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Conference Paper

Does Exposure To Economics Bring New Majors To The Field? Evidence From A Natural Experiment

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2015: Ökonomische Entwicklung - Theorie und Politik - Session: Education 1, No. A07-V1

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Steinmayr, Andreas; Fricke, Hans; Grogger, Jeff (2015) : Does Exposure To Economics Bring New Majors To The Field? Evidence From A Natural Experiment, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2015: Ökonomische Entwicklung - Theorie und Politik - Session: Education 1, No. A07-V1, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft

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DOES EXPOSURE TO ECONOMICS BRING NEW MAJORS TO THE FIELD? EVIDENCE FROM A NATURAL EXPERIMENT *

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First version: December 1, 2014

This version: January 9, 2015

Abstract

This study investigates how exposure to an academic field influences students' major choices. In particular, we analyze whether students who are inclined to study business change their intentions after being exposed to economics or law. We exploit a natural experiment at a Swiss university. All first year students face the same curriculum before they chose a major. An important part of the curriculum is a first year paper in business, economics, or law. Due to oversubscription of business, the university assigns the field of the paper in a standardized way unrelated to student characteristics. We find that assignment to economics raises the probability of majoring in economics by 2.7 percentage points, which amounts to 18 percent of the share of students who major in economics. The effect is entirely driven by male students.

Key words: major choice, economics, law, higher education, gender differences

JEL: I20, I23

* We thank Heinz Hofstetter and Alexander Schicho for invaluable support with the administrative data of the University of St. Gallen and for explaining the details of the institutional setting.

1 Introduction

A student's choice of college major has a large impact on her post-graduation labor market outcomes.² Indeed, wage differences between some majors are as big as the wage gap between college and high school graduates (Altonji, Blom, and Meghir 2012). Besides economic considerations, recent studies suggest that students choose their field of study according to their tastes and abilities.³ These individual characteristics determine to which extent students enjoy course work and how much time and effort they invest towards the degree.

When students start college, they have imperfect knowledge about their tastes and abilities. They are then exposed to different fields of study through their coursework, which potentially helps them learn about their tastes and abilities in different fields. In fact, one justification for late specialization is a better student-major match quality (Malamud 2010; Malamud 2011).

Yet, we know little about how exposure to different fields affects a student's major decision. A principal reason is that students self-select into courses: students choose courses in fields they think will interest them. As a result, using course selection to analyze the effect of exposure on major choice could overstate the importance of exposure.

This study analyzes how largely exogenous exposure to academic fields affects major choice. Specifically, we study the impact of exposure to economics and law for students who are interested business. To so we exploit a natural experiment at a Swiss university that offers studies in the fields of Business, Economics, Law, Law and Economics, and International Affairs.

At the University of St. Gallen, course work for first-year students is almost identical irrespective of the student's subsequent major choice. However, in addition to coursework, the first-year curriculum involves a substantial first-year paper. Each student must write their paper in one of the three core fields: business, economics, or law. Students may state their preferences over fields, but because business is oversubscribed, students do not necessarily receive their preferred choice. A computer algorithm assigns the field of the first-year paper in a standardized way that is unrelated to student characteristics. This allows us to identify the effect of exposure to a field on subsequent major choice and other student outcomes.

Among students whose preferred field is business, we find that being assigned to paper in economics increases the probability of majoring in economics by 2.7 percentage points. This is equal to 17.6 percent of the share of students who major in economics. Assignment to a law paper

² See (Arcidiacono 2004; Grogger and Eide 1995; Hamermesh and Donald 2008; James et al. 1989; Hastings, Neilson, and Zimmerman 2013)

³ Literature outside economics focuses on the role of aptitudes (i.e., major specific skills and abilities), tastes, and preferences (e.g. Malgwi, Howe, and Burnaby 2005). More recently, also the economics literature has started devoting more attention to these dimensions of the major decision. See (Montmarquette, Cannings, and Mahseredjian 2002; Stinebrickner and Stinebrickner 2014; Zafar 2011; Zafar 2013)

increases the probability of studying law by 1.6 percentage points. Furthermore, we find that being assigned to economics positively influences grades in introductory economic courses. Exposure to economics only affects male students and has no effect on female students.

In a broader sense, our study relates to the policy discussions about major choices. For instance, a policy objective in the United States is to guide students towards STEM majors.⁴ Stinebrickner and Stinebrickner (2014, 467) argue “it is possible that requiring additional science courses during college might lead to more science graduates”. However, based on simulations, they conclude that such a policy would not be very effective as “by and large, students are ultimately choosing science in numbers that are roughly consistent with their ability at the time of college entrance”. Our results suggest that such a policy might be worth exploring. More directly, our results indicate that more exposure of women to economics will probably not foster their participation in the field. The reason why so few women major in economics remains elusive (Goldin 2013).

Only a few recent studies provide evidence that students update their beliefs about different majors during their studies in response to new information (Stinebrickner and Stinebrickner 2014; Zafar 2011; Wiswall and Zafar 2015). Zafar (2011), and Stinebrickner and Stinebrickner (2014) find that learning has a general component: by learning about their abilities or interests with respect to their pursued major, students also receive information about non-pursued majors. However, in these studies students decide on their course work, which in turn determines the fields for which students receive new information. That is, exposure to fields might be partly driven by changes in unobserved tastes directly related to major choice. Wiswall and Zafar (2015) show that tastes play an important role in students’ major choices.

The remainder of the paper is structured as follows. Section 2 introduces the institutional setting at the University of St. Gallen and the assignment mechanism. Section 3 describes the administrative data and provides descriptive statistics. Section 4 explains the empirical framework. Section 5 presents the results. Section 6 concludes.

2 Institutional setting

2.1 General background

The University of St. Gallen is one of twelve public universities in Switzerland. It offers undergraduate degrees in Business, Economics, International Affairs, Law, and Law and Economics. Over three-fifths of students enroll in business (Table 1), which is by far the largest program. 69% of undergrad students are male and average age at enrollment is 20.2 years. 24% are foreign nationals.

⁴ For an overview of the discussion see Bettinger (2010).

Table 1: Major enrollment by field

Major	% enrolled in major
Business	61.7
Economics	15.3
Law	5.4
International Affairs	13.7
Law & Economics	7.7

Note: Distribution of majors of students that completed first year in first attempt. Shares don't add up to 100% as some students are enrolled in two majors.

The first-year curriculum is almost identical for all students. It includes one course in each of three core fields per semester. These core fields are business, economics, and law. In general, students have to pass the first-year curriculum in one year. In order to pass, students have to complete all courses and the first-year paper with sufficiently high grades.⁵ If students do not pass the first year, they can attempt the entire first-year curriculum one more time.

Each semester, the three core courses are taught in large lectures that accommodate all first-year students. Students are also assigned to a single discussion section which persists the entire first year. We briefly discuss the discussion sections because the student's assignment to section affects her assignment to the first-year paper field. All sections meet on Fridays. The only difference is that sections either meet in the morning, in the afternoon, or in the evening. The students attend the same section each week, but the core field to be discussed, and the tutor who leads the discussion, rotate weekly.

Students bid for discussion sections during an orientation week that takes place immediately before the first semester starts.⁶ Equal numbers of students (approx. 35) are assigned to each discussion section according to the highest bids. Important for our purposes is the time the bid is submitted. The timing plays a role for the sequence in which students' preference rankings for the first-year paper are processed. It does not, however, affect the assignment to a discussion section.

Beyond lectures and discussion sections, the other key part of the first-year curriculum is the first-year paper, which addresses a topic in one of the three core fields. The first-year paper is intended to provide students with an introduction to professional writing. Within the three fields, paper subjects are set and the student's work is supervised by a tutor, who also grades the paper. The tutor supervising the paper also directs the discussion of one core field in the student's section.

⁵ Students fail if they accumulate too many negative credit points. They receive negative credit points for each failed examination. Negative credit points are weighted by the grade and course credits.

⁶ During the orientation week, freshmen spend an entire week in small groups under the supervision of advanced student tutors. In this week, students learn about the university facilities, the curriculum, and other administrative procedures such as the bidding system. While students would have the possibility to place their bid already before the orientation week, very few do so due to the complexity of the bidding procedure. In a welcome letter, the university also suggests to wait with the bidding until the orientation week.

Tutors are relatively free to decide on the specific subjects they set within the field. Appendix 2 provides a sample list of subjects from the three fields. Assignment of the field and subject takes place close to the end of the first semester (mid December). Students have to finish the paper by mid second semester (April).

2.2 Assignment of the paper field

Students submit a preference ranking for the three fields by mid first semester. An example of such a ranking could be: 1 business, 2 economics, and 3 law. Preference rankings are processed on a section-by-section basis. Within each section, one-third of students are assigned to business, one-third to economics, and one-third to law. As a result, the factors that determine the field assignment are: (i) the student's own preference ranking; (ii) the sort order within the section; and (iii) the distribution of preference rankings of other students in the section who precede him in the sort order. The sort order in turn depends on the inverse order of the timing of the bids for discussion sections. The composition of preference rankings matters because the capacity constraints are imposed within sections. To see this, consider an example. Suppose you have two sections with 36 students each. In both sections, the preference ranking of student number 13 is 1 business, 2 economics, and 3 law. In Section A, only six of the students sorted between one and twelve rank business first, so student 13 gets business. In Section B, all students between one and twelve rank business first and student 13 is assigned his second preference, economics. Appendix 3 provides a detailed description of the implementation of the assignment algorithm.

The algorithm is supposed to create random assignment within discussion sections conditional on the preference rankings. The assignment procedure is not publicly known, especially not to students but also not to university officials. In fact, we were only able to understand the algorithm after spending a considerable amount of time with a computer programmer, going through the source code of the relevant software. Thus, strategic behavior on the side of students or university officials to deliberately influence the assignment beyond the preference ranking seems unlikely. Balance tests indicate that the mechanism is successful: conditional on preference groups, we find virtually no differences in observable characteristics between students that were assigned to different fields (see Section 3).

On average, 46% of students state business as first preference, which leads to an oversubscription of this field since only one-third of papers are assigned to business. Thus, about one quarter of these students are not assigned to business (Table 2). In contrast, students who state economics or law as their first preference face a high probability of being assigned the respective field. Students who do not provide a preference ranking are most likely assigned a paper in law (75%) or economics (23%). We focus our subsequent analysis mainly on preference group 1, i.e. "Business,

Economics, Law”. This group includes the majority of students who did not receive their first choice and who therefore were allocated algorithmically to their field.⁷

Table 2: Field assignment by preference group

Preference ranking	Assigned field of first-year paper			Total	Share (%)	Share 1 st choice (%)
	Business	Economics	Law			
1 Business, Economics, Law	2,461	533	235	3,229	34.9	76.2
2 Business, Law, Economics	774	0	231	1,005	10.9	77.0
3 Economics, Business, Law	21	1,999	40	2,060	22.3	97.0
4 Economics, Law, Business	0	290	14	304	3.3	95.4
5 Law, Business, Economics	2	0	725	727	7.9	99.7
6 Law, Economics, Business	1	0	366	367	4.0	99.7
7 No preferences stated	42	351	1,164	1,557	16.8	-
Total	3,301	3,173	2,775	9,249	100.00	-

Note: Table contains all first-year students in the years 2002 – 2012. It does not include students who have a special status because of insufficient command of German. See Section 3 for details.

3 Data and descriptive statistics

The data are based on the administrative student records of the University of St. Gallen. These records cover all students of the entering cohorts 2002 - 2012. They cover enrollment, major choice, courses, grades, and degrees. Furthermore, they include socio-demographic characteristics, such as age, gender, nationality, and native language, and whether a student had to take an entrance exam.⁸

The data contain detailed information on the first-year paper. For every student we know preference ranking, assigned field, and an identifier for their discussion section. In addition, the data include the times of the discussion sections as well as the respective tutor identifiers. All the above information can be merged by means of a unique student identifier.

For our analysis, we consider only students in their first attempt of the first year. We exclude students with limited knowledge of the German language, who have a special status. These students only write the paper in their third semester (about 4% of all students).⁹ See Table 11 in Appendix 1 for descriptive statistics of these students.

⁷ While preference group 7 would also provide sufficient variation, a high share of students in this group fails the first year (58%), as they do not seem to be committed to the studies in the first place.

⁸ Admission to studies at USG is unrestricted for all Swiss citizens and foreign nationals who obtained their high school degree (Matura) in Switzerland. Foreign students without a Swiss high school degree have to pass an entry exam and have to pay higher tuition fee. The acceptance rate is about 20%. Therefore this group of students is positively selected.

⁹ Students can also extend the first year because of other hardship, such as family obligations or health problems. However, the vast majority extends because of language insufficiency. The application for the extended assessment

Table 3 shows the relationship between preference rankings and majors chosen after the first year. The categories are non-exclusive and the shares do not add up to one since students with a GPA above 5.0 can choose double majors. Although stated preference rankings do not necessarily map one-to-one into chosen majors, there is a strong association between preference ranking and subsequent major choice. Among students in preference group 1, a majority starts a major in business. The table also reveals that a substantial share of students does not complete the first year successfully, i.e. students either drop out or repeat the first year, which points to the competitive nature of the first year. Further descriptive statistics by preference group are provided in Table 10 in Appendix 1.

Table 3: Major choice by preference groups for first-year paper field

Preference Group (Ranking)	Major					
	Business	Economics	Law	Int. Affairs	Law and Economics	Failed
1 Business, Economics, Law	0.55	0.06	0.01	0.06	0.03	0.32
2 Business, Law, Economics	0.42	0.03	0.03	0.07	0.07	0.40
3 Economics, Business, Law	0.37	0.22	0.01	0.14	0.03	0.28
4 Economics, Law, Business	0.16	0.22	0.04	0.19	0.08	0.34
5 Law, Business, Economics	0.16	0.03	0.21	0.07	0.13	0.41
6 Law, Economics, Business	0.13	0.08	0.16	0.11	0.17	0.38
7 No Preferences Stated	0.25	0.06	0.02	0.07	0.03	0.58
Total	0.39	0.10	0.03	0.09	0.05	0.37

Note: Table contains all regular first-year students in the years 2002 – 2012. Shares correspond to major choices after the first year. ‘Failed’ refers to students who do not complete the first year successfully. Groups are overlapping since students with a GPA of 5.0 or better in the first year are allowed to choose double majors.

Table 4 shows student characteristics by assigned first-year paper field for preference group 1. Overall, 74% of students are male and on average 20.18 years old at enrollment. Foreign students represent approximately 27% of the students and 20% had to take the entry exam. Almost all students speak German as native language. Only 1% of the students are in the law track.¹⁰ All characteristics are almost perfectly balanced between the three fields and differences are insignificant for all variables.

year has to be submitted during the first two weeks of the semester. Moreover, we exclude 13 students due to irregularities in their enrollment data.

¹⁰ Students who intend to study law can enter a specific law track. Instead of math it includes an additional law course in the first year. However, students can still choose all majors after the first year. In case students on the law start a non-law major, they have to take the math course in the second year. Students that change from the general track to a law major have to take the additional law course.

Table 4: Descriptive statistics and test of covariate balance (preference group 1)

Variable	Assigned field for first-year paper:				p-value
	Business	Economics	Law	Total	
Female (0/1)	0.27	0.26	0.24	0.26	0.66
Age (years)	20.17	20.20	20.17	20.18	0.91
Foreign national (0/1)	0.27	0.26	0.25	0.27	0.70
Entry exam (0/1)	0.20	0.18	0.19	0.19	0.82
German mother tongue (1/0)	0.95	0.96	0.97	0.96	0.62
Law track (0/1)	0.01	0.01	0.02	0.01	0.37
Morning session (0/1)	0.45	0.46	0.44	0.45	0.87
Afternoon session (0/1)	0.32	0.35	0.36	0.33	0.37
Evening session (0/1)	0.22	0.19	0.20	0.22	0.20

Note: Table contains all regular first-year students in preference group 1 in the cohorts 2002 – 2012. P-values are calculated based on a permutation of the F-statistic of a regression of the covariates on dummies for the assigned field with business as reference category (1000 replications).

4 Empirical strategy

Given quasi-random assignment to the field of the first-year paper, we estimate the effects of exposure on major choice with a straightforward linear model. Our baseline specification is

$$major_i = \beta_0 + \beta_1 * field_{econ_i} + \beta_2 * field_{law_i} + \varepsilon_i \quad (1),$$

where $major_i$ is an indicator variable whether student i starts a specific major after the first year. For instance, for economics the variable takes one if the student starts an economics major in the third semester and zero otherwise (zero includes students who fail the first year). The categories are non-exclusive because some students major in two fields. $field_{econ_i}$ and $field_{law_i}$ are indicator variables whether a student was assigned to economics or law (business is the omitted group). β_0 captures the probability that a student starts a specific major if she is assigned to business. β_1 and β_2 capture the change in this probability if a student is assigned to economics or law respectively. We also estimate the model conditioning on baseline covariates.¹¹ In Section 5.2 we present a series of robustness checks that address potential concerns regarding sorting into discussion sections and tutor effects.

We devote special attention to the estimation of p-values for our hypothesis tests. Our data consist of the whole population of regular students at the University of St. Gallen in the period under investigation and are thus not a sample from a bigger population. Therefore, uncertainty does not come from the sampling process but from assignment of the treatment, i.e., the paper field. Specifically, we want to estimate the probability of observing a certain coefficient if our null hypotheses – $\beta_1 = 0$ and $\beta_2 = 0$ – are true. For all specifications we report analytical Huber-

¹¹ Equation (1) allows us to estimate the effects of paper assignment fully non-parametric. For all specifications in which we condition on additional covariates, we provide corresponding marginal effects from a probit model in the Appendix (TO BE INCLUDED). Results are virtually identical.

White standard errors that are robust to heteroscedasticity and correlation of the outcome within discussion sections. In addition, we conduct Monte Carlo permutation tests to estimate exact p-values. For specifications without covariates, we randomly mismatch the outcome among students within discussion sections and reestimate Equation (1). We repeat this procedure 1,000 times. We then calculate the share of repetitions where the coefficient is larger than the coefficient estimated under the actual assignment. This share corresponds to the probability that we would observe this outcome if the null was true and thus provides an exact p-value.¹² For specifications with covariates we implement a reduced model permutation (Freedman and Lane 1983) that has been shown to perform well for tests of partial regression coefficients in linear models (Anderson and Legendre 1999) (TO BE IMPLEMENTED).

5 Results

5.1 Main results

Table 5 reports the effects of the first-year paper assignment on major choice. Panel 1 presents results from the baseline specification without covariates. Being assigned to an economics paper increases the probability of majoring in economics by 2.7 percentage points, which is large in relation to the share of economics students among students in the estimation sample (i.e. preference group 1). Similarly, the law paper increases the probability of majoring in law by 1.6 percentage points. The estimates are significantly different from zero irrespective of the inference method. Panel 2 in Table 5 reports the results of the baseline specification conditional on the covariates. The results remain almost unchanged. These findings suggest that the net effect of exogenous exposure to a field on the decision to major in this field is positive.

Now consider the remaining outcomes. Being assigned to economics does not significantly alter the decision to study any other fields. Being assigned to law reduces the probability of failing the first year by 5.6 percentage points. This effect is marginally significant. Again the inclusion of covariates does not change these results. These effects suggest that the assignment into unintended fields reallocates students not only among majors; it might also affect the probability of completing the first year.

To investigate to what extent the overall effects are driven by switching between majors and changes in the probability of passing the first year, we conduct a crude mediation analysis. As a first step, we analyze the effect of the assignment on students' first-year grades in the three core courses. Students take the first semester exams from mid-January to mid-February and the second semester exams from mid-June to mid-July. The first-year paper is assigned in December, approximately one month before the first semester exam period. The field of the assigned paper might affect grades on these exams in through a field-specific effect and a general time-wealth

¹² See Bloom et al. (2013) and Chetty et al. (2011) for two recent applications of permutation tests.

effect. Field-specific effects might be the result of an increase in students' interest in the respective field.

Table 5: Effects of field assignment for the first-year paper on major choice

	Major					
	Business	Economics	Law	Int. Affairs	Law and Economics	Failed
<i>Panel 1: without covariates</i>						
Econ. paper	-0.001 (0.024) [0.97]	0.027** (0.013) [0.04]	0.003 (0.004) [0.49]	0.001 (0.011) [0.91]	0.008 (0.008) [0.41]	-0.023 (0.023) [0.29]
Law paper	0.053 (0.035) [0.10]	0.011 (0.017) [0.50]	0.016* (0.009) [0.07]	-0.019 (0.013) [0.19]	0.001 (0.010) [0.92]	-0.056* (0.033) [0.14]
<i>Panel 2: with covariates</i>						
Econ. paper	-0.002 (0.024)	0.029** (0.013)	0.003 (0.003)	0.002 (0.011)	0.007 (0.008)	-0.022 (0.023)
Law paper	0.053* (0.033)	0.011 (0.017)	0.013* (0.007)	-0.018 (0.013)	-0.000 (0.011)	-0.052 (0.032)
Major share (mean of dependent variable)	0.555	0.059	0.007	0.056	0.026	0.321
N	3229	3229	3229	3229	3229	3229

Note: Values in () are robust standard errors clustered at the group level. Values in [] are p-values computed from 1000 permutation replications. Significance stars (* 0.1 ** 0.05 *** 0.01) correspond to analytical standard errors. Dependent variables are binary indicators that take 1 if student started respective major after first year of failed first year, or 0 otherwise. Covariates include age at enrollment, binary indicator for foreign nationality, binary indicator for entry exam, binary indicator for female, binary indicator for German native speaker, binary indicator for law track, and binary indicators for the timing of discussion sections.

As a result, students invest more time preparing for the exam in a specific field. Furthermore, while writing the paper, students might learn something directly applicable in the exams, and hence have an advantage over the other students. Differences in time spent on writing the paper by assigned field might result in a time-wealth effect. Students might perceive writing the paper in a field as easier than in another field and reallocate time between preparing for the exams and writing the paper. Such a wealth effect might influence grades in all fields but does not necessarily do so by the same magnitude.

Table 6 displays results of regressions of grades on assigned field. For ease of interpretation, we standardized grades to mean zero and standard deviation one. Assignment to an economics paper increases the grade in economics by 0.11 standard deviations in both semesters. Moreover, the first semester grade in business is modestly increased. Students assigned to law have 0.13 standard deviations higher grades than those assigned to business in the first semester and 0.15 standard

deviations higher grades in the second semester. The effect on the law grade is insignificant but sizeable in both semesters.

Table 6: Effects of field assignment for the first-year paper on first-year grades

	First year core grades			
	Missing grade	Business	Economics	Law
<i>Panel 1: first semester grades (fall)</i>				
Econ. paper	-0.001 (0.008) [0.92]	0.091** (0.046) [0.10]	0.115** (0.046) [0.00]	0.067 (0.049) [0.12]
Law paper	-0.018** (0.008) [0.21]	0.133** (0.067) [0.16]	0.048 (0.069) [0.51]	0.090 (0.060) [0.13]
Mean of dependent variable	0.029	0.081	0.059	0.022
N	3229	3160	3158	3167
<i>Panel 1: second semester grades (spring)</i>				
Econ. paper	0.002 (0.021) [0.90]	0.002 (0.050) [0.99]	0.114** (0.050) [0.01]	0.067 (0.051) [0.14]
Law paper	-0.018 (0.026) [0.64]	0.151** (0.070) [0.20]	0.018 (0.076) [0.84]	0.102 (0.068) [0.25]
Mean of dependent variable	0.179	0.071	0.026	0.000
N	3229	2675	2677	2669

Note: Values in () are robust standard errors clustered at the group level. Values in [] are p-values computed from 1000 permutation replications. Significance stars (* 0.1 ** 0.05 *** 0.01) correspond to analytical standard errors. Dependent variables are standardized grades (mean 0, standard deviation 1) in the core courses in the first two semesters. ‘Missing grade’ is a binary indicator that takes 1 if the students missed one of the three core exams in the respective semester.

The results point towards a field specific and time-wealth effects. While the former seems stronger for the economics assignment, the latter seems more evident for the law assignment. We believe that an increase in interest in a field drives the field specific effect since we also see a positive effect on the probability to major in the corresponding field. Moreover, the topics are very general and do not directly relate to the topics of the first-year courses. For instance, while economics paper usually cover policy topics, economics courses cover basic micro and macro theory.

As for the time-wealth effect, a tentative explanation is a reallocation of time students spent on each core course. A substitution effect towards the course corresponding to the first-year paper is unlikely as the other grades are if anything positively influenced. In case of the law paper, the differences might be driven by the particular institutional setting. According to anecdotal evidence, students consider law as easier and less work than business and economics. Law topics are partly

case studies that have a relatively standardized solution process. Furthermore, law students might get more support. In comparison to the other fields, the responsible department for first-year law offers smaller tutorials taught by grad students in addition to the discussion sections. While these are not designed as official support for the first-year paper, tutors may provide informal assistance. Moreover, a student association (ELSA St. Gallen) offers workshops on how to write first-year papers in law. An easier or more supported paper could influence grades in two ways. First, students potentially do not spend as much time on the law paper as on papers in the other fields. Hence, they can devote more time to preparing for the core exams. Second, marginal students who would have dropped out otherwise now see that they have a chance to pass the first year and invest more effort in general.

The positive grade effects are in line with the reduction in the probability of failing the first year, especially with respect to the law paper. We try to disentangle the effect of field assignment on performance and the effect on switching between majors. To that end, we reestimate Equation 1 controlling for a measure of students performance. We estimate mean grades in the three core fields in the fall and the spring semester and use these mean grades as control variables. We impute missing grades with mean values and add two indicator variables for missing grades in the fall and the spring semester respectively.

Table 7: Effects of field assignment for the first-year paper on major choice conditional on student quality

	Major					
	Business	Economics	Law	Int. Affairs	Law and Economics	Failed
<i>Panel 1: conditional on mean grades</i>						
Econ. paper	-0.014 (0.020)	0.022* (0.013)	0.002 (0.004)	0.000 (0.011)	0.007 (0.008)	-0.007 (0.014)
Law paper	0.023 (0.027)	0.004 (0.017)	0.016* (0.009)	-0.022* (0.013)	-0.000 (0.011)	-0.019 (0.020)
N	3229	3229	3229	3229	3229	3229
<i>Panel 2: only students that passed first year</i>						
Econ. paper	-0.028 (0.024) [0.60]	0.037** (0.018) [0.05]	0.004 (0.006) [0.63]	-0.001 (0.016) [0.96]	0.010 (0.012) [0.56]	
Law paper	0.010 (0.029) [0.74]	0.008 (0.023) [0.69]	0.022* (0.013) [0.23]	-0.032* (0.018) [0.10]	-0.001 (0.015) [0.95]	
N	2194	2194	2194	2194	2194	

Note: Values in () are robust standard errors clustered at the group level. Values in [] are p-values computed from 1000 permutation replications. Significance stars (* 0.1 ** 0.05 *** 0.01) correspond to analytical standard errors. Dependent variables are binary indicators that take 1 if student started respective major after first year of failed first year, or 0 otherwise. Specifications in Panel 1 condition on mean standardized grades in the three core fields in the first and second semester. We impute missing values with the mean and add dummies for missing grades in the first and second semester.

Note that, although random treatment assignment ensures identification of the ‘total’ field assignment effect on major choice, it does not ensure identification of the net or ‘direct’ effect (Robins and Greenland 1992). Other covariates affected by the field assignment might simultaneously influence students’ performance and major choice. These omitted variables would bias the estimate of the ‘indirect’ of student performance and consequently the estimate of the net effect. We offer these results as an admittedly crude form of mediation analysis. They should be cautiously interpreted as the effect on major choice net of the effect on student performance.

Panel 1 in Table 7 reports the estimated effects net of student performance. The effects of being assigned to economics or law on the probability to major in the respective field are hardly affected. On the contrary, the effects on the probability to complete the first year successfully are now substantially smaller and statistically insignificant. These results suggest that the assignment affects major choice beyond improving students’ grades and chances to succeed in the first year. Interestingly, now the estimates indicate a shift from business to economics.

Furthermore, results in Panel 1 in Table 7 also help to refute remaining concerns that the effects on major choice are driven by unobserved differences in ability or ambition. In case of such differences, the effects on student performance would most likely be merely a reflection of these differences and not a treatment effect. Hence, controlling for student performance should capture this ability bias. However, such an ability bias seems very unlikely since the effects on major choice remain almost unchanged.

Panel 2 in Table 7 shows the estimated effects in the subsample of students who successfully complete the first year. These effects are larger than the ones in the full sample but confirm the previous findings. These results also indicate that students switch from majoring in business to majoring in economics.

5.2 Heterogeneity

In this section we consider heterogeneous responses to field exposure. A growing number of studies documents large gender differences in major choices (Gemici and Wiswall 2014; Turner and Bowen 1999; Zafar 2013; Wiswall and Zafar 2015). Hence, in order to assess heterogeneous responses according to gender we estimate Equation 1 separately for female and male students.

Table 8 reports the results. For female students we find no significant effect of being assigned an economics paper but an effect of being assigned a law paper. The probability of majoring in law is increased by 4.7 percentage points. However, permutation p-values cannot reject that this effect is significantly different from zero. On the contrary, the results suggest that male students react to economics instead of law. Being assigned to economics increases the probability to start an economics major by 3.2 percentage points. These results suggest that male and female students differ in major specific tastes or abilities. Studies suggest tastes are most important since women

generally do not lack the sufficient skills for more technical majors (Gemici and Wiswall 2014; Zafar 2013).

Table 8: Effects of field assignment for the first-year paper on major choice according to gender

	Major					
	Business	Economics	Law	Int. Affairs	Law and Economics	Failed
<i>Panel 1: female students</i>						
Econ. paper	0.011 (0.048) [0.87]	0.016 (0.022) [0.61]	0.008 (0.010) [0.39]	-0.025 (0.025) [0.25]	-0.000 (0.015) [1.00]	-0.008 (0.046) [0.85]
Law paper	0.065 (0.080) [0.23]	0.005 (0.031) [0.89]	0.047* (0.029) [0.20]	-0.029 (0.031) [0.36]	-0.011 (0.018) [0.63]	-0.061 (0.073) [0.27]
Major share (mean of dependent variable)	0.477	0.052	0.011	0.076	0.028	0.377
N	849	849	849	849	849	849
<i>Panel 2: male students</i>						
Econ. paper	-0.006 (0.027) [0.85]	0.032** (0.015) [0.06]	0.001 (0.004) [0.82]	0.011 (0.013) [0.40]	0.010 (0.010) [0.31]	-0.027 (0.024) [0.28]
Law paper	0.046 (0.038) [0.22]	0.012 (0.018) [0.55]	0.007 (0.008) [0.37]	-0.014 (0.014) [0.43]	0.005 (0.013) [0.67]	-0.052 (0.036) [0.23]
Major share (mean of dependent variable)	0.583	0.061	0.005	0.048	0.025	0.300
N	2380	2380	2380	2380	2380	2380

Note: Values in () are robust standard errors clustered at the group level. Values in [] are p-values computed from 1000 permutation replications. Significance stars (* 0.1 ** 0.05 *** 0.01) correspond to analytical standard errors. Dependent variables are binary indicators that take 1 if student started respective major after first year of failed first year, or 0 otherwise.

5.3 Robustness

This section further assesses the robustness of our main results. As discussed before, conditional on stated preference ranking, assignment depends on two types of variation: first, the order of the assignment list and second, the variation in preference rankings of the other students across discussion sections. If either of the two types of variation is correlated with unobserved factors that simultaneously influence the choice of major, our estimates would be biased. To address this concern, we perform four robustness checks: first, we condition on orientation week groups; second, we condition on tutor fixed effects; third, we condition on discussion section fixed effects; and fourth, we exploit only variation induced by the distribution of preferences of students in the discussion section.

The first robustness check investigates the importance of orientation week groups. The orientation week group could potentially influence both types of variation. First, since most students bid on first year course work during the orientation week, the position the preference ranking could be influenced by group membership. Second, orientation week peers might affect students' selection into certain discussion sections. Hence, if these groups somehow differ in information or preferences, our results could be biased. It is important to point out that students as well as tutors are randomly assigned to orientation week groups.¹³

The second robustness check addresses the concern that students select into certain discussion sections because they have more information about tutors. A particular concern is the 'integration project' tutor who is also determined by the discussion section. The integration project comprises a group presentation and homework assignment that aim at an interdisciplinary solution of a case study. According to students, tutors have reputations about how they grade and how they assign the groups. This reputation seems to be important when students bid on the discussion section. A potential problem would be if better informed students systematically differ in their preferences towards the various majors. For instance, students who choose the discussion section because of an easier integration project tutor might be more determined to study business and thus rank business as their first choice. Since oversubscription to business would be more pronounced in these sections, these students would also be more likely to be assigned to economics or law.

The third robustness check addresses a similar concern as the second one. Discussion section fixed effects control for all unobserved factors that are constant within a discussion session. Hence, this check will also take care of other reasons than the timing of the section, the orientation week group peers, or integration project tutors that lead to a selection into the section and hence create systematic differences in preferences. This robustness check also assesses the concern that certain tutors might shape preferences. For example, if students are particularly drawn towards economics or law because of their tutors, the probability to be assigned to these fields decreases in preference group 1. However, the resulting change in the composition of students in preference group 1 and the change in the probability of being assigned to economics or law makes the direction of a potential bias ambiguous. With this robustness check, we isolate variation induced by the sort order on the assignment list.

In contrast to the third robustness check, the fourth robustness check exploits only variation caused by differences in the distribution of preference rankings between discussion sections. Hence any potential selection concern due to the sort order of the preference rankings is not relevant in this check.

¹³ Orientation week group identifiers are only available for the cohorts 2003, 2004, and 2006-2010. The main results do not change in this subsample.

Table 9: Robustness checks for major choice

	Major					
	Business	Economics	Law	Int. Affairs	Law and Economics	Failed
<i>Panel 1: orientation week group fixed effects</i>						
Econ. paper	0.005 (0.040)	0.039** (0.020)	0.006 (0.007)	0.008 (0.016)	0.007 (0.010)	-0.040 (0.036)
Law paper	0.083* (0.045)	0.023 (0.027)	0.023 (0.015)	-0.039* (0.021)	-0.003 (0.010)	-0.065 (0.042)
N	2040	2040	2040	2040	2040	2040
<i>Panel 2: integration project tutor fixed effects</i>						
Econ. paper	0.002 (0.025)	0.025* (0.013)	0.003 (0.004)	0.001 (0.011)	0.007 (0.008)	-0.022 (0.023)
Law paper	0.044 (0.035)	0.009 (0.018)	0.016* (0.009)	-0.020 (0.014)	0.004 (0.011)	-0.047 (0.034)
N	3229	3229	3229	3229	3229	3229
<i>Panel 3: discussion section fixed effects</i>						
Econ. paper	0.025 (0.028)	0.022 (0.015)	0.003 (0.004)	-0.003 (0.013)	0.003 (0.009)	-0.033 (0.026)
Law paper	0.042 (0.040)	0.004 (0.020)	0.012 (0.010)	-0.024 (0.017)	0.004 (0.013)	-0.034 (0.039)
N	3229	3229	3229	3229	3229	3229
<i>Panel 4: between discussion section variation</i>						
Prob. econ. paper	-0.133** (0.058)	0.059* (0.030)	0.005 (0.009)	0.025 (0.029)	0.031 (0.021)	0.019 (0.056)
Prob. law paper	0.079 (0.084)	0.048 (0.041)	0.036** (0.015)	0.011 (0.040)	-0.007 (0.022)	-0.151* (0.082)
N	3229	3229	3229	3229	3229	3229

Note: Values in () are robust standard errors clustered at the group level (* 0.1 ** 0.05 *** 0.01). Dependent variables are binary indicators that take 1 if student started respective major after first year of failed first year, or 0 otherwise. Orientation week group identifiers are only available for the cohorts 2003, 2004, and 2006-2010.

We calculate the probability of being assigned to a certain field for all students in preference group 1 within a discussion section. The probabilities p_{econ_j} and p_{law_j} for a student in discussion section j to be assigned to economics or law are:

$$p_{econ_j} = \frac{\sum_{i=1}^{n_j} field_{econ_i}}{\sum_{i=1}^{n_j} 1}, \quad p_{law_j} = \frac{\sum_{i=1}^{n_j} field_{law_i}}{\sum_{i=1}^{n_j} 1} \quad (2).$$

These probabilities depend on the share of students in the various preference groups. For example, if many students in the discussion section rank business first (preference group 1 and 2), the probability of being assigned to economics or law increases as business is more heavily

oversubscribed. These probabilities have a similar interpretation as predicted values from the first stage of a two-stage least squares estimation, except that the mechanic assignment mechanism allows us to calculate the probabilities rather than estimating them. We can directly use these probabilities instead of our treatment variables in Equation 1.

Table 9 reports the results of the four robustness checks. Overall the results are extremely robust. The results are slightly smaller than the baseline results conditional on integration project tutor fixed effects and discussion section fixed effects. However, the effects cease to be significant in the specification with discussion-section fixed effects. Conditional on the orientation week fixed effects and using the between group variation, the estimates are somewhat larger. Comparing the effects estimated on different sources of variation is further strong evidence that the results are not driven by selection into the discussion sections, tutor effects, or by systematic differences in the assignment list.

6 Conclusion

This study analyzes the role of exposure to academic fields on students' choice of majors. We investigate whether exposure to economics or law induces students primarily interested in studying business to change their plans. To solve the selection problem that students expose themselves to fields that interest them, we exploit a natural experiment at a Swiss university. At the University of St. Gallen the first year curriculum is almost the same for all students independent of their subsequent major choice. An important part of the curriculum is the first year paper. Students have to write this paper in one of the core fields: business, economics, or law. Due to oversubscription of business, the university assigns the field of the paper in a standardized way that is unrelated with student characteristics.

We find that exposure to economics and law substantially raises the probability of majoring in the respective fields. Students whose preferred field is business study economics 2.7 percentage points more often after writing an economics paper. This is equal to 18 of the share of economics majors. Being assigned to law increases the probability of majoring in law by 1.6 percentage points.

While we cannot conclusively unpack the mechanisms at work, these results seem to suggest that students learn about their match-quality with respect to this major as suggested by Stinebrickner and Stinebrickner (2014) and Zafar (2011). For instance, working on an economics topic might give students a better understanding of what economics is about and which skills are required. An interesting caveat in our setting is that students have to declare their major before they learn about the paper grade. Their assessment of individual match-quality in terms of ability is therefore confined to their own perception.

An interesting question is why students respond to the field of the first year paper if they are already exposed to these fields in the course work. The first year paper possibly conveys

information about applications and potential research areas in these fields, which is not the main focus in the introductory courses.

Furthermore, we find substantial gender differences in the response to the field of the first year paper. While male students only react to economics, female students tend to respond to law. These findings are in line with Gemici and Wiswall (2014) and Zafar (2013). They provide evidence that gender differences in major choice are most likely explained by differences in tastes and not in abilities. Women generally do not lack the sufficient skills for more technical majors (Gemici and Wiswall 2014; Zafar 2013). Recently, economists are increasingly concerned with the low participation rate of women in undergraduate economics. (Goldin 2013, 15) raises the question “how to sell economics to women without turning off men”. Our results suggest that policy is unlikely to achieve this goal by more exposure of women to economics.

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Appendix 1: Further descriptive statistics

Table 10: Descriptive statistics by preference group

Covariates	Preference group							Total
	1	2	3	4	5	6	7	
Female (0/1)	0.26	0.43	0.27	0.32	0.48	0.46	0.28	0.31
Age (years)	20.18	20.28	20.10	20.05	20.41	20.36	20.32	20.22
Foreign national (0/1)	0.27	0.15	0.32	0.24	0.13	0.17	0.23	0.24
Entry exam (0/1)	0.19	0.08	0.26	0.15	0.07	0.08	0.14	0.17
German mother tongue (1/0)	0.96	0.97	0.92	0.92	0.97	0.95	0.93	0.94
Law track (0/1)	0.01	0.06	0.01	0.08	0.42	0.35	0.08	0.08
Morning session (0/1)	0.45	0.44	0.45	0.44	0.44	0.45	0.41	0.44
Afternoon session (0/1)	0.33	0.35	0.33	0.29	0.33	0.29	0.36	0.33
Evening session (0/1)	0.22	0.20	0.21	0.27	0.23	0.26	0.23	0.22

Note: Table contains all regular first-year students in the years 2002-2012. Preference groups 1 to 7 correspond to “Business, Economics, Law”, “Business, Law, Economics”, “Economics, Business, Law”, “Economics, Law, Business”, “Law, Business, Economics”, “Law, Economics, Business”, and “No preferences stated”, respectively.

Table 11: Students that write first year paper in later semester

Covariates	Excluded	Sample
Field business (0/1)	0.20	0.36
Field law (0/1)	0.40	0.30
Field economic (0/1)s	0.40	0.34
Preference group 1 (0/1)	0.24	0.35
Preference group 2 (0/1)	0.08	0.11
Preference group 2 (0/1)	0.22	0.22
Preference group 4 (0/1)	0.08	0.03
Preference group 5 (0/1)	0.14	0.08
Preference group 6 (0/1)	0.07	0.04
Preference group 7 (0/1)	0.17	0.17
Foreign national	0.13	0.24
Entry exam (0/1)	0.05	0.17
German mother tongue (1/0)	0.03	0.94
Age (years)	20.71	20.22
Female (0/1)	0.33	0.31
Law track (0/1)	0.01	0.08
N	361	9249

Note: Table contains students in the years 2002-2012. Excluded refers to all students that are not assigned to first year paper in the first semester. Those students are mostly non-native German speaker. Some students can prolong the first year due to other hardship. Preference groups 1 to 7 correspond to “Business, Economics, Law”, “Business, Law, Economics”, “Economics, Business, Law”, “Economics, Law, Business”, “Law, Business, Economics”, “Law, Economics, Business”, and “No preferences stated”, respectively.

Appendix 2: Sample list of topics of first year papers

Note that first year papers are mostly written in German. The following titles have been translated to English by the authors.

Business

- What chances and challenges does crowd-sourcing provide for the innovation management of SME?
- Facebook, Xing, and Youtube: Social networks – how they work and why they are successful
- Intrinsic motivation and creative work – why money is not sufficient

Economics

- The comeback of gold: why the financial crisis fuels the price of gold
- The economic importance of tourism for the canton of St. Gallen
- Foreigners take our jobs!? Discuss the effect of immigration on the labor market in Switzerland. Who are the winners and losers of immigration?

Law

- Prohibition of alcohol in soccer stadiums: Who (federal or state government) has subject-matter jurisdiction to issue a ban on the consumption of alcohol in stadiums? Is such a ban in the public interest and is it proportionate?
- Does freedom to demonstrate exist in Switzerland?
- Is the ban of political posters on public ground legal?

Appendix 3: Illustration of the assignment mechanism

This appendix explains how the assignment mechanism is implemented exactly. Table 12 shows a discussion section with six students and their preference rankings. In this section with six students, two students are assigned to each field. The algorithm assigns the fields by looping through the list of students up to three times:

1. Go through the list of students from top to bottom and assign everybody their first choice until a field is full. This assigns students 1, 2, 3, 6 their first preferences. Business is full after student 2.
2. Go through the list again and assign those who did not get their first preference their second preference unless the field is full. Student 5 is assigned to economics, which is full now.
3. Go through the list again and assign the remaining students to their third preference. Assign students that did not state a preference ranking to the open slots. Student 4 is assigned to law.

Table 12: Example of discussion section with six students

Order in section	Preference ranking	Assigned field: 1 round	Assigned field: 2 round	Assigned field: 3 round
1	Business, Economics, Law	Business		
2	Business, Law, Economics	Business		
3	Economics, Business, Law	Economics		
4	No preferences stated			Law
5	Business, Economics, Law		Economics	
6	Law, Business, Economics	Law		