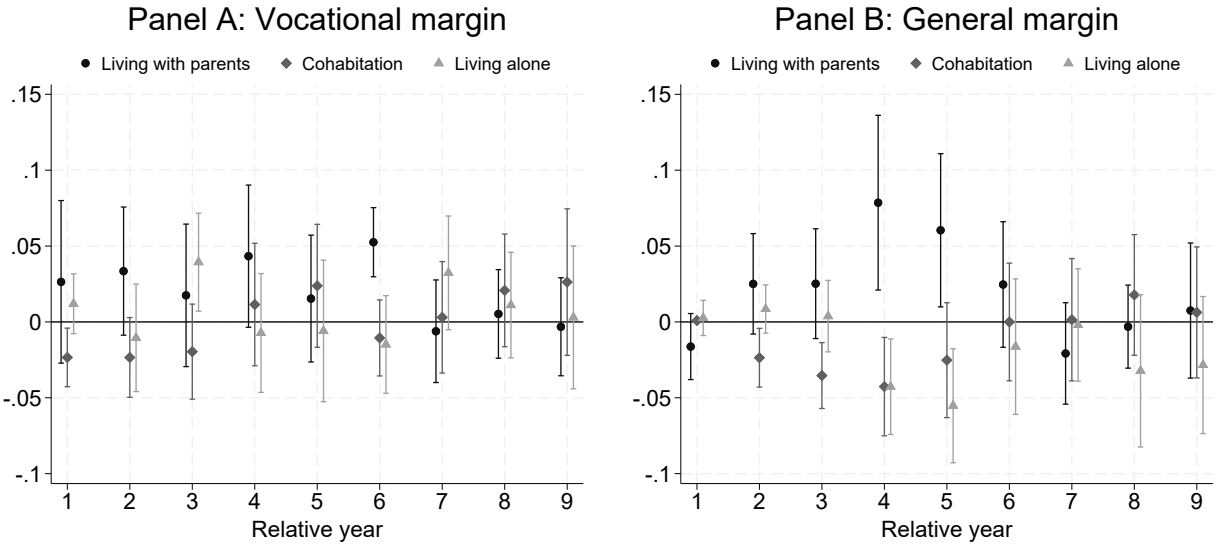

Figure A.5 Living arrangements and secondary school admission

Notes: This figure shows the conventional RD estimates and their 95% confidence intervals for annual living arrangements. Annual estimates are obtained following Equation (1), using a fixed bandwidth of 0.5 admission score point and a triangular kernel.

A.4 Robustness

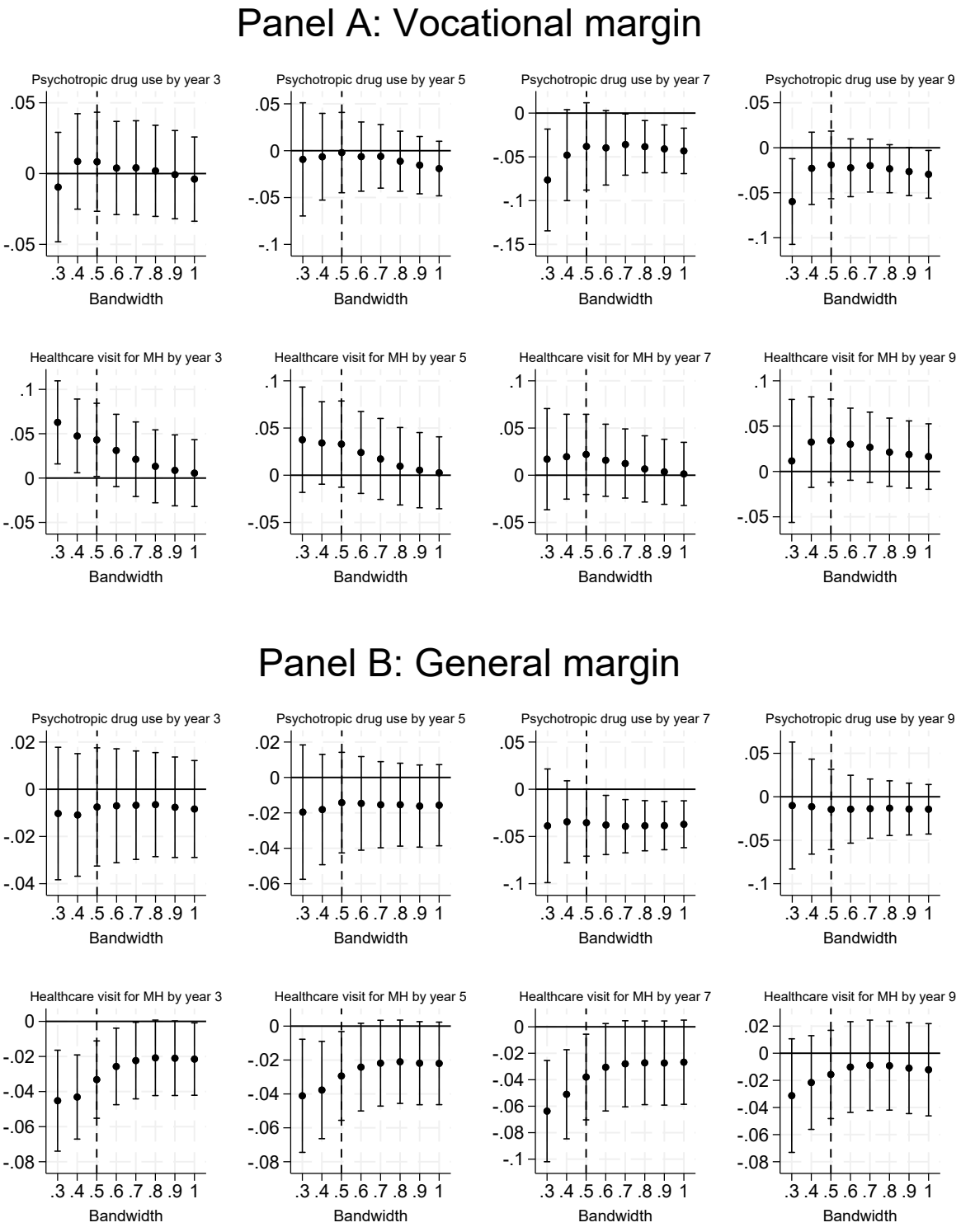

Figure A.6 Main estimates on mental health outcomes within alternative windows

Notes: This figure presents the conventional RD estimates for cumulative incidence of mental health outcomes 3, 5, 7, and 9 years after admission within alternative estimation windows. The conventional 95% confidence intervals are clustered at the cutoff level. Each estimate is obtained using a triangular kernel and includes cutoff and birth-year fixed effects. The vertical dashed line represents the estimation window that we use in our main model specification. The estimates based on the exact, non-rounded MSE-optimal windows are reported in Table A.6.

Table A.6 Alternative specifications

	Year 3	Year 5	Year 7	Year 9
Panel A: Vocational margin				
Psychotropic drug use				
Main estimate	.008 (-.071, .034)	-.002 (-.11, .043)	-.038*** (-.183, -.029)	-.019* (-.138, .008)
Additional covariates	-.001 (-.084, .028)	-.009 (-.123, .061)	-.057** (-.192, -.02)	-.044* (-.163, .006)
Without fixed effects	.006 (-.086, .042)	-.005 (-.127, .046)	-.042*** (-.193, -.029)	-.024** (-.153, 0)
Observations	8274	8252	8228	8209
Donut design	-.003 (-.096, .035)	-.006 (-.112, .063)	-.043** (-.188, -.008)	-.031** (-.173, -.001)
Observations	7459	7439	7419	7401
Optimal window	.008 (-.037, .052)	-.007 (-.072, .06)	-.065** (-.155, -.005)	-.027 (-.095, .025)
Observations	8274	6440	6417	6399
Full sample	.003 (-.077, .026)	-.01 (-.126, .025)	-.039*** (-.189, -.039)	-.033*** (-.184, -.031)
Observations	23,029	22,947	22,858	22,788
Healthcare visit for mental health				
Main estimate	.043* (-.007, .128)	.033 (-.039, .097)	.022 (-.073, .073)	.034 (-.078, .093)
Additional covariates	.027 (-.025, .11)	.021 (-.037, .089)	.004 (-.075, .05)	.018 (-.084, .065)
Without fixed effects	.039* (-.01, .133)	.029 (-.045, .105)	.02 (-.073, .083)	.029 (-.092, .099)
Observations	8274	8252	8228	8209
Donut design	.032* (-.011, .139)	.022 (-.047, .12)	.012 (-.076, .097)	.024 (-.093, .106)
Observations	7459	7439	7419	7401
Optimal window	.052*** (.021, .126)	.034* (-.006, .101)	.02 (-.032, .083)	.032 (-.036, .103)
Observations	6454	8252	8228	6399
Full sample	.025 (-.017, .099)	.006 (-.06, .058)	-.006 (-.107, .025)	-.002 (-.125, .033)
Observations	23,029	22,947	22,858	22,788
Panel B: General margin				
Psychotropic drug use				
Main estimate	-.007 (-.059, .021)	-.014 (-.079, .024)	-.035 (-.122, .043)	-.015 (-.104, .084)
Additional covariates	-.012 (-.075, .01)	-.015* (-.094, .008)	-.038* (-.139, .011)	-.011 (-.107, .057)
Without fixed effects	-.01 (-.072, .031)	-.02 (-.092, .023)	-.04 (-.129, .036)	-.014 (-.104, .088)
Observations	6023	5998	5976	5938
Donut design	-.024** (-.106, -.01)	-.032** (-.137, -.016)	-.059* (-.174, .005)	-.033 (-.148, .069)
Observations	5464	5441	5420	5385
Optimal window	-.012 (-.045, .017)	-.02 (-.067, .024)	-.035 (-.094, .016)	-.011 (-.078, .048)
Observations	4710	3857	4737	5015
Full sample	.005 (-.029, .043)	-.001 (-.044, .046)	-.017 (-.077, .065)	.010 (-.055, .115)
Observations	8654	8618	8589	8533
Healthcare visit for mental health				
Main estimate	-.033*** (-.105, -.024)	-.029** (-.103, -.005)	-.038*** (-.145, -.032)	-.016 (-.111, .014)
Additional covariates	-.032*** (-.107, -.028)	-.032*** (-.114, -.018)	-.041*** (-.155, -.046)	-.016** (-.123, -.008)
Without fixed effects	-.045*** (-.144, -.029)	-.045*** (-.147, -.021)	-.057*** (-.185, -.048)	-.033** (-.148, -.003)
Observations	6023	5998	5976	5938
Donut design	-.043*** (-.148, -.057)	-.03*** (-.133, -.023)	-.037*** (-.172, -.045)	-.024* (-.136, .005)
Observations	5464	5441	5420	5385
Optimal window	-.055*** (-.103, -.02)	-.047** (-.098, -.004)	-.083*** (-.15, -.033)	-.032 (-.09, .014)
Observations	2845	3671	2823	3811
Full sample	-.018** (-.078, -.007)	-.017 (-.077, .012)	-.022** (-.109, -.009)	-.005 (-.086, .026)
Observations	8654	8618	8589	8533

Notes: This table presents the conventional reduced form RD estimates for cumulative incidence of mental health outcomes 3, 5, 7, and 9 years after admission, estimated using alternative specifications in relation to the main specification. First, we add controls for background characteristics presented in Table 1. Second, we exclude cutoff and year of birth specific fixed effects from the model. Third, we exclude individuals who are, by their admission score, exactly at the cutoff, referred to as the donut design. Fourth, we use MSE-optimal window suggested by Calonico et al. (2014) in the estimation. Finally, we report estimates produced for the full samples (in total N=115,098 in vocational margin and N=32,477 in general margin), which also includes applicants to schools that do not have at least two applicants on both sides of the admission threshold. The robust bias corrected 95% confidence intervals, clustered at the cutoff level, are shown in parentheses. Note that the robust confidence intervals are not necessarily centered around the conventional RD estimates, which may occasionally fall outside the reported intervals when the bias correction is large.