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FIELDS OF STUDY AND FINANCIAL PROBLEMS: HOW ECONOMICS REDUCES THE RISK OF DEFAULT

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Field of Study and Financial Problems: How Economics Reduces the Risk of Default

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Abstract

This paper documents how extensive economic education can reduce the risk of getting into financial problems by comparing people who enter business and economics programs with people who enter other higher education programs. To identify the causal effect, I exploit GPA admission thresholds that quasi-randomize applicants near the thresholds into different programs. I find that admission to an economics education significantly reduces the probability of loan default by one-half. This large reduction in the default probability is associated with changes in financial behavior, but it is not associated with differences in the level or stability of people's income.

Keywords: Financial Problems, Education, Regression Discontinuity, Financial Literacy
JEL codes: G51, G53, I23

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1 Introduction

Financial decision-making in households has received growing interest in recent years. For instance, OECD argues that ill-informed financial decision-making has "tremendous adverse effects on both personal, and ultimately, global finance" (OECD, 2016). The interest often concerns the debt behavior of households and how well people manage and service their debt. Loan defaults and delinquencies have great consequences for the debtors, who can loose credit access, and for the creditors, who can loose their money (Kreiner et al., 2020). More generally, defaults have important adverse effects on the credit market and can lead to credit rationing (Stiglitz and Weiss, 1981). Economic education is often suggested as a way of improving financial decision-making, but evidence on the causal effect of economic education on financial outcomes is sparse (Beshears et al., 2018).

I investigate how field of study causally affects the probability of getting into financial problems and, in particular, whether studying economics can reduce the risk of default. The main challenge in identifying the causal effect is that the observed correlations can be driven entirely by students self-selecting into fields of study based on preferences or skills that also drive their financial behavior.

To address this self-selection problem, I leverage a unique combination of administrative third-party reported data on applications and admissions to higher education and on the universe of personal loans in Denmark. This combination enables me to identify the causal effect of field of study by exploiting that the Danish system of admission to higher education generates locally unpredictable grade point average (GPA) admission thresholds. Applicants with a GPA close to the admission thresholds are effectively randomized into different fields of study.

Intuitively, I compare applicants who are very similar but are admitted to different fields of study due to slightly different GPAs from upper secondary school. For instance, imagine two applicants who would both prefer to study political science (which belongs to the *Social science* field of study) if their GPA is above the admission threshold of this specific program. Both applicants have economics (which belongs to the *Business and economics* field of study) as their alternative choice. The admission thresholds of the two

programs are based on the GPA distribution of all applicants to these programs, and in the two applicants' year of application, economics gets a lower GPA admission threshold than political science. The applicants' GPAs are both very close to the admission threshold of political science, but one is just above the threshold and one is just below. Due to this small difference between their GPAs, one applicant is admitted to *Social science* (the preferred field of study) and the other is admitted to *Business and economics* (the alternative field of study). The example illustrates that the admission process quasi-randomizes applicants near the thresholds into different fields of study.

I find that admission to *Business and economics* significantly reduces the risk of default more than 10 years after the year of application. In particular, I find that applicants who have *Business and economics* as their alternative field of study are 6-8%-points less likely to default if they are just below the GPA admission threshold of their preferred field of study. This effect is more than half of the average probability of default for all first time applicants, which is 11%.

To investigate potential channels that can explain this finding, I estimate the causal effect of admission to *Business and economics* on outcomes related to labor market perfomance and financial behavior. For the applicants who have *Business and economics* as their alternative field, I find no changes in income, unemployment or self-employment around the admission threshold. Instead, I find changes in financial behavior and I show that the applicants admitted to *Business and economics* are less likely to hold debt and are less likely to be liquidity constrained. This pattern suggests that economic education reduces the probability of getting into financial problems by changing financial behavior and not by increasing the level or stability of income.

This paper is the first to show that extensive economic education can substantially reduce the risk of getting into financial problems. A large body of literature studies the association between economic education and a range of financial outcomes (Fernandes et al., 2014; Miller et al., 2015; Kaiser and Menkhoff, 2017, 2020; Kaiser et al., 2020). Many studies in this literature evaluate interventions in the context of lower levels of education and outside the formal education system, and many rely on financial literacy

assessments, self-efficacy or hypothetical or self-reported behaviors (Bruhn et al., 2016; Skimmyhorn, 2016; Lusardi et al., 2017; Bover et al., 2018). My paper is closest related to three papers that all exploit variation in high school requirements across U.S. states to study the causal effects of economic education on financial outcomes. First, Brown et al. (2016) use an event study design and find that additional mathematics training and financial education improves financial outcomes whereas additional economics training impairs the same outcomes. Second, Cole et al. (2016) exploit state-level variation in exposure to math and personal finance courses and find that additional mathematics training improves financial outcomes while personal finance courses have no effect. Third, Urban et al. (2020) use a difference-in-difference approach in which they compare students from three U.S. states that mandated financial education in high school with students from synthetic control states. They find that financial education improves financial outcomes but show that the effect size varies substantially across the states.

Summing up the evidence on the effect of education and information interventions on financial outcomes, including the three studies above, Beshears et al. (2018) conclude that the effects "are often small or null and appear to depreciate rapidly with time." The current paper differs from the existing literature by studying a very extensive educational intervention and showing that economic education can indeed have substantial and long-lasting effects on financial outcomes. Furthermore, I evaluate the long-term effects of education and because I can also link the data on financial problems with data on several labor market outcomes, liabilities and peers, I can provide suggestive evidence on the channels that are important for my findings. The implication of my findings is not that everyone should study economics at university level, but rather that an extensive intervention can improve financial decision-making even for individuals with an affluent background and a relatively low baseline probability of getting into financial problems.

The paper is also related to a study by Christiansen et al. (2008). They show that graduating from an economics education affects the likelihood of participating in the stock market. My paper differs from their study by investigating how economic education affects the probability of getting into financial problems using a different research design.

I replicate their finding on stock market participation using my identification strategy, which further supports the hypothesis that studying economics causally affects financial behavior.

Finally, this paper is also related to a growing body of literature that use GPA admission thresholds for the identification of educational effects, but I am the first to show that field of study in higher education have important impacts on financial behavior. Kirkeboen et al. (2016) use Norwegian data to estimate the early labor market payoff to field of study and institution and outline the importance of controlling for the alternative field of study in the estimation. The Danish admission data have also previously been used to study how admission to the first choice or preferred field affects educational outcomes, earnings, the timing of family formation and the gender gap in earnings (Heinesen, 2018; Humlum et al., 2017; Daly et al., 2021; Andersen et al., 2020). Other studies use Swedish (Öckert, 2010; Dahl et al., 2020a,b), Finnish (Silliman and Virtanen, 2021), Norwegian (Kirkebøen et al., 2021) and non-Scandinavian data (Altmejd et al., 2021; Hastings et al., 2014) to study labor market returns, family spillovers and assortative mating.

The paper proceeds as follows. Section 2 presents the institutional background and methodology and section 3 presents the data. Section 4 presents the results and discusses the potential channels that can explain the findings. Finally, section 5 concludes.

2 Institutional Background and Methodology

2.1 Admission to post-secondary education

In Denmark post-secondary education is free of charge and most students are eligible to public support from the State Educational Grant. Most students that start on a bachelor program at one of the eight Danish universities continue on a master program directly after obtaining the bachelor degree. Generally, it therefore requires 5 years of study to obtain a university degree. At the university colleges it normally takes 3.5 years to obtain a professional bachelors degree while the academy profession programs from the business academies requires 2 years of study.

The admission to higher education programs normally requires an Upper Secondary School Leaving Certificate and the admission process is administered by the Coordinated Admission under the Ministry of Higher Education and Science. The applicants can apply for and rank up to eight programs and each program is a combination of specific program and institution.

Admission to the programs is allocated through either the Quota 1 system or the Quota 2 system. The majority of slots are allocated through the Quota 1 system where the applicants are ranked based on their GPA from upper secondary school. The best ranked applicant gets his or her preferred choice, the second best ranked applicant gets his or her highest available choice and so on. The number slots is limited in most programs and if the number of applicants exceeds the number of slots, admission is restricted. This implies that applicants with a GPA above a certain threshold will be admitted to a particular program and applicants with a GPA below the threshold will be offered another program if any. It is important to notice that the applicants cannot know the specific thresholds at the time of application. Thereby, the Quota 1 admissions process generates locally unpredictable GPA thresholds that effectively randomize applicants near the thresholds into different programs and fields of study.

The Quota 2 admissions are allocated by the educational institutions based on criteria they select. These can be work experience, grades in particularly relevant subjects etc. If students apply for a program through the Quota 2 system, but fulfil the Quota 1 requirements, they will be admitted to the program through Quota 1. For a more detailed description of the admission process see Heinesen (2018).

2.2 Fuzzy Regression Discontinuity Design

The institutional setting described in the previous section enables me to estimate the causal effect of admission to a particular field of study on the probability of loan default using a fuzzy regression discontinuity design.

Imagine we have a group of individuals, $i = 1, ..., N$, who all have the preferred field $f_i^p = j$ and the alternative field $f_i^a = k$. The effect on an outcome, y, of being admitted to field j instead of field k can then be estimated by 2SLS for this sample:

$$D_i = \tilde{\beta}_0 + \tilde{\beta}_1 x_i + \tilde{\beta}_2 x_i T_i + \tilde{\beta}_3 T_i + u_i \tag{1}$$

$$y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i T_i + \beta_3 D_i + \varepsilon_i \tag{2}$$

where (1) is the first stage and (2) is the second stage. In the equations above x_i is the running variable, the distance to the GPA threshold. D_i is a dummy that equals 1 if individual i is admitted to field j and T_i is a dummy indicating whether i's GPA is above the threshold of i's preferred field, j.

3 Data

This section first provides an overview of the different sources of data I combine and how I select the sample used in the estimations. Second, it defines field of study and financial problems and gives a graphical illustration of the research design.

3.1 Data Sources

I combine third party reported Danish administrative data from the Coordinated Admission, Statistics Denmark and the Danish Tax Authorities in order to estimate the effects of field of study, and I link the data to individuals using a personal identifier.

From the Coordinated Admission, I have all applications for higher education programs in Denmark from 1993 to 2006. For each year and each applicant, I have information on their applications to different programs and institutions and how they rank their choices. From the Coordinated Admission, I also have information on the GPA threshold of each study program in the same period. The data does not include the individuals' GPAs from upper secondary school, but for the majority of the applicants, I obtain this information

from Statistics Denmark. From Statistics Denmark, I also have information on income, assets, education, employment and demographic variables which I use in sensitivity analyses and to investigate potential channels that explain my main finding.

Finally, I also use data from the Danish Tax Authorities on the universe of personal loans. This data contains information on loan defaults from 2003 to 2016 and I use this data to determine whether individuals are in financial problems.

3.2 Sample selection and summary statistics

I study individuals who applied for a higher education program between 1993 and 2006. For the oldest cohort, I have loan information from 10 years after the year of application and for the youngest cohort I have loan information until 10 years after the year of application. In this period, I observe 1,364,480 applications from 531,033 individuals. I focus on first time applicants from age 18 to 30 and this leaves me with 427,885 applicants.

In order to implement the research design described in section 2.2, I can only use applicants with a binding GPA admission threshold in their local program ranking. The local program ranking is the subset of the applicant's total program ranking where the GPA effectively determines which program he or she is admitted to. This means I drop an applications if (*i*) a higher ranked program has a lower threshold, (*ii*) an applicant's GPA is below the threshold of a lower ranked program, (*iii*) the applicant's GPA is above the thresholds of at least two higher ranked programs, (iv) or if there is a binding threshold for a higher ranked program (see examples in Appendix Table A1). I refer to the highest ranked program as the *Preferred* program (and later field of study) and the lowest ranked program as the *Alternative*. As in Kirkeboen et al. (2016), the preferred program is not necessarily the first priority program but rather the highest ranked program in the local program ranking where the GPA threshold is binding. This leaves me a sample of 53,882 applicants (see an overview of the selection process in table A2).

Finally, the sample used in the analysis consists of the applicants whose preferred program and alternative program are within different fields of study (18,236) and who completes at least one higher education program within 10 years from the year of ap-

Table 1: Summary statistics

	1st time applicants		Binding threshold		Sample	
	Mean	SD	Mean	SD	Mean	SD
Age	21.8	2.4	21.4	1.8	21.1	1.8
Male (%)	40.5	49.1	32.2	46.7	36.3	48.1
GPA	8.3	1.0	8.6	0.9	8.8	0.8
1st priority threshold	5.8	4.1	8.8	0.7	9.1	0.6
Offered rank	1.2	0.6	1.6	1.0	1.8	1.1
Number of applications	1.9	1.2	3.1	1.3	3.2	1.4
Income rank	58.2	28.0	58.6	28.0	63.2	28.5
Father's income rank	67.0	28.4	69.2	28.2	70.7	28.2
Mother's income rank	47.3	26.0	51.0	26.5	52.7	27.1
Father has master (%)	13.3	33.9	18.9	39.2	22.8	41.9
Mother has master (%)	6.4	24.5	9.6	29.4	11.9	32.3
Default (%)	11.1	31.4	9.1	28.8	8.0	27.1
Observations	427885		53882		14181	

Notes: The *1st time applicants* are all applicants observed in the data. This includes applicants to business academies that use another admission system than universities and university colleges. The *Binding threshold* group are applicants whose preferred program has a binding GPA threshold. The *Sample* are the applicants whose preferred program has a binding GPA threshold and whose preferred program and alternative program are within different fields of study. *Income rank* is within cohort rank based on total income measured 10 years after application. Father's and mother's income rank are measured when they are 45 yeas old. *Default* is measured 10 to 23 years after application. Appendix Table A3 shows the exact number of observations for each variable.

plication and not two programs from different fields of study. I make this restriction in order to increase the probability that admission actually leads to studying, but I show that the results are robust to the inclusion of non-completing applicants and applicants that complete several fields. This gives me a sample of 14,181 applicants.

Table 1 shows summary statistics for all first time applicants, applicants with a binding GPA threshold and the analysis sample. In the table, we see that the sample used in the analysis is slightly younger than the pool of all first time applicants and the share of male applicants is 36.3% compared to 40.5% for all first time applicants. We also see that the analysis sample have a higher average GPA from upper secondary school. Their GPA is almost 0.6 standard deviations higher. This is because the majority of the sample applicants apply for university programs whereas the group of all first time applicants also include applicants that apply for the shorter academy profession programs. This selection is also reflected in the applicants' backgrounds where we see that the sample applicants come from more advanced backgrounds when we look at the parents' incomes

and educational levels. We also see that 10 years after the year of application, the analysis sample have a within cohort income rank that is 5 ranks higher than the average rank for all first time applicants.

When we look at the application pattern, the sample applicants apply for more programs, 3.2 on average compared to 1.9 for all first time applicants. Despite that the sample applicants have a higher GPA from upper secondary school, they are admitted to programs that they rank lower. This is because they apply for more competitive programs. Their first priority program has an average threshold of 9.1 where it is only 5.8 for all applicants.

In the final row, the table shows the default rate for the three groups, which is the indicator for being in financial problems. Here we see that the applicants used in the analysis have a lower probability of experiencing default. One explanation could be the fact that they end up having higher incomes themselves, or because their parents on average have higher incomes. The important take away from the table is that the analysis sample is an advantaged group of applicants. Therefore we might a priori not even expect field of study to affect the probability of default since it is already low for this group and because they come from relatively affluent backgrounds.

3.3 Fields of study

I define 8 fields of study. I use the broad fields (level 4) of the Danish International Standard Classification of Education (DISCED) classification provided by Statistics Denmark (2020) as a starting point, but make some adjustments for two reasons: The first is that there is no broad DISCED field with a focus on business and economics. The second reason is that I want the fields to resemble the fields used in the previous field of study literature to ease comparison.

Here it is worth emphasizing the difference between *fields* and *programs*. If we take economics as an example, then a specific program would be Economics at the University of Copenhagen. If this program has more applicants than slots, this generates a GPA admission threshold for the program. In the DISCED classification, this program is a part

of the detailed field (level 2) *Economics*, the narrow field (level 3) *Social and behavioural sciences* and the broad field (level 4) *Social sciences, journalism and information*. This means that a field does not have single GPA threshold, but the applicants have different thresholds for the same preferred field of study depending on what specific program they prefer.

Appendix Table A4 illustrates how I construct the 8 fields of study based on the DISCED classifications. The main field in this paper is the *Business and economics* field. To construct this, I use pool the narrow field *Business and administration* with the detailed fields *Economics*, *Agricultural economics* and *Mathematical economics*. The programs in the *Business and economics* field are very similar to the programs within economics, accounting or finance used by Chetty et al. (2014).

No direct link exists between the programs in the application data from the Coordinated Admission and the DISCED programs in the educational data from Statistics Denmark. To establish this link, I use all applicants admitted to a each program in the Coordinated Admission data and investigate which program they are enrolled in six months later according to the educational data from Statistics Denmark. In each year, I then establish the link by determining the most common program according to Statistics Denmark among the admitted applicants.

It is important to notice that the program composition of the fields can be different based on whether the field is the preferred or the alternative. Appendix Table A5 shows the most common programs for each field of study depending on whether the field of study is the preferred or alternative. For instance, if *Business and economics* is the preferred field of study then the most common programs are *Business economics and language* (29%), *Business economics* (15%) and *Language and international marketing* (9%). On the other hand, if *Business and economics* is the alternative field then the most common programs are *Economics* (38%), *Business economics and law* (22%) and *Business economics* (20%).

Table 2 shows the sample applicants' preferred and alternative fields of study. I drop applicants who have *STEM* as their preferred field or *Medicine* as their alternative, since

Table 2: Combinations of preferred and alternative field of study

	Alternative field of study							
	B&E	Law	HAA	Educ.	Welf.	SocSci	STEM	Tot.
Preferred field								
Bus. & Econ.		47	344	< 25	< 25	214	162	767
Law	806		490	28	71	150	127	1672
Hum., Art & Arch.	196	79		227	238	591	444	1775
Education	41	< 25	338		416	92	89	976
Welfare	163	55	410	425		162	489	1704
Social Science	730	477	2593	260	429		327	4816
Medicine	127	121	161	< 25	518	73	1061	2061
Total	2063	779	4336	940	1672	1282	2699	13771

Notes: The table is based on all applicants whose preferred field of study has a binding threshold and whose preferred and alternative field of study differ. The rows show the number of applicants in the sample that prefer each field and the columns show the number of applicants that have each field as their alternative. The "< 25" cells are excluded from the totals.

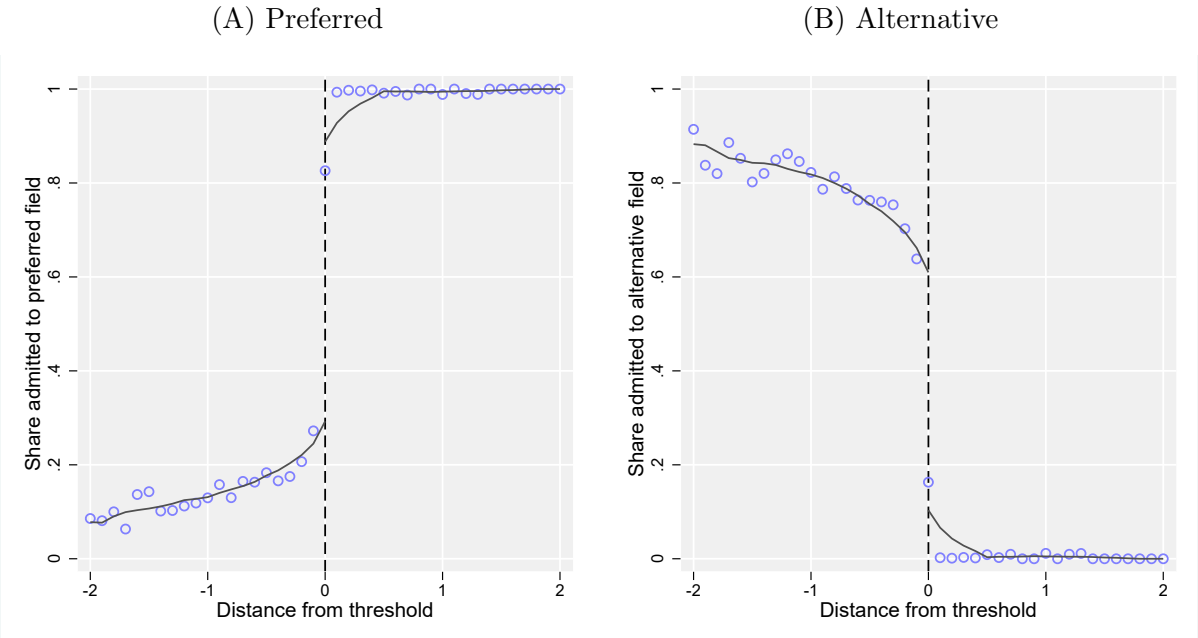
there are only 265 and 98 applicants in these groups. If we again focus on the *Business and economics* field, then the first column shows that 2063 applicants have this field as their alternative field. Almost 75% of these applicants have *Law* or *Social science* as their preferred field of study. This is important to keep in mind when we interpret the effects of admission to *Business and economics* when this is the alternative field in section 4.1. In section 4.1.1, I will also analyse the effect by preferred field of study for these applicants. If *Business and economics* is the preferred field, then 73% have *Humanities, art and architecture* or *Social science* as their alternative field.

3.4 Graphical illustration of research design

Figure 1 shows the change in the applicants' probability of being admitted to their preferred or alternative field of study based on the distance to the GPA admission threshold of their preferred field. Appendix Figure A1 also shows sharp discontinuities in enrolment after one year and completion of a program from the preferred or alternative field of study within 10 years of application.

Panel A of Figure 1 shows that the probability of admission to the preferred field is not zero if an applicant's GPA falls below the threshold. As discussed in section 2.1 this is due to the Quota 2 system, where admission is not only determined by GPA. The

Figure 1: Share of applicants admitted to preferred or alternative field of study



Notes: The figures are based on all applicants whose preferred field of study has a binding threshold and whose preferred and alternative field of study differ. The y-axes show the probability of admission to either the preferred (Panel A) or alternative (Panel B) field of study. The x-axes show the distance to the GPA admission threshold (0) of the preferred field of study. The bin width in the two panels is the smallest possible, 0.1. The local linear polynomials have a bandwidth of 0.5.

probability of admission increases with the GPA below the threshold because the GPA is also taken into consideration in the Quota 2 system.

The panel also shows that almost all applicants with a GPA strictly above the threshold are admitted to the preferred field while it is around 80% for the applicants who are exactly at the threshold. There are two explanations for this. First, the GPA is measured with one decimal's precision in the data, but the educational institutions may have more precise information than this. Second, if all applicants at the threshold cannot be admitted, it is decided either by lottery or age who will be admitted. Only some programs use the age criterion, where they admit the oldest applicants. In the graphical illustrations, I will not take this into account, but in all regressions I will use the age criterion where it is possible to characterize whether an applicant is above or below the threshold. Furthermore, I show that the main result is robust to using a donut regression discontinuity design where I drop all applicants exactly at the threshold from the estimation.

Panel B of Figure 1 shows the probability of being admitted to the alternative field. It clearly mirrors Panel A and also shows a sharp discontinuity in the probability of being admitted to the alternative field at the GPA threshold.

Both of these clear discontinuities enable me to estimate the causal effect of admission to a particular field on different outcomes. I exploit whether an individual is above or below the GPA threshold as an instrument for admission to the preferred or alternative field in a fuzzy regression discontinuity design as described in section 2.2.

Appendix Figure A2 shows the distribution of the applicants' distances to the threshold of the preferred field of study. The figure shows no evidence of manipulation of the running variable, i.e. the applicants cannot sort themselves above the threshold in order to be admitted to their preferred field. Similarly, Appendix Table A6 shows that formal manipulation tests do not indicate manipulation either.

3.5 Financial problems

As described in section 3.1, I use data from the Danish Tax Authorities to measure whether people are in financial problems. For each personal loan, the data indicates if the debtor is at least 60 days late with payments on the loan at the end of the year. This is reported by banks and other financial intermediaries to the tax authorities in order for them to verify that tax deductions for interest payments are correct.

I generate an indicator that equals one if an applicant has a loan in default at some point in time 10 years or later after the year of application. This means that I observe all application cohorts from 1993 to 2006 in the default data at least one year, but I observe the oldest cohort up to 23 years after the year of application.

This quantification of financial problems is similar to the method used by Kreiner et al. (2020) based on the same source of data from 2004 to 2011. They also use information on financial problems from two credit bureau companies and conclude that their findings using the data from The Danish Tax Authorities are not confined to the this specific measure of financial problems.

Panel A of Appendix Figure A3 shows how the share of applicants in default varies across completed fields of study from 7.0% for *Medicine* to 10.3% for *Humanities, Art and Architecture*. For *Business and Economics* the share of applicants who experience default is 9.6%. It is important to note that there are large differences between detailed and narrow fields within the broad fields of study. For instance, for *Economics* the average probability of default is 6.0% while it is 9.8% for *Business and administration*.

Panel B of Appendix Figure A3 shows that the outstanding amounts on accounts in default are non-trivial. 40,927 first time applicants had debt in default in 2016. The median outstanding amount in default for these applicants is 13,506 DKK (approximately 1800 Euro) and the distribution is highly right skewed with a mean outstanding amount in default of 147,452 DKK (almost 20,000 Euro).

Panel C and D of Appendix Figure A3 show the evolution of default after application. Both panels show that the default probability is low right after application, increases during studies and early work life and somewhat stabilizes after after 10 to 12 years.

Figure 2 shows how the probability of experiencing default co-varies with income and the marginal interest rate. These are two potential channels that could be affected by field of study and explain why field of study affects the probability of default. A third channel is unemployment which Kreiner et al. (2020, p. 250) show affects the default probability.

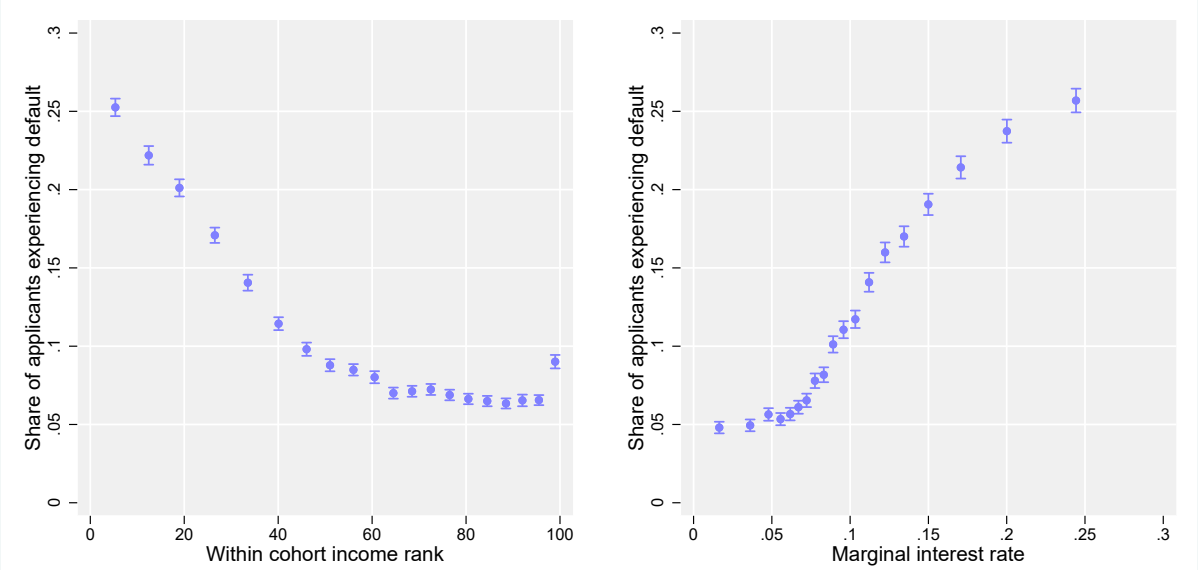
Panel A shows that applicants who are below the median income within their cohort 10 years after application are more likely to experience default and the probability increases the lower they are ranked in the income distribution.

In Panel B, I follow Kreiner et al. (2019) and use the marginal interest rate as a continuous measure of how liquidity constrained the applicants are. The marginal interest rate is defined as the highest interest rate an individual pays on a single loan in a year and the interest rate is calculated as the interest paid during the year divided by the mean of the outstanding amount in the beginning of the year and at the end of the year. The marginal interest rate is also generated using the data from the Danish Tax Authorities.

Figure 2: Correlation between default and income rank and marginal interest rate

(A) Income rank

(B) Marginal interest rate



Notes: The figures are based on all first time applicants. Default status is observed from 10 years after application until 23 years after application for the oldest application cohorts. Within cohort income rank is measured 10 years after application while the marginal interest is the average marginal interest rate from 7 to 9 years after application. There are the same number of applicants in the 20 bins in each panel. In the right panel I have left out the outlier top bin.

The panel shows that applicants who are more liquidity constrained 7 to 9 years after application according to this measure, are also more likely to experience default 10 years or later after the year of application.

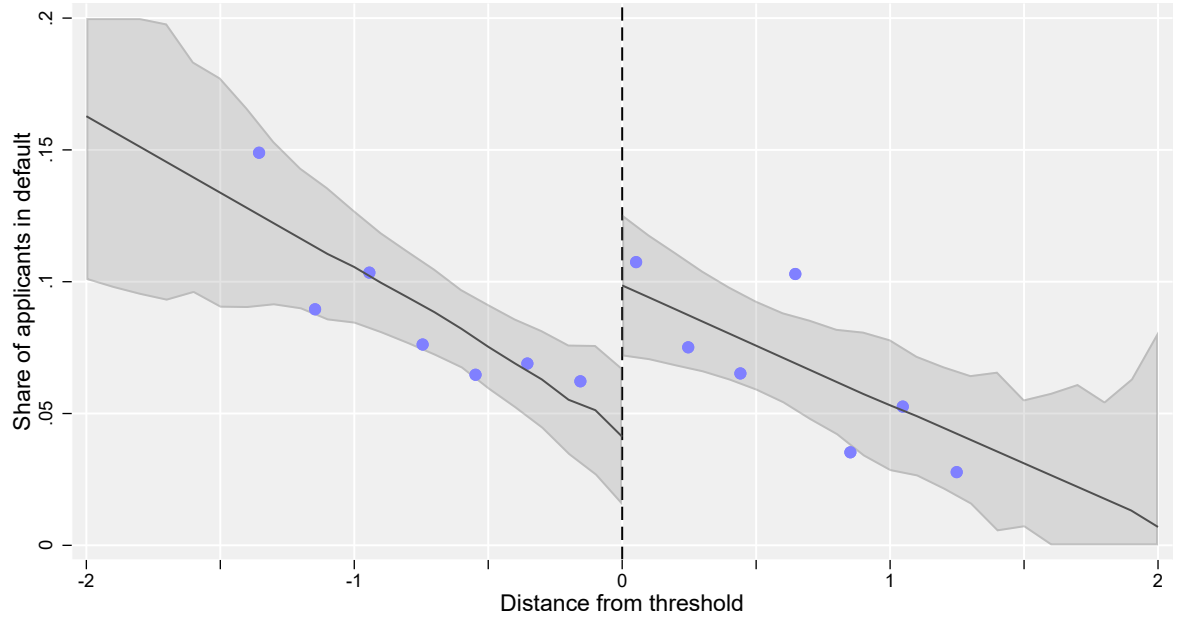
The correlations presented in this section show that the default indicator is a valid measure of financial problems, that these financial problems are non-trivial and that they vary across fields of study. In section 4.1, I will present results on the causal effect of field of study on the probability of getting into financial problems, and in section 4.2, I explore the three potential channels income, financial behavior and labor market outcomes and discuss the role of peers.

4 Results

4.1 Economics and financial problems

In this section, I present evidence on the effect of admission to *Business and economics* for applicants who have this as their alternative field. The models estimated are very

Figure 3: Admission to *Business and economics* and the probability of default



Notes: The figure is based on applicants with *Business and economics* as their alternative field of study and another field as their preferred. On the x-axis, 0 is the admission threshold of the preferred field of study. Therefore, applicants with GPAs below the threshold are more likely to be admitted to *Business and economics*. The y-axis shows the probability of default 10 years or more after application. The local linear polynomials have a bandwidth of 2 and I use a rectangular kernel. The grey area indicates the 95% confidence intervals for the local linear polynomials. The confidence bands are winsorized at 0 and 0.2. The bin width is 0.2, but I only plot bins with at least 30 observations.

similar to equation 1 and 2, but instead of only using applicants who have preferred field $f_i^p = j$ and alternative field $f_i^a = k$, I first pool all preferred fields and compare them to *Business and economics*. This group of applicants is particularly interesting, since the applicants would actually prefer to study something else than *Business and economics*, but they are"pushed" into this field if their GPAs are below the admission thresholds to their preferred fields. In section 4.1.1, I explore the effect by preferred field as in equation 1 and 2 for applicants who prefer *Social science* or *Law*.

Figure 3 shows the graphical reduced form evidence on the effect of admission to *Business and economics* on the probability of default. The figure shows that a higher GPA is associated with a lower probability of default and the effect is similar above and below the threshold. Exactly at the threshold, there is a clear jump in the probability of default, such that the applicants who are just above the threshold of their preferred field of study are approximately 6%-points more likely to experience default than the

Table 3: Admission to *Business and economics* and the probability of default

	Admission (%)	Probability of default (%)				
	(1) OLS	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
$\mathbb{1}$(GPA $\geq$ threshold)	-71.2***	5.5***				
	(2.3)	(2.0)				
$\mathbb{1}$(Admission B&E)			-7.7***	-8.1***	-7.8***	-8.2***
			(2.8)	(2.9)	(2.8)	(2.8)
N	1983	1983	1983	1983	1983	1983
Preferred field FE				✓	✓	✓
Sex, YOA and age					✓	✓
Income						✓

Notes: In the estimations, I use applicants with *Business and economics* as their alternative field of study and another field as their preferred for whom I observe all the control variables. Column (1) and (2) show the first stage and reduced form effects in %-points estimated with OLS. In column (3)-(6), I instrument admission to *Business and economics* with the indicator for being above the threshold of the preferred field in 2SLS estimations. *Preferred field FE* are fixed effects for the preferred field of study. *Sex* is a male indicator, *YOA* is year of application fixed effects, and *age* are indicators for age in the year of application. *Income* is included as dummies for five levels of the average total income 7 to 9 years after the year of application. Robust standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

applicants who are just below the threshold. The 95% confidence bands also indicate that this jump in the probability is statistically significant.[1]

Panel (A) of Appendix Figure A5 shows the first stage, namely the probability of admission to the *Business and economics* field based on the distance to the GPA threshold of the preferred field. The figure shows a pattern very similar to Panel B of Figure 1: The applicants above the threshold are very unlikely to be admitted to the *Business and economics* field, whereas the applicants just below the threshold are much more likely to be admitted to *Business and economics*.

In line with the graphical evidence in Appendix Figure A5, column (1) of Table 3 shows that being above the threshold reduces the probability of admission to *Business and economics* with 71.2%-points. Column (2) shows the estimated reduced form effect of being above the threshold on the default probability as Figure 3. The effect is a 5.5%-point

[1] Appendix Figure A4 and shows different versions of Figure 3. Panel B shows the figure with four bins of roughly the same size on each side of the threshold, Panel D shows the figure with a smaller bin width of 0.1, which is the smallest bin width possible, and Panel F shows the figure with a local linear polynomial with a bandwidth of 1.

increase in the probability of default if an applicant is admitted to his or her preferred field of study instead of *Business and economics*.

Column (3) shows the 2SLS estimate of the effect of admission to *Business and economics* on the probability of default. I find a 7.7%-point decrease in the probability of default which is the local average treatment effect of admission. Given an average default probability of 8.0% for this pool of applicants, it is a substantial decrease and the graphical evidence in Figure 3 suggest a local reduction of one half in the default probability near the threshold.

In column (4)-(6), I include preferred field fixed effects, flexible dummy controls for the predetermined characteristics sex, year of application and age at application, and finally flexible dummies for average income levels 7 to 9 years after the year of application. The 2SLS estimates show that adding these additional controls does not change the estimated effect in column (3), which indicates that applicants just above and just below the threshold are very similar. This is confirmed by Panel B of Appendix Figure A5 which shows no evidence on covariate imbalance around the threshold using the predicted probability of default based on predetermined characteristics. As discussed in section 3.5, income itself is potentially affected by field of study and is therefore a "bad control", but it is reassuring to see that the findings are robust to the inclusion of the income controls. To avoid controlling for income measured at the same time as default, I control for the income level 7 to 9 years after application which is before I measure default. In section 4.2.1, I investigate the income channel further and show that there are no income changes for these applicants around the threshold.

Appendix Table A7 shows that the estimated effects in Table 3 are robust to using all observations, i.e. dropping the bandwidth, using a smaller bandwidth of 1, using a triangular kernel instead of a rectangular kernel, using quadratic polynomials for the running variable, and excluding observations exactly at the threshold in a donut regression discontinuity design.

I explore the sensitivity of the estimates to the choice of bandwidth further in Appendix Figure A6. The figure shows the reduced form effect of being above the threshold as in

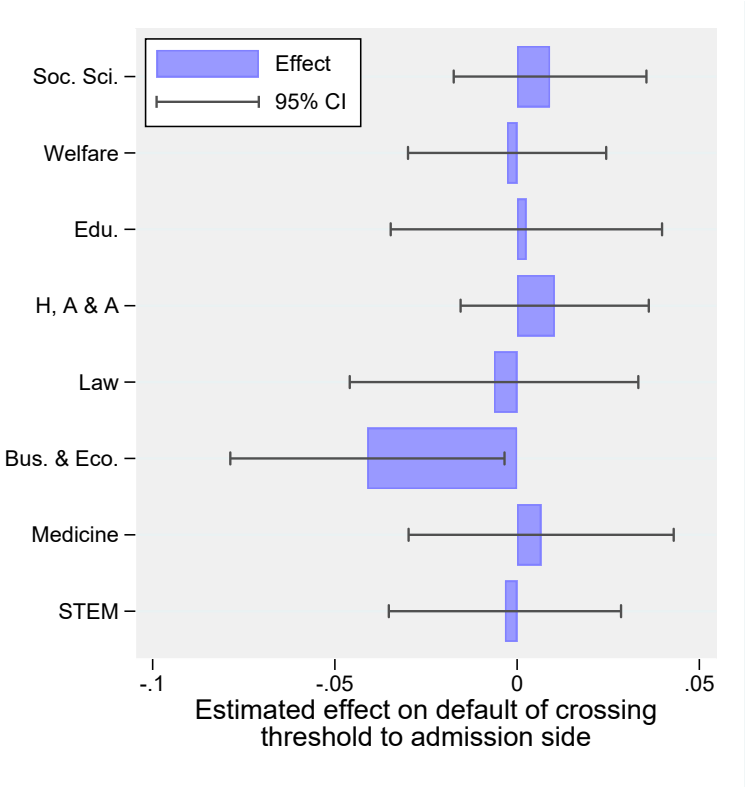
column (2) of Table 3 with varying bandwidth and demonstrates that the estimated effects are relatively stable across bandwidth choices. The confidence interval widens as the bandwidth gets smaller but the estimated effect is significant on the 10%-level until a bandwidth of 0.9, which is close to the bandwidth suggested by the McCrary (2008) procedure (0.84). The bandwidth suggested by the Calonico et al. (2017) procedure is 0.47. At this bandwidth the estimated effect is not significant but the point estimate is similar to the estimate using the McCrary bandwidth.

Appendix Table A8 shows that the results are also robust to using the definition of economics from Chetty et al. (2014) and to including non-completers, who never complete a higher education. The table also shows that the estimated effect is significant if I only look at default in 2016 (the only year where I observe the default indicator for all applicants) instead of pooling all observed years. The effect is still significant on the 10%-level if I restrict to accounts in default with an outstanding amount of more than 4000 DKK (500 Euro).

As a final validity check, I investigate whether I detect significant jumps in the default probability at placebo thresholds and for placebo fields. In Appendix Figure A7, I use the same specification as in column (2) of Table 3 and vary the threshold from -1 to 1 in steps of 0.1. In Panel A, I use a bandwidth of 2 and the panel shows that there are no significant jumps in the probability of default for placebo thresholds far from the true threshold. Right below the true threshold, the jumps at the placebo thresholds are significant at the 10%-level. Therefore, I shrink the bandwidth window to 0.9 in Panel B (the smallest bandwidth for which I detect a significant jump at the true threshold with a P-value of 0.060). The point estimate at the true threshold is almost unchanged but the point estimates at the placebo thresholds decrease and all become insignificant at the 10%-level.

Next, I investigate if I find similar effects of being admitted to other fields of study than *Business and economics*, the "placebo fields". I do this by estimating the effect of admission to each field of study where I pool applicants who prefer the field and have it as the alternative. I generate a variable, Z_i, that equals 1 if an applicant prefers field j

Figure 4: Admission to different fields of study and the probability of default



Notes: The bars plot the estimated reduced form effect of crossing the threshold to the admission side of each field of study. Each field's effect is estimated separately as in equation (3) where I pool applicants who have the field j as the preferred field of study, and another as their alternative, with applicants who have the field j as the alternative field of study, and another field as their preferred.

and is above the threshold, $T_i = 1$, or if an applicant has field j as the alternative and is below the threshold, $T_i = 0$. I then estimate the following equation:

$$y_i = \beta_1 x_i + \beta_2(x_i \times p_i) + \beta_3(x_i \times T_i) + \beta_4(x_i \times p_i \times T_i) + \beta_5 T_i + \beta_6 Z_i + \phi f_i^p + \psi f_i^a + \varepsilon_i \quad (3)$$

where I allow for different effects of the running variable above and below the threshold and depending whether field j is preferred ($p_i = 1$) or the alternative ($p_i = 0$). I also include fixed effects for preferred and alternative field, f_i^p and f_i^a.

Figure 4 shows the estimated β_6 from separate estimations of equation 3 field by field. These estimates can be interpreted as the reduced form effect of crossing the threshold to the admission side of the given field of study, no matter if it is the preferred or alternative. The figure shows that the only field where crossing the the threshold to the admission side has a significant effect on the default probability is *Business and economics*. Crossing the

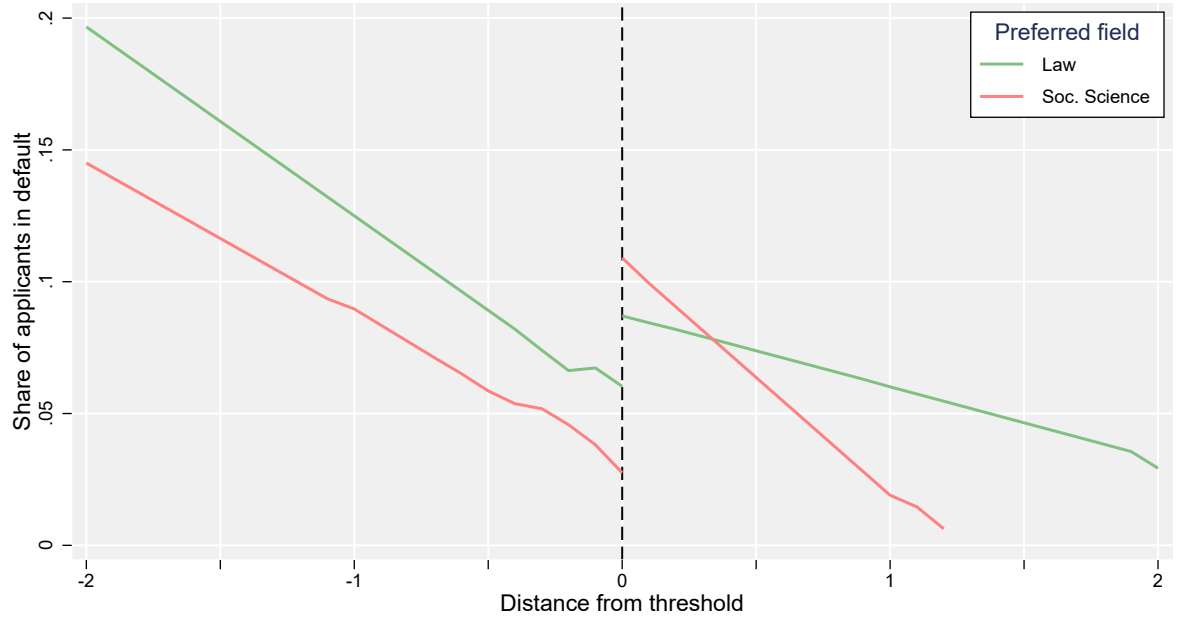
threshold to the admission side of the other fields of study has no significant effect and the point estimates are all close to 0.

To conclude, the estimated effects of admission to *Business and economics* are very consistent across the different specifications with a reduced form effect of being above the threshold of the preferred field of 4-6%-points and a local average treatment effect of 6-8%-points. At the threshold, the probability of default is reduced by almost one half. This effect size is in line with the effects found by Urban et al. (2020) who estimate the effect of financial education in three US states and find that the probability of being 30 days and 90+ days behind on an account decreases. The effects differ by state and increase the longer the policy has been implemented, but the declines are between 30% and 50% of the baseline rates and up to 95% for the 90+ days delinquency outcome.

The other studies using high school curriculum reforms have found smaller effects of education on the probability of getting into financial problems. Brown et al. (2016) find that requiring a one-year increase in math education for graduation in high school reduces the probability of having had a balance in collections with 0.6%-points from a baseline of 40%. Cole et al. (2016) estimate the effect of increasing high school math requirements and find a decrease in the probability of foreclosure of 0.4%-points from a baseline of 9%.

Even among the three studies that all rely on high school curriculum changes for identification, the magnitude of the treatment effects differ, which emphasizes that the specific contexts are very important. Since the treatment I study in this paper is very extensive compared to the studies cited above and involves education within both mathematics, economics and personal finance at the same time, it is not surprising that the effects I find are larger. One interpretation of the differences is that numerical training and financial knowledge are complements and providing education within both areas at the same time improves financial behavior. Another interpretation is that students in higher education institutions are better at transferring the financial education into financial decision-making than high school students. In any case, the results in this section show that extensive economic education can have large and lasting effects on financial behavior.

Figure 5: Admission to *Business and economics* vs. *Law* and *Social science* and default



Notes: The figure is based applicants who have *Business and economics* as their alternative field of study and either *Law* or *Social Science* as their preferred field. The y-axis shows the probability of default 10 years or more after application. The x-axis shows the distance to the GPA admission threshold (0) of the preferred field of study. The local linear polynomials use rectangular kernels with a bandwidth of 2.

4.1.1 Effect by preferred field of study

In table 2, we saw that a large share of the applicants, who have *Business and economics* as their alternative field, have *Law* or *Social science* as their preferred field. Figure 5 shows the effect of being above the threshold on the probability of default as in Figure 3 but separately for applicants who have *Law* or *Social science* as their preferred field of study.

For both groups of applicants, the figure shows an increase in the default probability right around the threshold but the jump is larger for the applicants who have *Social science* as their preferred field. Appendix Table A9 shows the formal estimation of the size of the jump at the threshold and the table shows that the jump in the probability is only statistically significant for the applicants with *Social science* as their preferred field.[2]

Figure 5 also shows negative slopes for all the local linear polynomials as in Figure 3. Below the threshold, the slopes are similar since the majority of applicants are admitted

[2]Column (1) and (4) of Appendix Table A9 show that the first stage reduction in the probability of being admitted to *Business and economics* is almost 25%-points larger for the *Social science* group. This is because more applicants are admitted to *Law* through Quota 2 (10.5%) than to *Social science* (5.9%).

to the same field but there is still a level difference. This suggests that applicants with the same alternative field are very likely different "types" if they have different preferred fields. The two groups also have a different composition of programs within the *Business and economics* field. For instance, the most frequent program for applicants with *Law* as the preferred field is *Business economics and commercial law* (42%) while the most frequent program for applicants who prefer *Social science* is *Economics* (52%).

Next, I extend the analysis by looking at all combinations of preferred and alternative fields.[3] I jointly estimate the reduced form effect for each combination by estimating the following equation:

$$y_i = \sum_a \beta_{1a}(x_i \times f_i^a) + \sum_p \beta_{2p}(x_i \times T_i \times f_i^p) + \sum_a \sum_{p \neq a} \left(\beta_{3ap}(T_i \times f_i^a \times f_i^p) + \pi_{ap}(f_i^a \times f_i^p)\right) + \varepsilon_i \quad (4)$$

I do not allow for separate effects of the running variable above and below the threshold for all combinations of fields due to the limited number of observations. Instead, I assume that the effect of the running variable below the threshold is the same for each alternative field no matter what the preferred field is. Similarly, I assume that the effect of the running variable above the threshold is the same for each preferred field no matter what the alternative field is. Still, I do allow for level differences for each combination of fields.

The estimates of the different β_{3ap} are presented in Table 4.[4] The first column shows the estimated effects of being above the thresholds to different preferred fields for applicants with *Business and economics* as their alternative. All point estimates are positive for this group of applicants meaning that admission to *Business and economics* reduces the probability of default no matter what the preferred field is, and most estimates are significant on the 10%-level. For the other fields we do not see any systematic patterns related to the probability of default.

[3] Appendix Figure A8 shows the distribution of the F-statistics from "first stage" regressions for each combination of preferred and alternatve field. For three combinations (*Education* preferred and either *STEM*, *Business and economics* or *Social science* as alternative) the F-statistic is below 10. Therefore, I leave out these three additional field combinations from the estimation.

[4] In the appendix, table A10 shows the corresponding local average treatment effects from a joint two-stage least square estimation.

Table 4: Joint estimation of the effect on default of being above the GPA threshold

	Alternative field						
	B&E	Law	HAA	Educ.	Welf.	Soc.	STEM
Preferred field							
Bus. & Econ.		-9.2	-2.4			-4.4	1.9
		(8.5)	(3.6)			(4.8)	(5.3)
Law	4.2*		-7.5**	-6.0	2.0	6.3	-10.2**
	(2.5)		(3.0)	(10.7)	(6.8)	(5.0)	(5.1)
Hum., A. and A.	4.4	4.6		-1.9	-0.2	-1.4	2.1
	(4.4)	(7.1)		(4.4)	(4.4)	(3.0)	(3.2)
Education			1.5		0.2		
			(3.7)		(3.5)		
Welfare	8.7*	6.7	-5.1	-2.0		-2.4	1.3
	(5.3)	(7.7)	(3.2)	(3.8)		(5.0)	(3.2)
Social Science	7.9***	-0.5	-2.7*	2.8	2.9		5.7
	(2.7)	(3.7)	(1.5)	(4.4)	(3.5)		(3.5)
Medicine	11.9**	8.0	3.5		-1.8	6.3	0.2
	(6.0)	(5.7)	(4.6)		(3.0)	(6.7)	(2.4)
N	1948	764	4185	858	1530	1125	2490
Default rate	8.1	7.9	9.0	6.9	6.4	9.0	6.7

Notes: The table shows the reduced form effects in %-points on default of being above the GPA threshold in a joint estimation of all combinations of preferred and alternative field of study. In the estimation, I use all applicants whose preferred field of study has a binding threshold and whose preferred and alternative field of study differ. The number of observations in the estimation is 12,900. *N* indicates the number of applicants in the estimation with the alternative field of study in the column. The *Default rate* indicates the probability of experiencing default for the applicants who have the field of study in the column as their alternative field of study. Robust standard errors in parentheses. $^{*}\,p < 0.1$, $^{**}\,p < 0.05$, $^{***}\,p < 0.01$.

4.1.2 Heterogeneous effects of admission

Appendix Table A11 investigates whether the treatment effects differ for men and women, by parental background, by time of application and by program.

Panel A shows the effect of being above the threshold for men and women who have *Business and economics* as their alternative field, separately, and I find that the effect is largest for men. The effect is statistically significant on the 5%-level for men, but not for women. In a pooled regression where the dummy for being above the threshold of the

preferred field is interacted with the male dummy, the table again shows that the effect is largest for men, but the difference between men and women is not statistically significant.

Men have a higher baseline probability of experiencing default, which might explain the difference, but men and women also have different application patterns. If we look at the three most common specific programs that the applicants apply for within the *Business and economics* field, the share of male applicants is around 60% for *Economics* and *Business economics* while it is only 43% for *Business economics and law*.

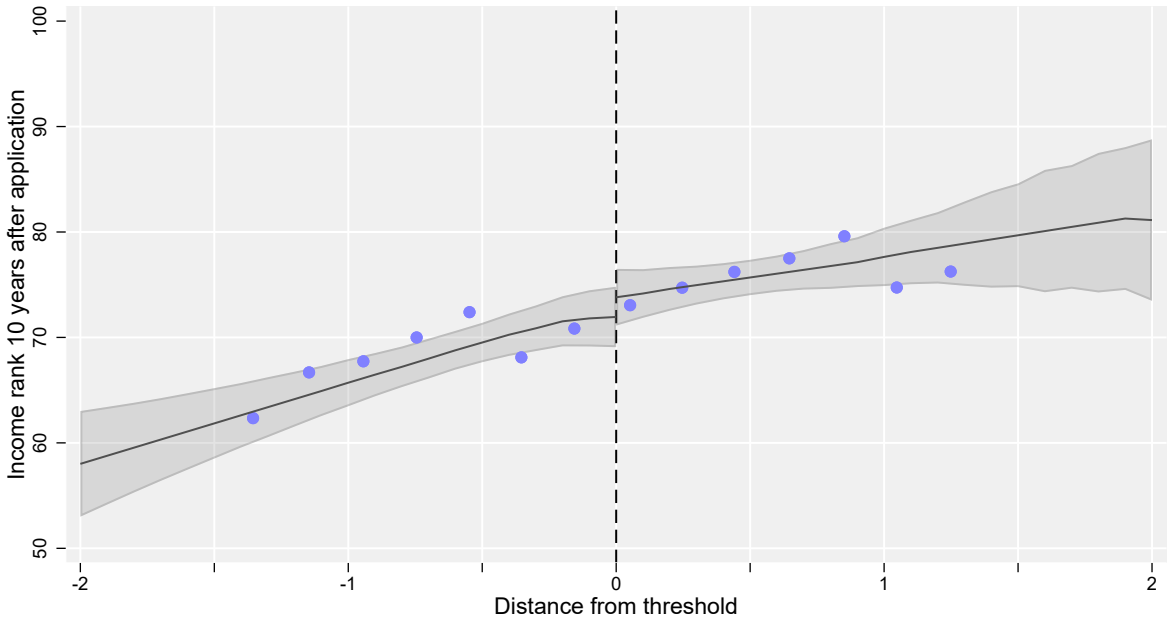
Panel B shows the effect split by whether the applicant's father has a higher education or not. The table shows that effects are very similar for the two groups. The point estimate is slightly higher for applicants whose father has a higher education but the estimates are not significantly different from each other and both are significantly different from 0 at the 10% level.

Next, Panel C splits the sample into applicants who applied before and after year 2000. The panel shows that the effect seems to be driven by the application cohorts who applied before 2000. Again, this may be because they have a higher baseline probability of default by construction since I observe them for a longer period in the data from the Danish Tax Authority. If we again look at the specific programs, the same pattern appears as when I split by gender: The cohorts who applied before 2000 are overrepresented in *Economics* and *Business economics* (55%), while they are underrepresented in *Business economics and law* (38%).[5]

Looking at the composition of specific programs across the groups studied so far, the effect seems to be strongest when *Economics* is the alternative. Panel D examines this directly and shows that indeed the effect is strongest for those who have *Economics* as their alternative. Again, it is important to keep in mind that there are differences in the preferred field of study between those who have *Economics* as the alternative and those who have for instance *Business Economics and law* as the alternative. Furthermore, a concern is whether income can explain this finding. In the next section, I show this is not the case.

[5] As described in the notes for Appendix Table A2, from 2000 and onwards I observe applicants who went to commercial upper secondary schools.

Figure 6: Admission to *Business and economics* and income rank



Notes: The figure is based on applicants with *Business and economics* as their alternative field of study and another field as their preferred. The y-axis shows the income rank within birth cohort 10 years after application. The x-axis shows the distance to the GPA admission threshold (0) of the preferred field of study. The local linear polynomials use rectangular kernels with a bandwidth of 2. The grey area indicates the 95% confidence interval. The bin width is 0.2, but I only plot bins with at least 30 observations.

4.2 Channels

4.2.1 Income

A key concern for the interpretation of the findings on the default probability is whether studying *Business and economics* leads to a higher income and that this drives the reduced the risk of default. For instance, Bleemer and Mehta (2021) use a regression discontinuity design to estimate the return to majoring in economics when this is the preferred major at the University of California, Santa Cruz, and find a 58% increase in the students' early career wages. This is in a different educational context and economics is the preferred field while the alternative is often sociology or psychology. I focus on applicants who have *Business and economics* as their alternative field and would often prefer to study political science or law, which are both high paying master degrees in the Danish context.

In Table 3, I controlled directly for income, but Figure 6 shows the reduced form effect of being above the threshold on income rank 10 years after application when *Business and economics* is the alternative field. The figure shows no indication of a discontinuity

around the threshold. Appendix Table A12 shows the estimated effects on labor income, total income, household income, income rank and on the probability of being in the top or bottom of the income distribution. I find no statistically significant effects for any of these measures of income.[6] I also look at different sub periods (1 to 9 years after application, which includes income during studies, and 10 to 12 years after application), but I find no evidence that being admitted to the *Business and economics* field leads to a higher income when this field is the alternative.

4.2.2 Financial behavior

A potential channel that could explain why admission to *Business and economics* reduces the risk of getting into financial problems is that it affects the financial behavior of the applicants. For instance, in order to default, you need to have debt, and if you do not hold sufficient liquid assets, even small shocks to your personal economy could make you unable to service your debt.

Table 5 shows the effect of being above the threshold of the preferred field on the probability of being liquidity constrained and the debt behavior of the applicants with *Business and economics* as the alternative. Column (1) shows the reduced form effect on the probability of having bank deposits smaller than one month of total income. The table shows that being above the threshold increases the probability of having a low level of bank deposits with 7.8%-points where 46.2% of the applicants on average have a low level of bank deposits. Column (2) shows the effect on the probability of having a high marginal interest rate (greater than 30%). I find an an increase of 6.0%-points at the threshold, which is a large effect given that only 4.1% have such a high marginal interest rate. Both of these estimates indicate that admission to *Business and economics* makes the applicants less liquidity constrained 10 years after application.

In column (3), the outcome is an indicator for whether the applicants have non-mortgage bank debt and I find an increase of 5.8%-points at the threshold. Column (4) shows the effect on the probability of having a high debt-to-income ratio (larger than 1)

[6] Appendix Table A13 shows that the effect is not different for those applicants who have the *Economics* as their alternative

Table 5: Admission to *Business and economics* and financial behavior

	Low bank deposit	High marg. int. rate	Bank debt	Debt-to-inc. ratio	Has pub. debt	Stock part.
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}$(GPA $\geq$ threshold)	7.8**	6.0***	5.8**	4.2	4.4*	-6.2*
	(3.6)	(2.0)	(2.7)	(3.5)	(2.5)	(3.3)
N	1959	1069	1959	1629	1952	1959
Average outcome	46.2	4.1	83.2	22.6	13.1	27.6

Notes: The table shows the estimated reduced form effects in %-points on financial behavior outcomes of being above the threshold of the preferred field. In the estimations, I use applicants with *Business and economics* as the alternative field of study and another field as their preferred. All outcomes are dummy indicators. The outcomes in column (1)-(4) and (6) are measured 10 years after application. In column (5), *Has pub. debt* is measured from 10 years after application. *Low bank deposit* equals one if an applicant's bank deposit is smaller than one month of total income. *High marg. int. rate* equals one if an applicant's marginal interest rate is greater than 30%. *Bank debt* equals one if an applicant has bank debt. *Debt-to-inc. ratio* equals one if the applicant's debt-to-income ratio is larger than one. *Has pub. debt* equals one if an applicant has public debt. *Stock part.* equals one if an applicant holds stocks with a value in excess of 1500 DKK (200 Euro) in 2015 prices. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

conditional on having debt. The estimate is positive but insignificant. This means that being above the threshold increases the probability of having bank debt, but conditional on having bank debt there is not a significant effect on how much debt the applicants have relative to their incomes.

In column (5), the outcome is an indicator that equals one if an applicant has public debt more than 10 years after application. This is because public debt is only recorded from 2013 and onwards. Public debt is interest-bearing outstanding amounts that a person owes to the government, e.g. unpaid taxes, and could also be interpreted as a sign of financial problems in itself. Here, the table also shows an increase in the probability of having this type of debt at the threshold of 4.4%-points, which is significant at the 10%-level.

In the final column (6), I follow Christiansen et al. (2008) and estimate the effect of crossing the threshold on a dummy indicating stock market participation. Similar to their results, I find that admission to the *Business and economics* field increases stock market participation, since being above the threshold reduces the probability of participation with 6.2%-points. This suggests that studying economics affects financial behavior broadly, and not only affects debt behavior. It could also indicate that the applicants become more

willing to take risks which could have an adverse effect on the probability of getting into financial problems. The fact that they still have a lower probability of default suggests that they indeed become better at managing and servicing their debt.

In total, Table 5 shows that being admitted to *Business and economics* affects the financial behavior of the applicants. The applicants are less likely to be liquidity constrained and also less likely to take on debt. Both of these findings can potentially contribute to explain why the applicants admitted to *Business and economics* are less likely to experience financial problems.

4.2.3 Labor market outcomes

The level of income, as studied in section 4.2.1, is not the only way income could be related to financial problems. Another possibility is that fluctuating income or an unstable source of income can increase the risk of default.[7]

Table 6 explores how being above the threshold affects different labor market outcomes for applicants with *Business and economics* as their alternative field. Column (1), (2) and (3) show the reduced form effects on different measures of unemployment. In column (1), the outcome in an indicator that equals one if the applicant experienced more than 3 months of unemployment in year 10 after application. The outcome in column (2) is a dummy that equals one if the applicant was unemployed ultimo November 10 years after application, and in column (3), the outcome is the total number of months with unemployment from 7 to 9 years after the year of application. None of these measures of unemployment seem to change around the threshold. Taken together with the estimated insignificant effects on labor income in Appendix Table A12, these results suggest that for the applicants with *Business and economics* as their alternative there are no changes in the unemployment risk around the threshold.

Column (4) shows the effect of being above the threshold on the probability of being self-employed 10 years after application. If applicants admitted to *Business and economics* are less likely to be self-employed this could indicate that they have a more stable source

[7]For instance, Kreiner et al. (2020) show that unemployment shocks increase the probability of default.

Table 6: Admission to *Business and economics* and labor market outcomes

	Unemployment			Self-employed	Private sector	Finance & insurance
	> 3 m.	Nov.	Cum. 7-9 y.			
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}$(GPA $\geq$ threshold)	-0.7	0.8	25.2	-0.9	-10.3***	-4.1**
	(1.7)	(1.1)	(28.3)	(0.7)	(3.9)	(2.0)
N	1893	1893	1988	1893	1689	1706
Average outcome	5.2	2.2	1.6	1.6	61.7	7.0

Notes: The table shows the estimated reduced form effects in %-points on labor market outcomes of being above the threshold of the preferred field. In the estimations, I use applicants with *Business and economics* as the alternative field of study and another field as their preferred. All outcomes are indicators measured 10 years after application except *Cum. 7-9 y.*, which is the cumulated number of months of unemployment 7 to 9 years after application. *> 3 m.* equals one if an applicant was unemployed for more than 3 months in the year. *Nov.* equals one if an applicant was unemployed in November. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

of income, but the estimated effect shows this is not the case. The table also shows that these applicants are very unlikely to become self-employed in the first place (1.6%).

In column (5) and (6), I investigate which sectors the applicants are employed in 10 years after application. Column (5) shows the effect of being above the threshold on the probability of being employed in the private sector. Job security is often considered to be higher in the public sector,[8] so if applicants admitted to *Business and economics* are more likely to work in the public sector, this could mean that they have a more stable source of income and therefore are less likely to experience default. The estimated effect of being above the threshold is a 10.3%-point *reduction* in the probability of being employed in the private sector. This means that admission to *Business and economics* actually makes it significantly less likely that the applicant will be employed in the public sector, and therefore the job security explanation does not seem to explain the reduced risk of getting into financial problems.

Column (6) shows the effect on the probability of being employed in the *Finance and insurance* sector.[9] The table shows that being above the threshold reduces the probability of working in the *Finance and insurance* sector with 4.1%-points. This result and the result on the probability of working in the private sector in column (5) shows that field of study does affect the applicants' future work lives. The effect of studies and subsequent

[8] See for instance Luechinger et al. (2010).

[9] The sector is defined by the DB07 classification provided by Statistics Denmark.

work experience cannot be disentangled in this setup, since they are co-determined.[10] If we believe that it requires more financial knowledge and understanding to get a job in the *Finance and insurance* sector, this result suggests that admission to the *Business and economics* fields of study actually increases financial knowledge and understanding.

The results from Table 6 show that employment or income stability does not seem to change for applicants around the threshold. Therefore, it is unlikely that these channels explain the change in the probability of default around the threshold. The table also shows that admission to *Business and economics* lead to more employment in the private sector and in the *Finance and insurance* sector.

4.2.4 Peers

An applicants' field of study also affects who his or her peers are and this could potentially influence the probability of getting into financial problems. In this section, I explore whether admission to *Business and economics* affects which partner an applicant lives with 10 years after application and if it affects the background of the applicant's peers in the study program he or she is admitted to.

College can be considered as a marriage market and which field of study an applicant is admitted to could affect what his or her later partner's field of study is (Eika et al., 2019; Kirkebøen et al., 2021). If we look at all applicants who have different preferred and alternative fields of study, column (3) of Appendix Table A14 shows that being above the threshold actually increases the probability that the partner 10 years later has an education within that same field of study. The same is not true if we look at the alternative field of study in column (4). Being above the threshold of the preferred field does not significantly decrease the probability that the partner has an education within the alternative field of study. This is also the case if we only look at the applicants who have *Business and economics* and their alternative field of study in column (5). This suggest that the reduced probability of default is not driven by an increase in the probability that

[10] As a robustness check, I drop all applicants who end up working in the *Finance and insurance* sector 10 years after application in column (3) of Appendix Table A8. This reduces the estimated effect of studying *Business and economics*, but the effect remains significant on the 10%-level with a P-value of 0.078.

you get an "economist" as partner later in life. Furthermore, the results indicate that potential peer effects are strongest for those who are admitted to their preferred field of study and perhaps less important for those who are admitted to the alternative field.

In column (6) of Appendix Table A14, I use the educational background of an applicant's peers in his or her study program as the outcome. In particular, I look at the share of peers who come from the mathematical track (instead of the linguistic track) in upper secondary school. I find that being above the threshold reduces the share of peers from the mathematical track with 9.0%-points. For these applicants the average share is 44.5% so this is a substantial reduction that is significant on the 1%-level. I cannot rule out that this change in the peer composition is a part of the explanation for the finding on financial problems but another way to interpret this result is that admission to *Business and economics* exposes an applicant to a more math intensive program that potentially increases the applicant's numeracy which is also important for financial understanding.

5 Conclusion

This paper investigates how field of study in higher education affects the probability of getting into financial problems, and, in particular, if studying economics can reduce the risk of default. Ill-informed financial decision-making has great consequences for both creditors and debtors but causal evidence on the effect of economic education on financial outcomes is sparse.

I link data on admission to higher education in Denmark with data on the universe of personal loans to estimate the causal effect of admission to the *Business and economics* field of study on the probability of experiencing default. I identify the causal effect by exploiting that the Danish system of admission generates locally unpredictable GPA admission thresholds, which enables me to compare similar applicants who are quasi-radomized into different fields of study due to small differences in their GPA from upper secondary school.

I find that applicants who have *Business and economics* as their alternative field of study but would prefer another field are 6-8%-points less likely to experience default if

they are just below the GPA admission threshold of their preferred field. This is a sizeable effect since 11% of all first time applicants experience default. The evidence suggests that admission to *Business and economics* reduces the probability of default no matter what the preferred field is.

I show that admission to *Business and economics* does not increase income which could explain why these applicants are less likely to default. This is because the most common preferred fields, *Social science* (namely the program *Political science*) and *Law*, lead to high incomes in the Danish labor market. I also present evidence that admission to *Business and economics* does not reduce the probability of becoming unemployed or lead to more stable employment.

Instead, I find changes in the financial behavior around the GPA admission threshold for the applicants who have *Business and economics* as their alternative field. These changes can potentially explain why the applicants have a lower default probability. I find that they are less likely to be liquidity constrained, i.e. they are less likely to have low levels of bank deposits and a high marginal interest rate. They are also less likely to have bank debt and public debt.

Therefore, I conclude that admission to the *Business and economics* field of study reduces the risk of getting into financial problems. This result shows that extensive economic education can improve financial decision-making and have long-lasting effects on financial outcomes even for individuals from a relatively affluent background.

References

Altmejd, A., A. Barrios-Fernández, M. Drlje, J. Goodman, M. Hurwitz, D. Kovac, C. Mulhern, C. Neilson, and J. Smith (2021). O Brother, Where Start Thou? Sibling Spillovers on College and Major Choice in Four Countries. *The Quarterly Journal of Economics*.

Andersen, S., P. D'Astous, J. Martínez-Correa, and S. H. Shore (2020). Cross-program differences in returns to education and the gender earnings gap. Working paper / center for economic analysis of risk (CEAR), CEAR, Georgia State University, Atlanta, GA.

Beshears, J., J. J. Choi, D. Laibson, and B. C. Madrian (2018). Behavioral Household Finance. In B. D. Bernheim, S. DellaVigna, and D. Laibson (Eds.), *Handbook of Behavioral Economics: Foundations and Applications 1* (First ed.)., Chapter Behavioral, pp. 177–276. Amsterdam: Elsevier.

Bleemer, Z. and A. S. Mehta (2021). Will Studying Economics Make You Rich? A Regression Discontinuity Analysis of the Returns to College Major. *American Economic Journal: Applied Economics*, Forthcoming.

Bover, O., L. Hospido, and E. Villanueva (2018). The Impact of High School Financial Education on Financial Knowledge and Choices: Evidence from a Randomized Trial in Spain. *IZA Discussion Paper No. 11265*.

Brown, M., J. Grigsby, W. Van Der Klaauw, J. Wen, and B. Zafar (2016). Financial education and the debt behavior of the young. *Review of Financial Studies 29*(9), 2490–2522.

Bruhn, M., L. d. S. Leão, A. Legovini, R. Marchetti, and B. Zia (2016). The impact of high school financial education: Evidence from a large- scale evaluation in brazil. *American Economic Journal: Applied Economics 8*(4), 256–295.

Calonico, S., M. D. Cattaneo, M. H. Farrell, and R. Titiunik (2017). Rdrobust: Software for Regression-discontinuity Designs. *The Stata Journal 17*(2), 372–404.

Cattaneo, M. D., M. Jansson, and X. Ma (2018). Manipulation testing based on density discontinuity. *Stata Journal 18*(1), 234–261.

Chetty, R., J. N. Friedman, S. Leth-Petersen, T. H. Nielsen, and T. Olsen (2014). Active vs. Passive decisions and crowd-out in retirement savings accounts. *Quarterly Journal of Economics 129*(3), 1141–1219.

Christiansen, C., J. S. Joensen, and J. Rangvid (2008). Are economists more likely to hold stocks? *Review of Finance 12*(3), 465–496.

Cole, S., A. Paulson, and G. K. Shastry (2016). High school curriculum and financial outcomes: The impact of mandated personal finance and mathematics courses. *Journal of Human Resources 51*(3), 656–698.

Dahl, G. B., D.-O. Rooth, and A. Stenberg (2020a). Family spillovers in field of study. NBER working paper 27618, National Bureau of Economic Research, Cambridge, MA.

Dahl, G. B., D.-O. Rooth, and A. Stenberg (2020b). Long-run returns to field of study in secondary school. NBER working paper 27524, National Bureau of Economic Research, Cambridge, MA.

Daly, M., M. F. Jensen, and D. le Maire (2021). University admission and the similarity of fields of study. Unpublished manuscript.

Eika, L., M. Mogstad, and B. Zafar (2019). Educational Assortative Mating and Household Income Inequality. *Journal of Political Economy 127*(6), 2795–2835.

Fernandes, D., J. G. Lynch, and R. G. Netemeyer (2014). Financial literacy, financial education, and downstream financial behaviors. *Management Science 60*(8), 1861–1883.

Hastings, J. S., C. A. Neilson, and S. D. Zimmerman (2014). Are some degrees worth more than others? Evidence from college admission cuttoffs in Chile. NBER working paper 19241, National Bureau of Economic Research, Cambridge, MA.

Heinesen, E. (2018). Admission to higher education programmes and student educational outcomes and earnings–Evidence from Denmark. *Economics of Education Review 63*(January), 1–19.

Humlum, M. K., J. H. Kristoffersen, and R. Vejlin (2017). College admissions decisions, educational outcomes, and family formation. *Labour Economics 48*, 215–230.

Kaiser, T., A. Lusardi, L. Menkhoff, and C. Urban (2020). Financial Education Affects Financial Knowledge and Downstream Behaviors. NBER working paper 27057, National Bureau of Economic Research, Cambridge, MA.

Kaiser, T. and L. Menkhoff (2017). Does financial education impact financial literacy and financial behavior, and if so, when? *World Bank Economic Review 31*(3), 611–630.

Kaiser, T. and L. Menkhoff (2020, October). Financial education in schools: A meta-analysis of experimental studies. *Economics of Education Review 78*, 101930.

Kirkebøen, L., E. Leuven, and M. Mogstad (2021). College as a Marriage Market. NBER working paper 28688, National Bureau of Economic Research, Cambridge, MA.

Kirkeboen, L. J., E. Leuven, and M. Mogstad (2016). Field of study, earnings, and self-selection. *Quarterly Journal of Economics 131*(3), 1057–1111.

Kreiner, C. T., D. D. Lassen, and S. Leth-Petersen (2019). Liquidity constraint tightness and consumer responses to fiscal stimulus policy. *American Economic Journal: Economic Policy 11*(1), 351–379.

Kreiner, C. T., S. Leth-Petersen, and L. C. Willerslev-Olsen (2020). Financial trouble across generations: Evidence from the universe of personal loans in Denmark. *Economic Journal 130*(625), 233–262.

Luechinger, S., S. Meier, and A. Stutzer (2010). Why does unemployment hurt the employed? Evidence from the life satisfaction gap between the public and the private sector. *Journal of Human Resources 45*(4), 998–1045.

Lusardi, A., A. Samek, A. Kapteyn, L. Glinert, A. Hung, and A. Heinberg (2017). Visual tools and narratives: New ways to improve financial literacy. *Journal of Pension Economics and Finance 16*(3), 297–323.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics 142*(2), 698–714.

Miller, M., J. Reichelstein, C. Salas, and B. Zia (2015). Can you help someone become financially capable? A meta-analysis of the literature. *World Bank Research Observer 30*(2), 220–246.

Öckert, B. (2010). What's the value of an acceptance letter? Using admissions data to estimate the return to college. *Economics of Education Review 29*(4), 504–516.

OECD (2016). *PISA 2015 Assessment and Analytical Framework*. Paris: OECD Publishing / PISA.

Silliman, M. and H. Virtanen (2021). Labor market returns to vocational secondary education. *American Economic Journal: Applied Economics*, Forthcoming.

Skimmyhorn, W. (2016). Assessing financial education: Evidence from boot camp. *American Economic Journal: Economic Policy 8*(2), 322–343.

Statistics Denmark (2020). DISCED-15, Field of education, current educations, v1:2020. https://www.dst.dk/en/Statistik/dokumentation/nomenklaturer/disced-15–fagomraade–igangvaerende-uddannelser\# (accessed August 13, 2020).

Stiglitz, J. E. and A. Weiss (1981). Credit Rationing in Markets with Imperfect Information. *American Economic Review 71*(3), 393–410.

Urban, C., M. Schmeiser, J. Michael Collins, and A. Brown (2020). The effects of high school personal financial education policies on financial behavior. *Economics of Education Review 78*, 1–12.

Appendix

Table A1: Examples of program rankings at University of Copenhagen in 2006

	GPA	Priority	Program	Threshold	Field
Ex. 1	8.6				
		1	Law	8.5	Preferred
		2	Economics	0	Alternative
		3	Pol. science	9.7	Drop: Law has higher rank and lower threshold
Ex. 2	8.3				
		1	Pol. science	9.7	Drop: GPA below threshold of Law
		2	Law	8.5	Preferred
		3	Economics	0	Alternative
Ex. 3	10.0				
		1	Pol. science	9.7	Preferred
		2	Law	8.5	Alternative
		3	Economics	0	Drop: GPA above threshold for all programs
Ex. 4	9.5				
		1	Pol. science	9.7	Preferred
		2	Law	8.5	Alternative
		3	Economics	0	Drop: Lowest of two thresholds

Notes: The table shows made up examples of four applicants to programs at the University of Copenhagen in 2006. The first applicant has a grade point average of 8.6 from upper secondary school and has *Law* as her first priority, *Economics* as her second priority, and *Political science* as her third priority. The column labelled *Threshold* shows the (real) GPA thresholds for the three programs. The final column shows how the applications are used in the research design. For this applicant *Law* is the preferred program, *Economics* is the alternative program and the *Political science* application is discarded because the other programs have a higher rank and lower thresholds and therefore the applicant will never be admitted to *Political science*. The three remaining examples illustrate other cases where applications are discarded for different reasons.

Table A2: Selection of sample

Restriction	Observations
First time applicants	427,885
Only one program has first priority	426,666
At least two applications in ordinary system	170,098
GPA threshold for first priority program	133,009
Not admitted to program with another admission system	129,320
Admitted to one program	98,688
GPA is not missing	81,350
GPA is above the GPA threshold of at least one program	67,522
Applicants with binding threshold	53,882

Notes: The large reduction from the restriction *At least two applications in ordinary system* is caused by the fact that many applicants only apply for one program and many only apply for programs that use another admission system. The *GPA is not missing* restriction reduces the sample size because GPA was not recorded for Upper secondary higher commercial examination before 2000. The sample size is similar to the sample sizes in other studies using the same data. For instance, Daly et al. (2021) have 46,213 observations that meet their selection criteria. They use data from 1996 to 2006, applicants that are 17 to 25 years old and only applications to university level programs whereas I include university college programs as well.

Table A3: Summary statistics

	1st time applicants			Sample		
	Obs.	Mean	SD	Obs.	Mean	SD
Age	427885	21.8	2.4	14181	21.1	1.8
Male (%)	427885	40.5	49.1	14181	36.3	48.1
GPA	323751	8.3	1.0	14181	8.8	0.8
1st priority threshold	320740	5.8	4.1	13666	9.1	0.6
Offered rank	358047	1.2	0.6	14181	1.8	1.1
Number of applications	427885	1.9	1.2	14181	3.2	1.4
Income rank	412865	58.2	28.0	14022	63.2	28.5
Father's income rank	325715	67.0	28.4	11638	70.7	28.2
Mother's income rank	367522	47.3	26.0	13014	52.7	27.1
Father has master (%)	389010	13.3	33.9	13530	22.8	41.9
Mother has master (%)	400293	6.4	24.5	13829	11.9	32.3
Default (%)	422365	11.1	31.4	14170	8.0	27.1

Notes: The *1st time applicants* are all applicants observed in the data. This includes applicants to business academies that use another admission system than universities and university colleges. The *Sample* are the applicants whose preferred program has a binding GPA threshold and whose preferred program and alternative program are within different fields of study. *Income rank* is within cohort rank based on total income measured 10 years after application. Father's and mother's income rank are measured when they are 45 years old. *Default* is measured 10 to 23 years after application.

Table A4: Construction of fields of study from DISCED classifications

Fields of Study	DISCED
Humanities, arts and architecture	Arts and humanities (L4) Architecture and town planning (L2)
STEM	Engeneering, manufacturing and construction (L4) Natural sciences, mathematics and statistics (L4) Information and communication technologies (L4)
Law	Law (L3)
Business and economics	Business and administration (L3) Economics (L2) Mathematical economics (L2) Agricultural economics (L2)
Social science	Social sciences, journalism and information (L4)
Education	Education (L4)
Welfare	Health and welfare (L4)
Medicine	Medicine (L2) Veterinary (L3)

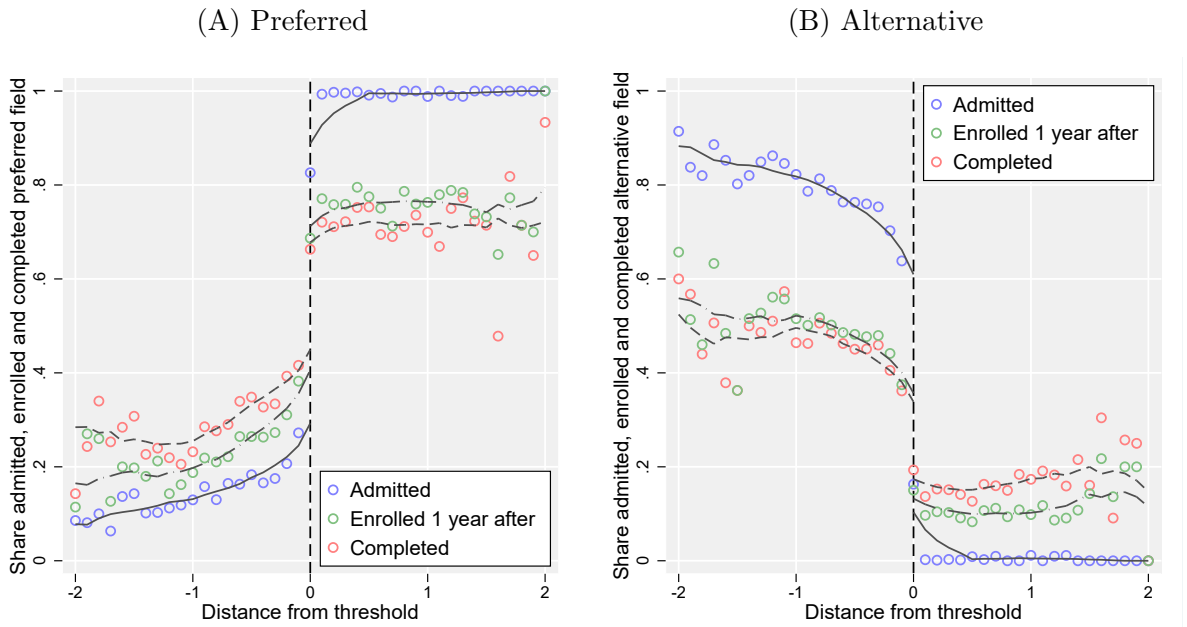
Notes: The parentheses indicate the DISCED level. Level 4 is ISCED Broad fields, level 3 is ISCED Narrow fields and level 2 is ISCED Detailed fields. Two level 4 (L4) DISCED groups are left out. These are *Agriculture, forestry, fisheries and veterinary* and *Services*. For the first group there are very few observations that do not belong to the narrow field *Veterinary* (included in *Medicine*) and for the latter group there are also very few observations, since the *Service*-educations are not at university or university college level. The DISCED name for *Mathematical economics* is *Inter-disciplinary programs involving mathematics and statistics*. The DISCED name for *Agricultural economics* is *Inter-disciplinary programs involving agriculture*.

Table A5: Most common programs within the fields of study

Field of study	Preferred	Alternative
Hum., art & arch.	Humanistic basic education (22%) Architect (16%) History (8%)	History (12%) Business language (10%) Danish (7%)
STEM		Engineer (25%) Biology (15%) Natural science (15%)
Law	Law (100%)	Law (100%)
Bus. & econ.	Business econ. and language (29%) Business economics (16%) Language and int. marketing (9%)	Economics (38%) Bus. econ. and law (22%) Business economics (20%)
Social science	Political science (25%) Psychology (22%) Anthropology* (12%)	Soc. sci. basic edu. (39%) Librarian (13%) Admin./Soc. studies (10%)
Education	Teacher (84%) Audiologopedics (7%) Pedagogy (4%)	Teacher (91%) Pedagogy (6%) Audiologopedics (2%)
Welfare	Sports (22%) Dentist (17%) Social worker (14%)	Pedagogue (31%) Nurse (24%) Social worker (12%)
Medicine	Medical science (83%) Veterinary (16%)	

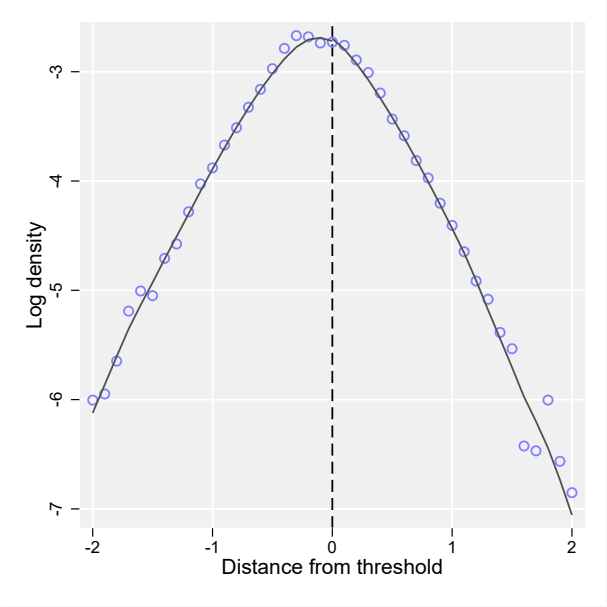
Notes: The *Preferred* column shows the most common programs when the field is the preferred field of study. The *Alternative* column shows the most common programs when the field is the alternative field of study. **Anthropology* consists of two programs: *Anthropology* and *Humanities 2*. The latter was a program at Aarhus University from 1993 to 1998 where the enrolled applicants were divided into different programs. The mode of applicants accepted to the program studied *Anthropology* later in the year of application, but others studied philosophy or literature for instance.

Figure A1: Admission, enrolment and completion for preferred or alternative field of study



Notes: The figures are based on all applicants whose preferred field of study has a binding threshold and whose preferred and alternative field of study differ. The bin width in the two panels is the smallest possible, 0.1. The local linear polynomials have a bandwidth of 0.5.

Figure A2: Distribution of the distance to the GPA threshold



Notes: The figure is based on all applicants whose preferred field of study has a binding threshold and whose preferred and alternative field of study differ. The bin width in the two panels is the smallest possible, 0.1. The local linear polynomials have a bandwidth of 0.5.

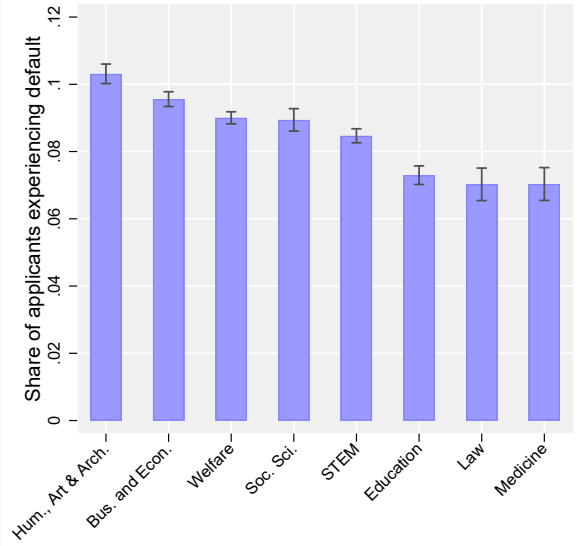
Table A6: Test for manipulation of the running variable

	Stata	Test stat.	Std. Err. / P-val	Bandwidth
McCrary (2008)	DCdensity	-0.0167	0.037	0.68
Cattaneo et al. (2018)	rddensity	0.0571	0.9544	0.22/0.25

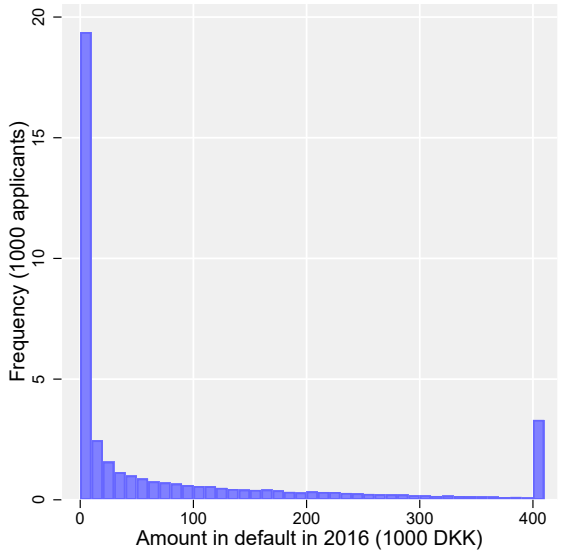
Notes: The tests are based on all applicants whose preferred field of study has a binding threshold and whose preferred and alternative field of study differ. The column *Stata* indicates which Stata program was used to implement the test. The column *Std. Err. / P-val* shows the standard error for the McCrary test and the P-value for the test proposed by Cattaneo, Jannson and Ma. For the latter test, the two calculated bandwidths are to the left and right of the threshold.

Figure A3: Completed field of study, time since application and default

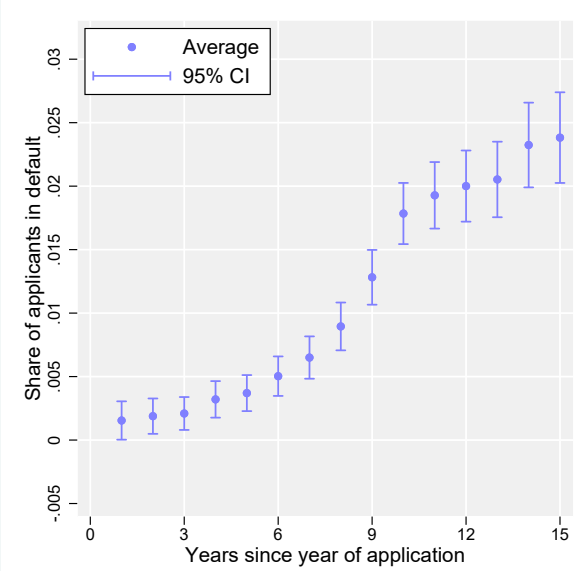
(A) Default by field of study



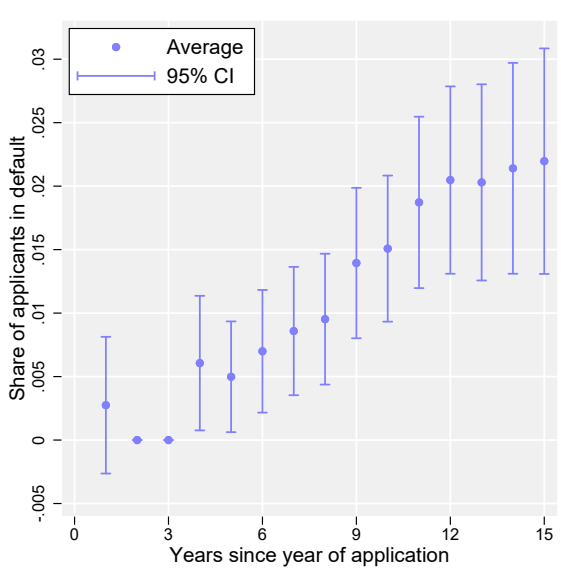
(B) Distribution of amount in default



(C) Default and time since application (applicants with binding GPA threshold)



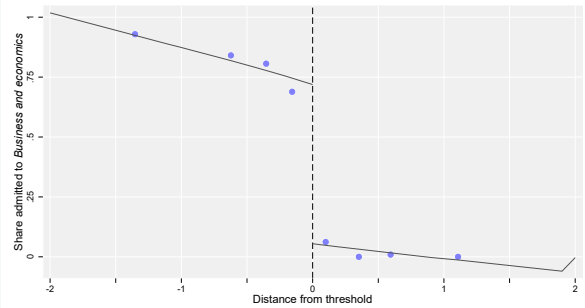
(D) Default and time since application (applicants with B&E as alternative)



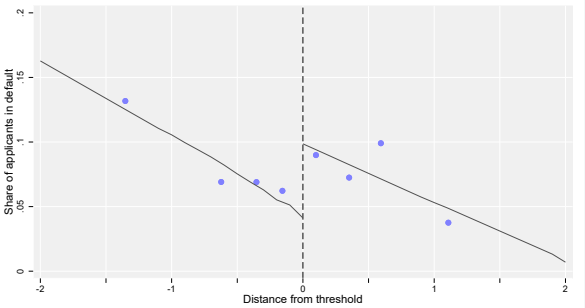
Notes: In the top left panel, default status is observed from 10 years after application until 23 years after application for the oldest application cohorts. The figure is based on first time applicants who complete a higher education degree. For these applicants the average probability of default is 8.9%. In the top right panel, the bin width is 10,000 DKK (1300 Euro). The amount in default is censored above 400,000 DKK. The bottom panels show the share off applicants with binding GPA thresholds that experience default in each year since their first year of application. The left panel includes all applicants with a binding threshold and different preferred and alternative fields of study and the right panel only includes applicants with *Business and Economics* as their alternative field of study.

Figure A4: Admission to *Business and economics* and default

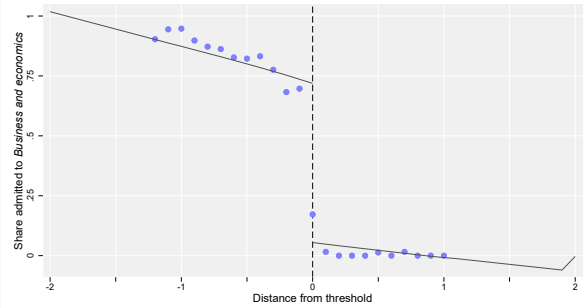
(A) First stage with 4 bins



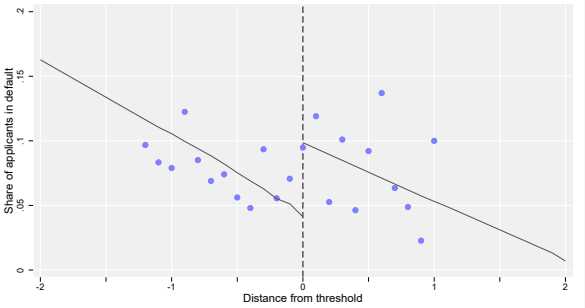
(B) Reduced form with 4 bins



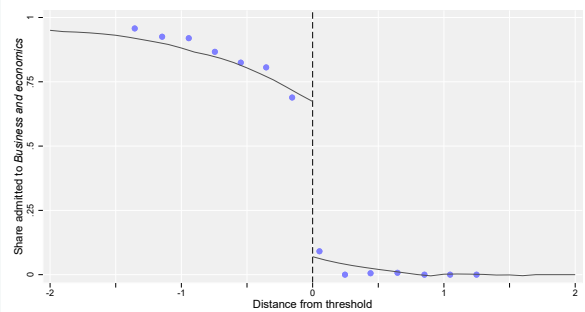
(C) First stage with smallest bin width



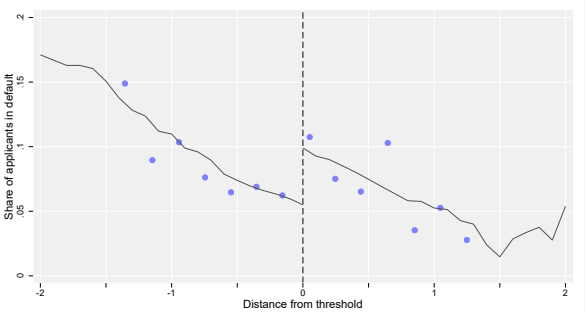
(D) Reduced form with smallest bin width



(E) First stage with a bandwidth of 1



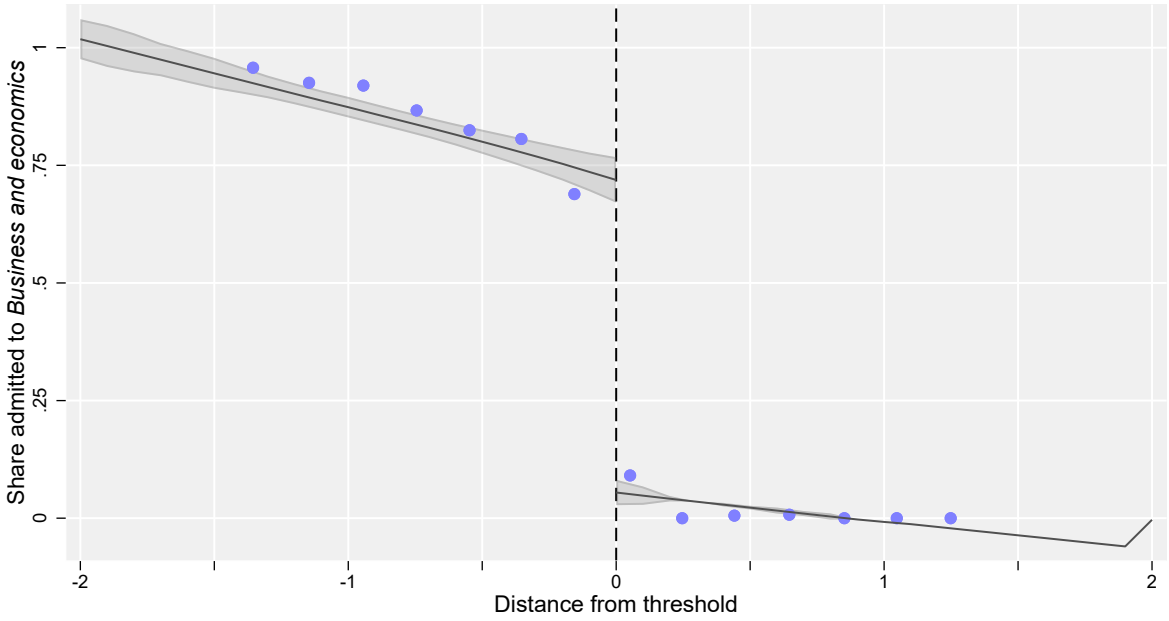
(F) Reduced form with a bandwidth of 1



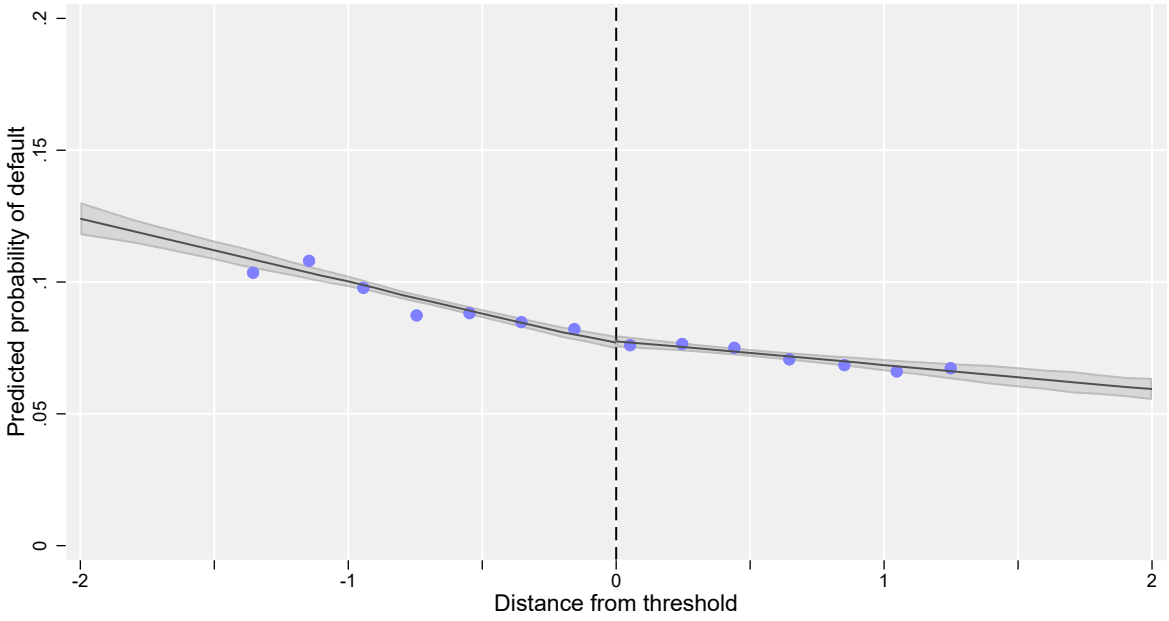
Notes: The figures are based on applicants with *Business and economics* as their alternative field of study and another field as their preferred. In the top panels, I use a bandwidth of 2 and the four bins have approximately the same number of observations. In the middle panels, the bin width is the smallest possible, 0.1, but I only plot bins with at least 30 observations. In the bottom panels, I use a bandwidth if 1 and the bin width is 0.2, but I only plot bins with at least 30 observations All panels use rectangular kernels and I include individuals who are admitted to either their preferred or alternative field of study.

Figure A5: Admission to *Business and Economics* and predicted probability of default

(A) First stage

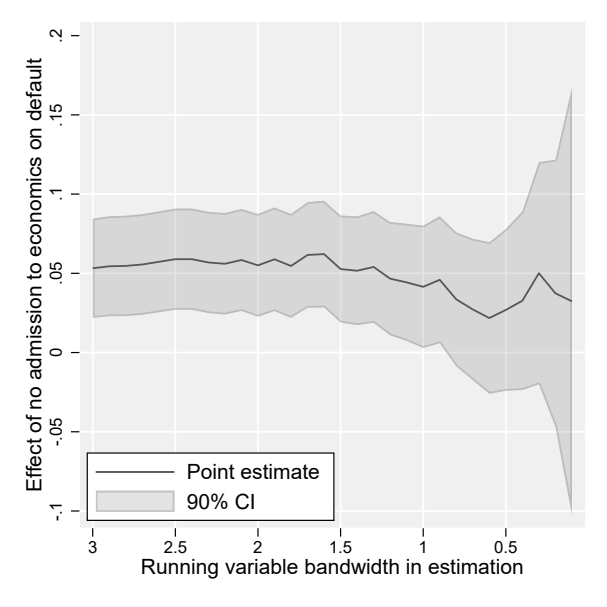


(B) Reduced form using predicted default



Notes: The figures are based on applicants who have *Business and economics* as their alternative field of study and another field as their preferred. In both panels, the local linear polynomials have a bandwidth of 2 and I use a rectangular kernel. The grey area indicates the 95% confidence interval. The bin width is 0.2, but I only plot bins with at least 30 observations. The top panel shows the first stage, namely how the probability of admission to *Business and economics* changes around the threshold of the preferred field of study. In the bottom panel, the probability of default is predicted using a probit model with sex, year of application, age and grade point average as the explanatory variables.

Figure A6: *Business and economics* and default for different choices of bandwidth



Notes: The figure shows the estimated reduced form effect as in column (2) of Table 3 with different choices of bandwidth. The Stata program `DCdensity` suggests a bandwidth of 0.84 (McCrary, 2008) and `rdrobust` suggests a bandwidth of 0.47 (Calonico et al., 2017).

Table A7: Admission to *Business and economics* and the probability of default

	Probability of default more than 10 years after application					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}$(GPA $\geq$ threshold):	-71.2***	-71.9***	-67.3***	-69.0***	-67.0***	-71.1***
Effect on admission	(2.3)	(2.1)	(2.9)	(2.6)	(3.0)	(2.3)
$\mathbb{1}$(GPA $\geq$ threshold):	5.5***	5.3***	4.1*	5.1**	5.6**	5.6***
Effect on default	(2.0)	(1.9)	(2.4)	(2.1)	(2.5)	(2.2)
Local average	-7.7***	-7.4***	-6.2*	-7.4**	-8.4**	-7.9***
treatment effect	(2.8)	(2.7)	(3.6)	(3.1)	(3.8)	(3.1)
N	1983	2013	1707	1983	2013	1867
Bandwidth	2		1	2		2
Functional form	Linear	Linear	Linear	Linear	Quadratic	Linear
Kernel	Rect.	Rect.	Rect.	Tri..	Rect.	Rect.
Donut RD						✓

Notes: In the estimations, I use applicants with *Business and economics* as their alternative field of study and another field as their preferred for whom I observe all the control variables. The estimated effects are in %-points. The top row shows the first stage effects of being above the threshold on the probability of admission to *Business and economics*. The middle row shows the reduced form effects of being above the threshold on the probability of default. The bottom row shows the effects of admission to *Business and economics* on the probability of default using two stage least squares estimation where admission is instrumented using whether an applicant is above the threshold of the preferred field. *Bandwidth*, *Functional form* and *Kernel* indicate how the local linear polynomials are specified. *Donut RD* indicates that applicants exactly at the threshold are discarded in column (6). Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

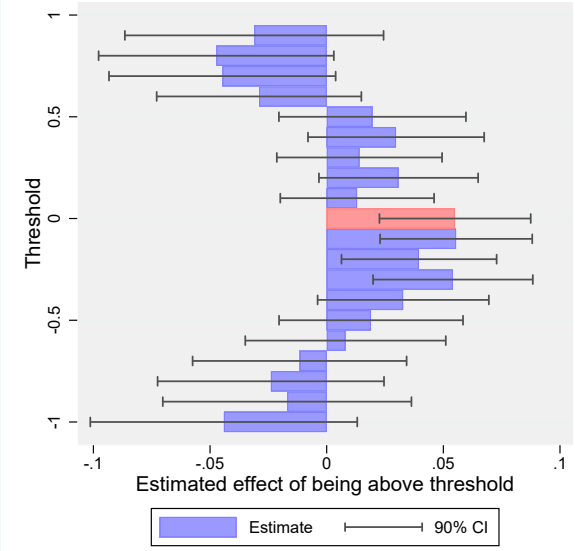
Table A8: Admission to *Business and economics* and the probability of default

	Default +10 years after			Default in 2016	
	(1)	(2)	(3)	(4)	(5)
				$\geq$ 0 DKK	$\geq$ 4000 DKK
$\mathbb{1}$(GPA $\geq$ threshold):	-72.4***	-70.3***	-69.4***	-71.2***	-71.2***
Effect on admission	(1.9)	(2.3)	(2.7)	(2.3)	(2.3)
$\mathbb{1}$(GPA $\geq$ threshold):	5.6***	6.0***	3.7*	4.3**	2.1*
Effect on default	(1.9)	(2.0)	(2.1)	(1.9)	(1.3)
Local average	-7.7***	-8.5***	-5.4*	-6.1**	-3.0*
treatment effect	(2.6)	(2.9)	(3.0)	(2.7)	(1.8)
N	2665	1955	1589	1983	1983
Bandwidth	2	2	2	2	2
Functional form	Linear	Linear	Linear	Linear	Linear
Kernel	Rect.	Rect.	Rect.	Rect.	Rect.
Incl. non-completers	✓				
Alternative econ. def.		✓			
Excl. bankers			✓		

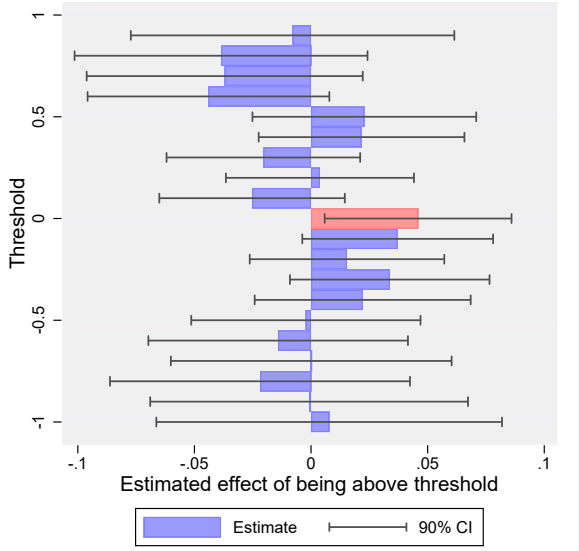
Notes: In the estimations, I use applicants with *Business and economics* as their alternative field of study and another field as their preferred for whom I observe all the control variables. The estimated effects are in %-points. In column (1)-(3), I use the same outcome as in Table 3. In column (4) and (5), I only use an indicator for default in 2016, and in column (5), I only use accounts in default with an outstanding amount of more than 4000 DKK (500 Euro). The top row shows the first stage effect of being above the threshold on the probability of admission to *Business and economics*. The middle row shows the reduced form effect of being above the threshold on the probability of default. The bottom row shows the effect of admission to *Business and economics* on the probability of default using two stage least squares estimation where admission is instrumented using whether an applicant is above the threshold of the preferred field. *Bandwidth*, *Functional form* and *Kernel* indicate how the local linear polynomials are specified. In column (1), I include non-completers, who never obtain a higher education degree. In column (2), I use the definition of *Business and economics* from Chetty et al. (2014). In column (3), I exclude applicants who end up working in the *Finance and insurance* sector. Robust standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure A7: Admission to *Business and economics* and default at placebo thresholds

(A) Bandwidth = 2



(B) Bandwidth = 0.9



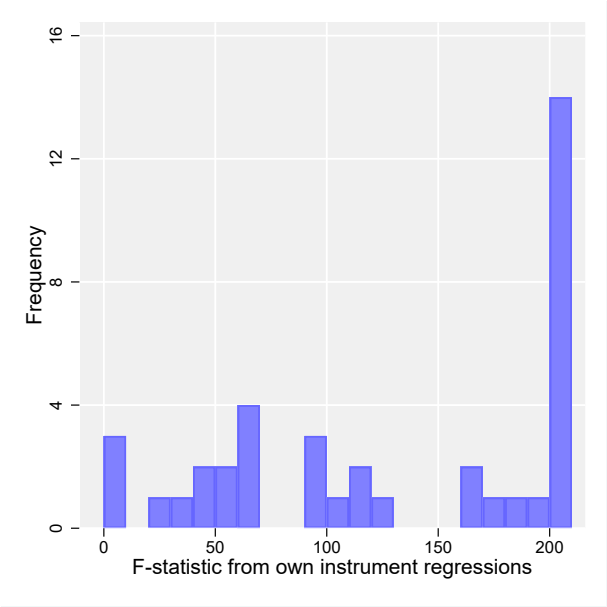
Notes: The figures show the estimated reduced form effect similar to column (2) of Table 3, but where I vary the threshold from -1 to 1 in steps of 0.1 which means that 0 on the y-axis is the "true" threshold.

Table A9: Admission to *Business and economics* vs. *Law* and *Social science* and default

	Law			Social Science		
	Admission	Default		Admission	Default	
	(1) OLS	(2) OLS	(3) 2SLS	(4) OLS	(5) OLS	(6) 2SLS
$\mathbb{1}$(GPA $\geq$ threshold)	-57.1***	1.6		-82.2***	8.2**	
	(4.0)	(3.3)		(3.4)	(3.3)	
$\mathbb{1}$(Admission B&E)			-2.8			-9.9**
			(5.8)			(4.0)
N	782	782	782	711	711	711

Notes: The table is based on applicants who have *Business and economics* as their alternative field of study and who prefer either *Law* or *Social science*. The estimated effects are in %-points. Column (1) and (3) show the first stage effect of being above the threshold on the probability of admission to B*usiness and economics*. Column (2) and (5) show the reduced form effects of being above the thresholds on the probability of default. Column (3) and (6) show the effect of admission to *Business and economics* on the probability of default from two stage least squares estimation where admission is instrumented using whether an applicant is above the thresholds. The estimations use a bandwidth of 2, linear polynomials on each side of the threshold and a rectangular kernel. Robust standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure A8: Histogram of F-statistics from own instrument regressions



Notes: The F-statistics are from estimations of $P(admission_i) = \beta_0 + \beta_1 x_i + \beta_2(x_i \times T_i) + \beta_3 T_i + \varepsilon_i$ for applicants to each combination of preferred and alternative field of study. The figure is censored above 200.

Table A10: Joint estimation of the LATE on default of being above the GPA threshold

	Alternative field						
	B&E	Law	HAA	Educ.	Welf.	Soc.	STEM
Preferred field							
Bus. & Econ.		-10.7	-3.7			-7.4	2.8
		(10.1)	(5.2)			(8.3)	(8.0)
Law	6.5*		-9.9**	-7.0	2.3	7.9	-11.6**
	(3.7)		(3.9)	(11.8)	(8.7)	(6.5)	(5.9)
Hum., A. and A.	6.5	5.1		-3.0	-0.3	-1.6	2.7
	(5.7)	(7.8)		(6.5)	(6.0)	(3.6)	(4.1)
Education			2.5		0.7		
			(7.3)		(10.6)		
Welfare	11.3*	7.0	-7.1	-3.7		-3.3	1.6
	(6.5)	(8.1)	(4.3)	(7.1)		(7.1)	(3.8)
Social Science	10.1***	-0.5	-3.3*	2.9	3.2		6.9
	(3.3)	(4.3)	(1.8)	(5.3)	(3.9)		(4.3)
Medicine	13.4**	9.2	3.7		-2.2	8.3	0.2
	(6.4)	(6.7)	(5.1)		(3.7)	(8.9)	(2.6)
N	1948	764	4185	858	1530	1125	2490
Default rate	8.1	7.9	9.0	6.9	6.4	9.0	6.7

Notes: The table shows the local average treatment effects in %-points on default of being admitted to the preferred field in a joint estimation similar to the estimation in Table 4. Robust standard errors in parentheses. $^{*}\,p < 0.1$, $^{**}\,p < 0.05$, $^{***}\,p < 0.01$.

Table A11: Heterogeneous effects of not being admitted to *Business and economics*

	Probability of default				
Panel A: Gender					
				Women	Men
$\mathbb{1}$(GPA $\geq$ threshold)	5.4***	5.3***	4.0	4.0	6.5**
	(2.0)	(2.0)	(2.4)	(2.4)	(3.1)
Male	3.6***	2.3	0.9		
	(1.2)	(2.0)	(2.7)		
$\mathbb{1}$(GPA $\geq$ threshold) $\times$ Male			2.5		
			(3.9)		
N	1983	1983	1983	914	1069
Panel B: Father education					
				Low	High
$\mathbb{1}$(GPA $\geq$ threshold)	5.4***	5.4***	4.9*	4.9*	5.9**
	(2.0)	(2.0)	(2.9)	(2.9)	(2.8)
High Edu. Father	0.3	-0.3	-0.8		
	(1.2)	(2.0)	(2.8)		
$\mathbb{1}$(GPA $\geq$ thres.) $\times$ High			1.0		
			(4.0)		
N	1916	1916	1916	935	981
Panel C: Period					
				1993-99	2000-06
$\mathbb{1}$(GPA $\geq$ threshold)	5.5***	5.6***	2.4	9.4***	2.4
	(2.0)	(2.0)	(2.7)	(3.1)	(2.7)
Before 2000	0.8	1.9	-1.8		
	(1.2)	(2.1)	(2.9)		
$\mathbb{1}$(GPA $\geq$ thres.) $\times$ Before 2000			7.0*		
			(4.1)		
N	1983	1983	1983	918	1065
Panel D: Economics					
				Economics	Not econ.
$\mathbb{1}$(GPA $\geq$ threshold)	5.5***	5.6***	2.2	11.4***	2.2
	(2.0)	(2.0)	(2.4)	(3.5)	(2.4)
Economics	1.2	0.8	-4.1		
	(1.3)	(2.2)	(2.9)		
$\mathbb{1}$(GPA $\geq$ thres.) $\times$ Economics			9.2**		
			(4.3)		
N	1983	1983	1983	762	1221
Slopes by group		✓	✓		

Notes: The table shows the reduced form effects in %-points of being above the threshold of the preferred field for applicants who have *Business and economics* as their alternative field and another field as their preferred. *Father education* is defined as high if it is at the level *Short cycle higher education* or higher. *Economics* is defined by the DISCED Detailed field. *Slopes by group* indicates whether I allow for the two groups to have different running variable slopes, both above and below the threshold. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A12: Reduced form effect on income of being above the threshold when *Business and economics* is the alternative

	Labor income		Total income		Household inc.	Inc. rank	Top 10%	Bottom 50%
Years after application	1-9	10-12	1-9	10-12	10	10	10	10
$\mathbb{1}$(GPA $\geq$ threshold)	-0.1	12.2	1.4	15.9	3.4	1.8	0.4	-3.2
	(5.6)	(13.3)	(5.2)	(12.7)	(24.1)	(2.1)	(3.4)	(3.0)
N	1986	1968	1986	1968	1959	1959	1959	1959
Average outcome	144.1	349.0	195.8	385.5	633.3	63.1	19.2	30.2
Unit	1000 DKK	1000 DKK	1000 DKK	1000 DKK	1000 DKK	Rank	%-point	%-point

Notes: *Labor income* and *Total income* and *Household inc.* are winsorized at $p1$ and $p99$ and are in 2015-prices averaged over the years indicated in the *Years after application* row. *Inc. rank* is within birth cohort rank based on total income. *Top 10%* and *Bottom 50%* are dummies for being in the top 10 or bottom 50% within birth cohort with respect to total income. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A13: The effects on income of not being admitted to *Business and economics*

	Labor inc. 10-12 yr	Total inc. 10-12 yr	Inc. rank 10 yr	Top 10% 10 yr	Bottom 50% 10 yr
$\mathbb{1}$(GPA $\geq$ threshold)	13.2	15.3	1.7	-0.6	-3.5
	(17.0)	(16.2)	(2.5)	(4.4)	(3.7)
Economics	-27.1	-35.8**	-4.4	-6.7	3.2
	(19.1)	(18.3)	(3.2)	(4.9)	(4.8)
$\mathbb{1}$(GPA $\geq$ thres.) $\times$ Econ.	-2.6	2.0	0.3	3.3	1.1
	(27.1)	(25.7)	(4.3)	(7.0)	(6.2)
N	1965	1965	1957	1957	1957

Notes: The table shows the effect of being above the threshold of the preferred field for applicants who have *Business and economics* as their alternative field and another field as their preferred. *Economics* is an indicator that equals 1 if an applicant's alternative program belongs to the DISCED detailed field *Economics*. Robust standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A14: The effects of being above the threshold on partner and peers

	Has partner		Partners completed field of study			Peers from
	All	B&E	Same as pref.	Same as alt.	B&E	math. track
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}$(GPA $\geq$ threshold)	-3.0**	-3.0	4.2***	-1.7	-2.0	-9.0***
	(1.2)	(3.4)	(1.2)	(1.2)	(3.6)	(1.0)
N	13826	1983	9415	9415	1321	1983
Average outcome	68.1	66.6	16.4	16.8	21.7	44.5

Notes: The table shows the reduced form effects in %-points of being above the threshold of the preferred field. In column (1), (3) and (4), I use all applicants with a binding threshold and different preferred and alternative fields. In column (2), (5) and (6), I only use applicant who have *Business and economics* as their alternative field. Robust standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.