



The impact of studying economics, and other disciplines, on the belief that voluntary exchange makes everyone better off

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Using a survey of a large group of first and final-year students of different disciplines, to study their belief in the existence of mutual benefits of voluntary transactions, we observe significant differences between economics and business students on the one hand, and students of other disciplines on the other hand. Those differences increase over time, due to economics students increasingly supporting that belief, and other students increasingly disagreeing with it. Beliefs of students specializing in the same topic also become more homogeneous over time. We therefore report evidence of both a selection and a learning effect of studying different disciplines.

JEL Classifications: A13, A20, B40, D01, D63.

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1. Introduction

The belief that market transactions are mutually beneficial lies at the core of mainstream contemporary economics. Concepts as central as the consumer and producer surplus, the efficiency of competitive markets, or the inefficiency of imperfect competition all rest on that basic presumption. Unsurprisingly, that belief is rather consensual among economists, as Blaug (1996) remarks.

However consensual it may be, that belief still remains value laden. Blaug (1996) indeed recalls that implicit to it is the value judgment that individuals are the best judges of their own welfare. Though that basic contention is shared by a majority of economists, it may appear much less widespread among other people. Such a difference would not be surprising, as lay people have also been found to be less pro-market than professional economists, for instance by Caplan (2002). The difference is not only striking when economists are compared to lay people, but also when they are compared to other academics and scholars, like in Frey (1986). Since such beliefs are bound to reflect on policy preferences, documenting existing differences and tracing their origins matters. This is particularly true as they determine not only how economists think, but also how they vote, and most of all what kind of policy advice they provide.

The existence and origin of such differences directly question the role of education. If the belief in beneficial transactions is so central to economics, one may wonder if students of economics share it, and if other students do too. Indeed, evidence that economics students are different abounds. They have thus been found to perform differently in experiments, for instance by Marwell and Ames (1981) or Carter and Irons (1991), and respond differently to surveys, by Frey (1986) or Rubinstein (2006). Kirschgässner (2005) devoted a whole survey to their differences. A natural question is to ask from where those differences come. They could be the result of studying different topics or being exposed to different ways of thinking. They may alternatively result from a selection process whereby students choose a field that is closer to their prior beliefs. Frey et al. (1993) summarize that question by opposing the selection and the indoctrination of economists. Some studies find evidence of the selection hypothesis only, such as Carter and Irons (1991), Yezer et al. (1996), Frank and Schulze (2000), Gandal and Roccas (2002), Frey and Meier (2003). Others also report evidence of a learning or indoctrination effect, like Frank et al. (1993), Haucap and Just (2003), Gross (2005), or Cipriani et al. (2009).

If several studies have underlined that economists are, or become, different, none has focused on one of the cornerstone principles of the discipline: that voluntary exchange is beneficial. That belief is key because it is implicit to micro, public, and welfare economics, which represent a large chunk of economics studies. It is moreover also explicitly emphasized in many textbooks and courses at various stages of economics curricula. To cite a few popular examples, the idea that market transactions must be mutually beneficial explicitly appears in Nordhaus and Samuelson (1998, chapter 5) or Stiglitz (1993, chapter 3). It appears in Mankiw's (1998, p.8) ten principles of economics as "trade can make everyone better off". Stiglitz (1993, p.55) even remarks that "*economists do not have much patience with [these] objections*" to that principle. At higher levels, although the principle is often taken for granted, it remains central to any welfare analysis. Hillman (2003) still emphasizes it in the introduction of his graduate public finance textbook.

Surprisingly, although that principle is central to economics, it has so far been overlooked by the literature devoted to the differences between economists and non-economists. The focus of the present paper is precisely to check whether economics students support that principle more than other students, and to determine whether it preexists among students choosing different fields or if is a result of learning. Thanks to a survey of students at Université Libre de Bruxelles (ULB), we compare the prevalence across academic disciplines and years of study of the belief that voluntary transactions benefit participants.

We indeed find evidence that economists are different right from the start of their studies, although they resemble business school students. Moreover, we observe some evidence that differences between economics students and other students increase as time passes. We find that this trend is due both to economics students increasingly supporting that belief over the course of their studies and other students increasingly disagreeing with it. We also document that the beliefs of students specializing in the same topic tend to become more homogeneous over time, which has to our knowledge not been studied in the literature. We therefore report evidence of both an initial selection effect and an effect of studying different disciplines.

To reach those conclusions, the next section describes the design of the survey and discusses its interpretation. Section 3 discusses aggregate differences across years and disciplines, while section 4 puts individual answers to an econometric test. Section 5 concludes.

2. The survey

In this section, we present and discuss the key question of the survey, then describe how the survey was administrated.

2.1. The questionnaire

The key question of the survey was designed to capture the agreement of respondents with the idea that voluntary exchange is beneficial. It was framed in a way that was equally accessible to all respondents, regardless of familiarity with the economic jargon. After a series of trials, we finally asked students to answer the following question on a one-to-seven scale, one corresponding to total agreement and seven to total disagreement:¹

Question 1: “In general, do you think that when two individuals exchange a good or a service against money, it is because they both find it advantageous?”

An important feature of this question is that it abstracts from value judgments. Namely, survey respondents are asked to report their degree of agreement with the idea that

¹ The scale featured cells, each one corresponding to an integer value of the answer. Many students however precisely ticked the line separating two cells. We considered that the value of their answers corresponded to the mean of the two adjacent integers. Our results are however robust to dropping those observations.

two individuals engaging in a voluntary transaction find that it makes them better-off from their own point of view. Haferkamp et al. (2009) have shown that preferences for various policies were driven both fairness and efficiency considerations. Using structural equation modeling, they found that economists not only differed in the evaluation of both dimensions, but also that they put more weight than lay people on the efficiency criterion. Our question is framed in a way that abstracts from fairness to focus specifically on the belief in the efficiency of voluntary exchange.

Many interpretations of that question are however possible, and one cannot be sure that this particular question is actually interpreted by survey respondents as measuring their support to the market mechanism. One way to check that they do, is to measure the correlation of answers to that question with answers to a more standard question. The survey therefore also included a variant of Khaneman et al.'s (1986) "snow shovels" question, reframed by Frey et al. (1993) as a "water bottles" question. That question asks respondents how they evaluate various mechanisms to allocate goods for which a temporary shortage is observed. It is indeed interpreted as a measure of peoples' attitudes to the market mechanism, like in Khaneman et al. (1986), Frey et al. (1993), Haucap and Just (2003), or Cipriani et al. (2009).

Here, we followed Frey and Pommerehne (1993) and offered respondents a menu of mechanisms. We however replaced snow shovels by de-icing salt in our questionnaire, because trial surveys had revealed that many respondents suggested to solve the shortage of snow shovels by passing the shovel that had already been used to someone else. Since de-icing salt is not reusable, they rule out that answer. The exact framing of the question was the following:

Question 2: In a community, the local store sells de-icing salt for one euro per bag. It has a stock of 100 bags. On a morning following an unexpected cold-wave that resulted in black ice, the demand for salt is 200 bags. Please tick the way to allocate bags of salt that is the best according to you.

- a. A price increase to two euro per bag;
- b. Selling bags at one euro per bag according to the principle of "first-come, first-served";
- c. Selling bags at one euro per bag following a random procedure (e.g. to all persons whose surname starts with A through P);

- d. The local authorities buy bags for one euro and distribute them according to their own criteria.

We used a multinomial logit regression where the dependent variable was individual respondents' answers to the "de-icing salt" question and the explanatory variable their response to question 1, to check the correlation of their answers. The result of our estimation is displayed in table 1a, and the corresponding marginal effects evaluated at the median in table 1b.

Table 1a: Correlation of answers across questions 1 and 2: multinomial logit

	a	b	c
Question1	-0.135*** (4.316)	-0.0316 (0.991)	0.153* (1.882)
Constant	0.299*** (2.856)	-0.222** (2.000)	-3.363*** (10.46)
Observations	2541	2541	2541
Log-likelihood	26.21	26.21	26.21

Absolute z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 1b: Correlation of answers across questions 1 and 2: Marginal effect

	a	b	c	d
Question 1	-0.0282*** (4.50)	0.0052 (0.91)	0.0042*** (2.74)	0.0189*** (3.07)

Absolute z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 1a and 1b report a significant correlation between the answers to the two questions. That correlation moreover suggests that question 1 captures respondents' attitude to the market mechanism. Table 1b allows being more specific. It shows that at the median, a higher score on question 1's scale results in a lower probability of answering "a" to question 2. In other words, respondents who disagree more with the idea that voluntary exchange can be beneficial are less likely to favor increasing the price of de-icing salt when there is a shortage of it.

Furthermore, a higher score on the scale results in a larger probability of choosing to allocate de-icing salt thanks to a random procedure, response "c", or by asking public servants

to choose the allocation, response “d”, which are both non-market mechanisms. All three correlations are significant at the one-percent level.

2.2. Administration of the survey

The survey took place during the course of the academic year 2007 at Université Libre de Bruxelles (ULB). Three waves of the survey were run. The first one took place among first year students, in the first two weeks of the academic year. The point was to administrate the questionnaire to students who had not been exposed to teaching. The second survey wave was administrated to the same students as the previous one, but at the end of their first academic year. The third wave was administrated to students at the end of their final year at the university. Practically, the first wave was administrated during lectures, while we used exams to carry the other two.

The point of the three waves was to follow the evolution of students’ preferences over time. The first two waves allowed assessing the impact of one year of higher education. The third one aims at assessing the impact of a full curriculum. Due to time constraints, the students who responded to the third wave did not belong to the same cohort as those who responded to the first two, but were enrolled in the same departments. Another limitation of the study is that university regulations forbid identifying questionnaires. We could therefore not match individual questionnaires of the first and second waves.

Finally, we carried the survey on as many departments as possible. We could thus carry the survey on six departments in the first wave (economics, psychology, social sciences, law, sciences, and the business school). We had to drop the sciences department in the second wave, because students were scattered across too many optional courses.² For the same reason, we could only administrate the third wave to psychology, law, and economics students.

The next two sections interpret our results.

3. Aggregate results

In this section, we compare groups of students who have chosen different fields, and students of the same department at different stages of their studies. We first compare average answers, then investigate the dispersions of answers.

² Getting colleagues’ approval to administrate the survey during their lectures or exams was also challenging. One of them simply replied that he “despised economists”.

3.1. Average answers

Table 2 displays the descriptive statistics of the answers of each year of study in each field of specialization.³ The average and median answers, ranging from 2.5 to 3.602, suggest that students tend to “rather agree” with the proposition in general. However, there are differences across groups.

Table 2: Descriptive statistics by year of study and field of specialization

		Beginning of the first year	End of the first year	Final year
Economics	Mean	2.817	2.970	2.615
	Median	2.5	2.5	2.5
	Mode	1	1	3
	Standard deviation	1.560	1.744	1.231
	Coefficient of variation	0.554	0.587	0.471
Law	Mean	3.032	2.948	3.255
	Median	2.5	2.5	3
	Mode	3	2.5/3	3
	Standard deviation	1.510	1.386	1.704
	Coefficient of variation	0.498	0.470	0.524
Psychology	Mean	3.065	3.474	3.602
	Median	3	3	3
	Mode	3	3	3
	Standard deviation	1.486	1.510	1.402
	Coefficient of variation	0.485	0.435	0.389
Social sciences	Mean	3.248	3.257	
	Median	3	3	
	Mode	3	3	
	Standard deviation	1.657	1.526	
	Coefficient of variation	0.510	0.468	
Business	Mean	2.927	2.929	
	Median	2.5	2.5	
	Mode	2	2	
	Standard deviation	1.568	1.485	
	Coefficient of variation	0.536	0.507	
Sciences	Mean	3.244		
	Median	3		
	Mode	3		
	Standard deviation	1.686		
	Coefficient of variation	0.520		

³ Bar charts are displayed in Appendix 1.

Let us first focus on differences across students in their first week at the university, which allows testing the existence of a selection bias. The relevant information can be found in the first column of table 2. That column shows that economics and business students are those who agree the most with the proposition that trade makes everyone better off, with average scores of 2.817 and 2.927 respectively. On the other side of the spectrum, sciences and psychology students are those that support the proposition the least, with scores of respectively 3,244 and 3,065. T-tests confirm that the mean answers of economics and business students are not significantly different.⁴ However, those tests show that the mean answers of economics are smaller than those of other students well beyond the ten-percent level of significance. On the other end of the spectrum, students of social sciences prove to agree statistically less with the statement than any other group of students except sciences students. First-week students are therefore statistically different in their degree of confidence in beneficial exchange.

When one looks at the statistical mode of the distribution of answers across first year students, the results are more striking. The mode of the distribution of the answers of economists is equal to one, the value that corresponds to full agreement, while the mode of other students is usually three, except for business students, whose mode is two. Finally, the median answer of first year economics students is 2.5, which is the same as the median of business and law students, while the median of psychology, social sciences, and sciences students is 3.

Those result confirm the selection bias, already reported in the literature, for instance by Carter and Irons (1991), Yezer et al. (1996), Frank and Schulze (2000), Gandal and Roccas (2002), Frey and Meier (2003).

One may also remark that differences that exist initially tend to persist, as tables 2, A2 and A3, providing in the appendix, show. Whenever the average answers of two groups of students differ significantly at the beginning of the first year, they still do at the end of the year, and at the end of their final year. The only exception is law students, who do not seem different from economists at the end of the first year, while they did at the beginning of the year. The initial difference however reappears in the final year.

While students self-select themselves and are therefore different right from the start, one may wonder whether those differences increase over time, as they are exposed to different topics that may affect their beliefs. To address this question, we compare the mean answer of

⁴ A t-test matrix is provided in table A1, in the appendix.

first-week students with their mean answer at the end of their first year at the university, and the mean answer of students of the same field in the final year at their bachelor. Since the impact of teaching takes time, it should increase with the length of the exposure to a topic. One should expect differences, if any, to be strongest between first week and final year students.

This is what we may check by comparing the columns of table 2.⁵ We, in general, find no significant difference in the mean answers of first year students between the beginning and the end of their year of study. This is true for almost all topics for which we have data for the beginning and the end of the first year, economics, law, business, and social sciences. Psychology stands as the only exception. The survey indeed reveals that psychology students tend to agree less with the proposition that voluntary exchange benefits those who are involved at the end of their first year than at the beginning of their first year. Their mean answer thus rises from 3.065 to 3.474, and the difference is significant at the one-percent level of confidence.⁶

To grasp the long term impact of studying a topic one can compare the mean answer of first-week students with the mean answer of final-year students.⁷ There are three fields for which we could obtain that information: economics, law, and psychology. Here the impact of learning seems to depend on the topic. Final year economics students indeed agree more than their younger fellows, and the difference is significant at the ten-percent level. Namely, the mean answer of final year economics students is statistically smaller than that of their first year fellows. On the other hand, final-year psychology students agree less than their first-week fellows, and the difference in the two means is significant at the one-percent level of significance. Finally, we observe no significant difference between first-week and final-year law students.

To summarize, we observe a clear self-selection effect, and some learning effect. An interesting new finding here, is that learning about the benefit of voluntary exchange is not limited to economics. As expected, being exposed to economics tends to result in more

⁵ The relevant t-test matrix is provided in the appendix in table A4.

⁶ One must recall here that questionnaires could not be paired, for legal reasons, and that our samples are therefore treated as independent. Since differences between students of the same group are sizeable, there is a downward bias on significance. Finding statistically significant differences in those circumstances must therefore be interpreted as strong evidence of a learning effect.

⁷ The median and the mode are less informative here, as they are more inert. However, we observe an increase in the median answer of law students between their first and final years. We also find that the mode of the answers of economics students increases between the beginning and the end of their studies, unlike their mean and their median. It however appears that answers 1 to 2.5 are almost as frequent as answer 3, while answers greater than 3 are much less frequent.

agreement that voluntary transactions benefit all parties to the transaction. Conversely, studying psychology has a significant opposite effect. Moreover, the speed of learning differs across disciplines. It is faster in psychology, where the bulk of the observed effect shows up within one year at the university, than in other disciplines, including economics, where we could observe no such effect at the end of the first year.

3.2. Dispersion of answers

The mean answer to the question may be not the only effect of specializing in a given field and being exposed to its line of reasoning. As students self-select in a discipline according to their prior beliefs or preferences, they may form homogeneous groups. Moreover, they may provide more stereotypical answers on questions that are more directly related to the field they decided to specialize in. The point here is that the variance of answers may be as informative on the existence of a selection bias as their mean.

Let us first focus on the first week of students' first year at the university, which is described in the first column of table 2. That column does not seem to display any specific pattern. Furthermore, the variances of answers of economics students are not even statistically distinguishable from those of other fields.⁸ Students who have chosen economics are therefore neither more heterogeneous nor homogeneous than the others.

One may also expect that, as students learn more about the method and way of thinking of a given discipline, and interact with each other, their opinions converge. In other words, the impact of learning may not only affect the mean of answers but also their variance. We therefore compared the variances of answers across fields at the other stages of the bachelor. A surprising finding is that at the end of the first year, the answers of economics students are more dispersed than those of students of any other field. The difference with other fields is moreover always statistically significant, as table A6 reveals. We have no ready explanation for this finding, but it is reminiscent of Klein and Stern (2006), who report that the variance of answers of members of the American Economic Association to questions pertaining to state intervention tend to be larger than that of any other discipline. However, in the last year of their bachelor, economics students appear to be the most homogeneous, as table A7 shows. Although the difference between economics students and psychology students is not statistically significant, it is significant at the one-percent level with law students. It therefore seems that studying economics for long enough does homogenize students' answers.

⁸ The relevant t-test matrix is provided in the appendix in table A5.

To probe deeper in the impact of each discipline on the heterogeneity of the students that have chosen it, we compared the variances of answers of students of the same field at the beginning and the end of their bachelors. The striking result, revealed by table A8, is that economics stands out as the only discipline whose study resulted in a significant reduction of the variance of students' answers. The variance of answers of economics students at the end of the final year of the bachelor is significantly lower than the variance of the first-week fellows. This result suggests that studying economics reduces the heterogeneity of opinions regarding the impact of voluntary exchange, even though it takes more than a single year to do it.

To summarize this section, we find clear evidence that, although they on average do not reject the idea, students who have selected different fields of specialization exhibit different degrees of agreement with the proposition that voluntary exchange benefits everyone. Typically, first-week economics and business students tend to agree more with the proposition than psychology, law, sciences, or social sciences students. Secondly, studying given disciplines tends to accentuate those differences. Namely, the agreement of economics students tends to increase, whereas the agreement of psychology students tends to decrease. It also seems that the speed of that evolution differs across disciplines. Namely, no significant impact is observable after the first year among economics students, but there is evidence of a change among psychology students. Finally, economics is the only topic that results in a significantly lower heterogeneity among students at the end of their bachelor than at the beginning of it.

Those results were obtained by comparing aggregate means and variances. The next sub-section refines them by studying individual responses.

4. Individual responses

Previous results were obtained by comparing aggregate results on the means and variances of answers. We now complement those aggregate findings by results obtained by studying individual responses. The point here is to take advantage of individual characteristics that respondents were asked to document. Namely, they were asked to specify their gender, their age, and whether the current year was their first year at the university. Controlling for individual characteristics helps interpreting aggregate results, because it may decompose the overall effect.

To study individual answers, we used an ordered logit model, where the answer to question 1 was the dependent variable.⁹ The main explanatory variable was the respondent's specialty. We therefore defined a dummy variable for each section, economics being the reference category. Control variables were a dummy variable for female students, the respondent's age, and a dummy variable equal to one if the current year was not the respondent's first year at the university.

We ran a separate regression for each wave of the survey, allowing to compare students across disciplines at different points in time. To maximize the number of disciplines, we first ran those regressions for the first two waves of the survey: the beginning and the end of the first year. This allowed us to compare economics, law, psychology, social sciences, and business school students. We then added the final year, which obliged us to restrict our sample to students from economics, law, and psychology only.

The result of the first estimation are reported in table 3. In all regressions, Wald Chi squares are significantly different from zero, at least at the ten-percent level of significance, which implies that the hypothesis that all coefficients are jointly zero can always be rejected. The left panel of that table reports the results of the regression pertaining to the beginning of the first year. Its first column confirms the results of previous section. Namely, we observe that the coefficients of the law, psychology, and social sciences dummies are all positive and statistically significant at least at the ten-percent level, while the coefficient of the business school dummy is insignificant. In other words, students enrolled in law, psychology, and social sciences tended to answer more negatively than economics students to the question, while business school students did not differ from economics students in that respect.

⁹ We also estimated ordered probit models, and obtained the same results.

Table 3: Ordered logit estimates, beginning and end of the first year, five disciplines

	Beginning of the first year				End of the first year			
	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)	(3.6)	(3.7)	(3.8)
Law	0.287* (1.821)	0.252 (1.573)	0.180 (1.098)	0.156 (0.921)	0.179 (0.755)	0.141 (0.589)	0.079 (0.314)	0.162 (0.608)
Psychology	0.364** (2.148)	0.291* (1.670)	0.26 (1.433)	0.215 (1.155)	0.806*** (3.146)	0.736*** (2.795)	0.728*** (2.627)	0.845*** (2.917)
Social Sciences	0.5*** (3.022)	0.479*** (2.863)	0.5*** (2.888)	0.481*** (2.724)	0.527** (2.049)	0.475* (1.812)	0.354 (1.295)	0.468* (1.652)
Business	0.117 (0.732)	0.126 (0.79)	0.036 (0.216)	-0.008 (0.049)	0.107 (0.434)	0.122 (0.494)	0.065 (0.25)	0.188 (0.696)
Female		0.148 (1.541)	0.144 (1.456)	0.127 (1.274)		0.144 (0.987)	0.15 (0.971)	0.119 (0.733)
Age			-0.022 (1.559)	-0.016 (1.149)			-0.005 (0.280)	-0.004 (0.251)
Not the first year				-0.141 (1.191)				-0.164 (1.068)
Observations	1549	1544	1472	1445	655	652	609	571
Wald Chi ²	13.19**	15.62***	19.46***	20.43***	17.43***	17.61***	17.05***	18.15**
Pseudo R ²	0.00226	0.00268	0.00344	0.00362	0.0066	0.0067	0.00671	0.00831

The reference category in each year is economics. Absolute robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Ordered logit estimates, from the beginning of the first year to the end of the final year, three disciplines

	Beginning of the first year				End of the first year				Final year			
	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)	(4.6)	(4.7)	(4.8)	(4.9)	(4.10)	(4.11)	(4.12)
Law	0.295* (1.789)	0.213 (1.248)	0.131 (0.752)	0.119 (0.668)	0.173 (0.75)	0.0877 (0.369)	0.131 (0.752)	0.112 (0.421)	0.681** (2.030)	0.616* (1.819)	0.675* (1.876)	0.672* (1.822)
Psychology	0.379** (2.139)	0.23 (1.223)	0.181 (0.93)	0.155 (0.777)	0.778*** (3.091)	0.634** (2.407)	0.181 (0.93)	0.704** (2.423)	1.225*** (4.607)	1.105*** (4.025)	1.259*** (4.240)	1.226*** (4.067)
Female		0.33** (2.343)	0.351** (2.419)	0.348** (2.361)		0.326* (1.724)	0.351** (2.419)	0.406* (1.956)		0.373 (1.534)	0.313 (1.254)	0.355 (1.376)
Age			-0.017 (0.723)	-0.0176 (0.736)			-0.017 (0.723)	0.009 (0.261)			-0.045 (0.941)	-0.054 (1.367)
Not the first year				-0.004 (0.026)				-0.047 (0.230)				-1.249 (0.975)
Observations	782	780	743	733	396	395	743	348	248	248	234	231
Wald Chi ²	4.857*	10.22**	9.808**	9.093**	12.88***	15.33***	9.808**	18.66***	22.21***	23.44***	24.96***	24.87***
Pseudo R ²	0.00169	0.00349	0.00355	0.00335	0.00806	0.00967	0.00355	0.0133	0.0209	0.0235	0.0272	0.0278

The reference category in each year is economics. Absolute robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The following columns provide new insights, as they control for individual characteristics of survey respondents. When gender is controlled for, the female dummy exhibits a positive sign, which may signal that female students are less confident in the market mechanism, but is not significant. The dummy variable for law students however loses its significance. This suggests that the observed difference between law and economics students is mainly due to a composition effect, the former section being more female than economics.¹⁰ The other dummies remain significant at conventional levels, and keep the same sign as in regression (3.1). When age and previous enrolment at the university are controlled for, they are not significant, and the effect of psychology loses its significance, but the coefficient of the social sciences remains positively significant at the one-percent level. This suggests that the selection effect of first-year students into economics versus other social sciences is irreducible to gender, age or having already studied at the university.

The right-hand panel of table 3 studies the differences between students at the end of their first year in higher education, when some learning has taken place. They are broadly similar to the results obtained for the beginning of the year. Namely, we observe that business students do not significantly differ from economics students, and that social sciences students disagree significantly more than economics students with the statement that transactions can make everyone better off. Two new findings however appear. First, law students at the end of the first year are not significantly different from economics students anymore. Second, psychology students are always different from economics students regardless of individual characteristics. They suggest some form of learning during the first year, whereby law students move closer to economics students, while psychology students drift away from them.

Table 4 test the longer run effect of studying a topic. Unfortunately, we could only trace three sections from the first to the last year at the university. Our results therefore focus on economics, law, and psychology students. The method remains the same. We estimate an ordered logit model for each wave of the survey. Now, we restrict the sample to the three sections for which we have data over the three waves, and estimate a model for students' final year at the university.

The left-hand panel of table 4 confirms that law and psychology students differ from economics students when they start their studies, insofar as economics students tend to agree more with the statement that voluntary transactions make everyone better-off. Moreover, those differences still seem to be driven by a gender bias across the three sections, economics

¹⁰ To wit, 63.3 percent of first year law students but only 38.6 percent of economics students are female. The proportion of female students in each section remains stable across waves of the survey.

being the most masculine, and psychology the most feminine.¹¹ The central panel of table 4 is also consistent with previous results. It reports a statistically insignificant coefficient for law students and, in general, a positive coefficient for psychology students. Again, this suggests a convergence between law and economics students and a divergence between psychology and economics students.

A novel result of table 4 appears in the rightmost panel that studies students at the end of their course at the university. The coefficients of the law and psychology dummies is now always positive, at least at the ten-percent level, and regardless of the number of control variables. It therefore confirms the result of previous section that the impact of studying different topics led students who specialized in law and psychology to diverge from economics students, even though law students first converged at the end of their first year.

An interesting complementary result is that the coefficient of the gender dummy now fails to be significant. A possible interpretation is that studying a topic for three to four years or more has an impact on students' opinions that compensates initial gender biases.

To gauge the economic significance of the effect of studying a given discipline tables A9 to A11 report the estimated marginal effects implied by regressions (4.2) (4.6) and (4.10). Those regressions allow following the impact of three disciplines from the first to the final undergraduate year, and control for the impact of gender, which is the only control variable that is statistically significant. Since the reference category is a male student specializing in economics, the reported coefficients measure the impact on the probability of selecting each answer of being female instead of male, or of respectively choosing law or psychology instead of economics.

A first quantitative impression of the impact of studying economics can be obtained by comparing the coefficient of the law and psychology dummies with the coefficient of the gender dummy. To save on space, let us focus on answers 2 and 6 corresponding respectively to a strong agreement and a strong disagreement with the statement that voluntary exchange benefits those involved. The marginal impact of studying law and psychology on the probability to choose answer 2 is negative, while its effect on the probability of choosing answer 6 is positive in all tables. In other words, economics students are more likely to strongly agree, and less likely to strongly disagree, than law and psychology students. At the beginning of the first year, the marginal effects of studying psychology or law instead of economics on the probability of ticking 2 or 6 are statistically insignificant. At the end of the

¹¹ The proportion of female students in psychology caps 80.3 percent in the first year.

first year, both the coefficient of studying psychology and the coefficient of being female are significant. It then appears that the marginal impact of studying psychology on the probability of both answers is twice as large as the coefficient of gender. In the final year of study, the impacts of both law and psychology on the probability to choose answer 2 are significant, whereas the gender dummy is no more significant. Its size is however again smaller than the other two. One may also notice that the coefficient of the psychology dummy is larger than the coefficient on the law dummy, suggesting that economics students are closer to law students than to psychology students.

Another way to gauge the marginal impact of studying one of the three disciplines is to compare their marginal effect to the estimated probability of choosing a given answer. One can infer from regression (4.2) that the estimated probability for a male economics student to choose answer 2 at the end of the first year is 21.4 percent. The marginal impact of studying psychology at the end of the first year is -0.087, and therefore implies that choosing psychology instead of economics would result in a probability to tick answer 2 of 12.7 only. By the same token, a male economics student has an estimated probability to choose answer 6 of 4.3 percent. Given the coefficient of the psychology dummy, a similar student would have a probability to choose that answer of 7.7 percent. In the final year, the psychology dummy is still statistically significant for both answers, while the law dummy is significant for answer 2 but not for answer 6. In that year the implied probability for a male economics student to choose answer 2 is 25.8 percent. Given both coefficients it is 19.6 percent for a male law student and only 14.4 percent for a male psychology student. The impact of studying a given topic is therefore not only statistically significant but also sizeable.

At any rate, those results all point out to a learning effect of higher education on students' perceptions of voluntary exchange. That effect is moreover in line with expectations. It leads economics students to have a more favorable opinion of the impact of voluntary transactions than law and psychology students. Moreover, differences tend to increase over time, which is what the learning hypothesis would suggest.

5. Concluding comments

The belief that market transactions are mutually beneficial is central to economics. This paper documents the extent to which students adhere to that belief, and how specializing in different disciplines affects. The first finding is that students specializing in different disciplines already differ with respect to that belief at the very start of their studies, namely during the first week of their first year at the university. Typically, economics and management science students agree more with the idea that voluntary transactions make those involved better off than students of psychology, law, sciences, or other social sciences. Our survey therefore provides additional evidence of a self-selection bias in higher education.

The survey moreover provides evidence of a learning effect of studying different topics. This learning effect takes two guises. First, the answers of students from different disciplines tend to drift apart over the course of their studies. Thus, final year economics students agree more with the statement that voluntary transactions make those involved better off than their first year fellows. Similarly, final year law students and psychology students tend to disagree more than students who have just started the same studies. The speed of the effect may differ across disciplines. It takes at least three years in economics and law, whereas the effect is observable after only one year in psychology.

Second, we observe that the answers of economics students tend to become more homogeneous over time. That effect is only observed in economics. It points out to some specificity of economics teaching. One may easily argue that since the efficiency of voluntary transactions is so central to economics, students' exposure to that belief is massive, whereas other disciplines only incidentally hinge on that question. It is therefore not surprising, and to some extent reassuring on the impact of teaching economics, that the views of economics students over so central a belief tend to converge.

The question is now to determine how that specificity of future economists relates to their political preferences and behaviors. We have briefly touched upon it by showing that a stronger agreement with the notion that voluntary transactions make everyone better off correlates with a preference for the market mechanism in a variant Khaneman et al.'s (1986) fairness question, while more disagreement results in a higher probability of preferring other mechanisms. Those questions are still abstract, and could be complemented by questions on more topical policy issues. Moreover, if the present paper has unveiled differences in beliefs,

differences in values may also affect behaviors and policy preferences. Distinguishing how they interact is food for future research.

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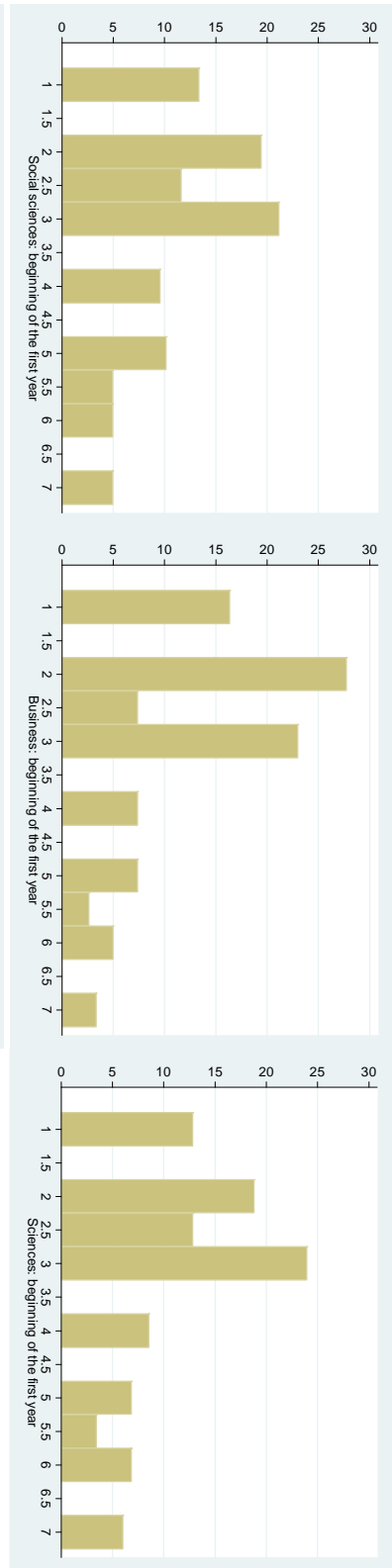
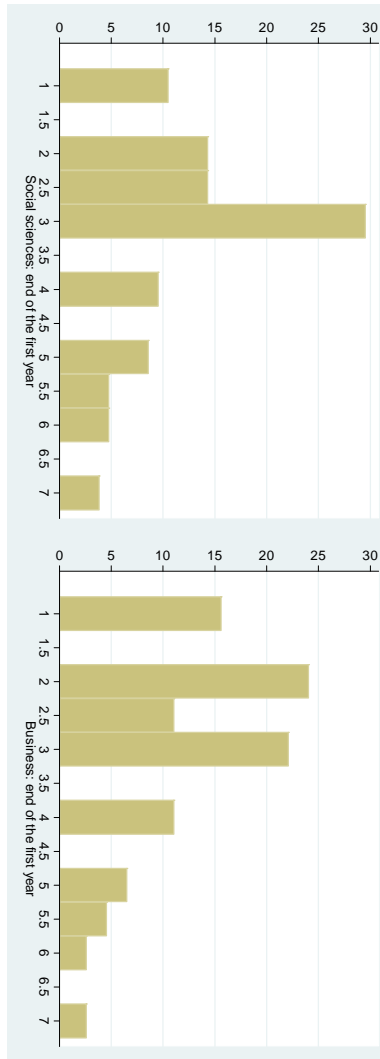
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6. Appendix

Appendix 1: Distribution of answers (percentage points)





Appendix 2: Differences in average answers

Table A1: t-tests for differences in average answers, beginning of the first year

	Economics	Law	Psychology	Social sciences	Business	Sciences
Economics	1	1.5702*	1.6731**	3.0215***	0.8105	2.2269**
Law	-	1	0.2565	1.7950**	-0.9567	1.2041
Psychology	-	-	1	1.3819*	-1.1156	0.9709
Social sciences	-	-	-	1	-2.7368***	-0.0236
Business	-	-	-	-	1	1.8266**
Sciences	-	-	-	-	-	1

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the difference between the mean of the group in column and the mean of the group reported in line. A positive (negative) sign signals that the average answer of the group in column is larger (smaller) than the average answer of the group in line.

Table A2: t-tests for differences in average answers, end of the first year

	Economics	Law	Psychology	Social sciences	Business
Economics	1	-0.1186	2.4591***	1.3566*	-0.2178
Law	-	1	2.9054***	1.6409*	-0.1163
Psychology	-	-	1	-1.0644	-2.9689***
Social sciences	-	-	-	1	-1.7203**
Business	-	-	-	-	1

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the difference between the mean of the group in column and the mean of the group reported in line. A positive (negative) sign signals that the average answer of the group in column is larger (smaller) than the average answer of the group in line.

Table A3: t-tests for differences in average answers, final year

	Economics	Law	Psychology
Economics	1	2.4608***	4.5498***
Law	-	1	1.1356
Psychology	-	-	1

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the difference between the mean of the group in column and the mean of the group reported in line. A positive (negative) sign signals that the average answer of the group in column is larger than the average answer of the group in line.

Table A4: t-tests for differences in average answers across waves of the survey

	End of the first year (vs. beginning of the first year)	Final year (vs. beginning of the first year)
Economics	0.8199	-1.3324*
Law	-0.6012	0.8835
Psychology	2.4024***	2.5043***
Social sciences	0.0537	-
Business	0.0143	-

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the difference between the mean of the group in column and the mean of the group reported in line. A positive (negative) sign signals that the average answer of the group in column is larger than the average answer of the group in line.

Appendix 3: Differences in the variance of answers

Table A5: t-tests for differences in the variance of answers, beginning of the first year

	Economics	Law	Psychology	Social sciences	Business	Sciences
Economics	1	0.9365	0.9078	1.1278	1.0106	1.1685
Law	-	1	0.9693	1.2044**	1.0791	1.2044**
Psychology	-	-	1	1.2425**	1.1133	1.2872*
Social sciences	-	-	-	1	0.8960	1.0360
Business	-	-	-	-	1	1.1562
Sciences	-	-	-	-	-	1

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the ratio of the variance of the group in column divided by the variance of the group in line. Ratios smaller (larger) than one signal that the variance of the group in column is smaller (larger) than the variance of the group in line.

Table A6: t-tests for differences in the variance of answers, end of the first year

	Economics	Law	Psychology	Social sciences	Business
Economics	1	0.6322***	0.7498*	0.7656*	0.7250**
Law	-	1	1.1860	1.2109	1.1467
Psychology	-	-	1	1.0210	0.9669
Social sciences	-	-	-	1	0.9470
Business	-	-	-	-	1

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the ratio of the variance of the group in column divided by the variance of the group in line. Ratios smaller (larger) than one signal that the variance of the group in column is smaller (larger) than the variance of the group in line.

Table A7: t-tests for differences in the variance of answers, final year

	Economics	Law	Psychology
Economics	1	1.9147***	1.2963
Law	-	1	1.4771*
Psychology	-	-	1

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the ratio of the variance of the group in column divided by the variance of the group in line. Ratios smaller (larger) than one signal that the variance of the group in column is smaller (larger) than the variance of the group in line.

Table A8: t-tests for differences in the variance of answers across waves of the survey

	End of the first year (vs. beginning of the first year)	Final year (vs. beginning of the first year)
Economics	1.2494*	0.6232***
Law	0.8435	1.2743
Psychology	1.0320	0.8900
Social sciences	0.8481	-
Business	0.8963	-

*** p<0.01, ** p<0.05, * p<0.1. One-tailed p-values. T-tests are computed for the ratio of the variance of the group in column divided by the variance of the group in line. Ratios smaller (larger) than one signal that the variance of the group in column is smaller (larger) than the variance of the group in line.

Appendix 4: Marginal effects

Table A9: Marginal effects, beginning of the first year, three disciplines

Answer	1	2	3	4	5	6	7
Law	-0.032 (1.22)	-0.019 (1.26)	0.015 (1.23)	0.01 (1.25)	0.01 (1.25)	0.005 (1.22)	0.005 (1.23)
Psychology	-0.034 (1.22)	-0.021 (1.21)	0.017 (0.014)	0.011 (1.21)	0.011 (1.21)	0.006 (1.16)	0.006 (1.23)
Female	-0.048** (2.34)	-0.031** (2.26)	0.023** (2.30)	0.015** (2.23)	0.016** (2.19)	0.008** (2.09)	0.008** (2.02)

Marginal effects computed from estimation (4.2). The reference category is a male economics students. Absolute robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A10: Marginal effects, end of the first year, three disciplines

Answer	1	2	3	4	5	6	7
Law	-0.014 (0.37)	-0.007 (0.37)	0.005 (0.36)	0.005 (0.37)	0.004 (0.37)	0.004 (0.37)	0.001 (0.37)
Psychology	-0.087** (2.34)	-0.056** (2.36)	0.025* (1.76)	0.035** (2.28)	0.031** (2.28)	0.034** (2.15)	0.010** (1.81)
Female	-0.049* (1.76)	-0.028 (1.62)	0.017 (1.60)	0.019* (1.68)	0.015 (1.61)	0.015 (1.53)	0.004 (1.32)

Marginal effects computed from estimation (4.2). The reference category is a male economics students. Absolute robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A11: Marginal effects, final year, three disciplines

Answer	1	2	3	4	5	6	7
Law	-0.083** (2.01)	-0.062* (1.68)	0.054** (2.07)	0.033* (1.67)	0.027 (1.50)	0.007 (1.22)	0.012 (1.20)
Psychology	-0.127*** (3.94)	-0.114*** (3.74)	0.070*** (2.97)	0.060*** (3.17)	0.055*** (2.64)	0.015* (1.75)	0.027** (2.02)
Female	-0.055 (1.46)	-0.036 (1.57)	0.036 (1.48)	0.019 (1.54)	0.015 (1.51)	0.004 (1.17)	0.006 (1.33)

Marginal effects computed from estimation (4.2). The reference category is a male economics students. Absolute robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1