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Overconfidence and career choice

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November 21, 2014

Abstract

People self-assess their relative ability when making career choices. Thus, confidence in own abilities is likely an important factor for selection into various career paths. In a sample of 711 first-year students we examine whether there are systematic differences in confidence levels across fields of study. We find evidence for selection based on our experimental confidence measure: While Political Science students exhibit the highest confidence levels, students of Humanities range at the other end of the scale. This may have important implications for subsequent earnings and/or professions students select themselves in.

Keywords: Overconfidence, selection, field of study, career choice

JEL codes: C91, I21, J24

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1. Introduction

Laboratory experiments show that confidence is an important factor for selection (e.g. Niederle & Vesterlund, 2007 and Camerer & Lovallo, 1999). However, it is less well understood how these results extrapolate to a real world setting such as career choice. In our study we relate participants' field of study to an experimental confidence measure. We find considerable differences: On average, students from Political Science, Law, Economics and Business Administration are overconfident, while students from Humanities tend to be underconfident.

Choosing the field of study is certainly an important – if not the most important – career decision in life. It has a strong influence on a person's professional choices later in life, and earnings depend to a great extent on students' major (Paglin & Rufolo, 1990). To the degree that confidence drives selection into academic disciplines, it affects career paths and earnings. Confidence may also explain gender differences in labor-market outcomes. Several studies find that females are less confident than males (see e.g. Croson & Gneezy, 2009; Bertrand, 2011).

Consequences not only follow for individuals, but also for whole professions. Graduates from certain academic disciplines might be more prone to the many phenomena overconfidence is associated with like excess entry into markets (Camerer & Lovallo, 1999), value-destroying mergers (Malmendier & Tate, 2008, 2005), excessive job market search and unemployment (Dubra, 2004), or frictions and inefficiencies in financial markets (Scheinkman & Xiong, 2003; Barber & Odean, 2001; Daniel et al. 1998). Our data suggests that students, who major in disciplines generally taught at business schools, are more likely to be overconfident. As many of them will later work in influential management positions, potential employers may want to take overconfidence into account.

Related to our study is Niederle and Vesterlund (2007). In laboratory settings they find that selection into competitive environments is partly explained by differences in confidence levels (as well as competitive preferences): men exhibit greater preference for competition as well as greater confidence in their ability than women and are more likely to select themselves into competitive environments. These differences can already be found for 9 to 18 year olds (Sutter & Rützler, 2010). Our study adds to and supports their findings by investigating the relevance of overconfidence for career choices.

Buser, Niederle and Oosterbeek (2014) also focus on the extrapolation of Niederle and Vesterlund (2007). They show that competitive preferences can explain curriculum choices of 15 year old high school students in the Netherlands: Students with stronger preferences for competition are more likely to select into more prestigious curricula. In contrast to our study their main focus is on competitive preferences. They do not find that confidence significantly

influences curriculum choice. Our study focuses at individuals at a later state of their educational career. Compared to the four curricula high school students choose from, the choice of a field of study is presumably more decisive with regard to future occupations and career paths.

2. Experimental Design and Procedures

We conducted our study with first year students. In a laboratory environment we measure individual confidence in a very intuitive and incentive compatible way. Subjects are ranked according to their performance in trivia questions and subsequently guess their rank within a well-defined group of participants.

Performance measure: participants guess the year of five historical events of the 20th century (see the appendix for the trivia questions and instructions). We choose the events such, that students should know them, but uncertainty to the exact year remains. For correctly answering a question subjects earn 2 Swiss Francs; for each year the answer deviates 0.2 Francs are deducted (deviations of 10 or more years yield no payoff). We define the performance of a subject as the sum of absolute deviations from the correct answers across all questions.[1]

Ranking: subjects are asked to rank themselves within their benchmark group. The benchmark group consists generally of twelve individuals who were all present in a particular session.[2] For estimating their correct rank subjects receive five Francs, any other estimate is not rewarded. To rule out hedging subjects are informed about this rank guessing task only after they completed the trivia quiz.

Confidence measure: The difference between a subject's rank estimate and its true rank[3] constitutes our measure of confidence. An accurate estimate of the own relative performance corresponds to zero while positive differences indicate overconfidence.

In total 711 students participated in the experiment, 343 students in 10 sessions at the University of Zurich and 368 students in 18 sessions at the University of St.Gallen. The University of St.Gallen offers five fields of study: Political Science, Law, Economics, Other Social Sciences and Business Administration, while the Zurich sample contains a considerable larger variety of academic disciplines including all fields taught in St.Gallen.

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[1] Trivia questions as performance measure have also been used by Ewers and Zimmermann (2012) and Gächter and Riedl (2005).

[2] We were interested to see if our confidence measure is robust to the group size subjects rank themselves in. We ran some sessions where subjects ranked themselves in groups of 6, to 36 participants. We do not find any significant difference in this variation and therefore included these observations in our main analysis.

[3] For the data analysis we make use of all the information and calculate true ranks based on the entire sample of a given cohort.

The experiment lasted about 12 minutes and was added to unrelated experiments lasting in total 1.5 h. Students earnings in this experiment averaged 4.13 Francs (about $4.6). The experiment was computerized and programmed with z-Tree (Fischbacher, 2007).

3. Results

Our data reproduces the better-than-average effect from psychological research (even though not nearly as pronounced as in Svenson, 1981): the majority of subjects (55 percent) judge themselves to be better than the median of 6.5. On average subjects overplace themselves by 0.44 ranks. A Wilcoxon signed-rank test reveals that confidence is significantly different from zero ($z = 3.412$, $p = 0.0006$).

Figure 1 sets the stage for our main finding. The mean confidence levels by academic discipline reveal a considerable degree of heterogeneity: Political Science, Law, Business Administration and Economic exhibit the highest confidence levels. Students overplace themselves between 1.4 and 0.8 ranks. On the other hand, students of Humanities, Natural Science, or Medicine underestimate their true rank by 0.8, 0.3 and 0.2 ranks respectively. A Kruskal-Wallis test rejects the hypothesis that the confidence levels in different fields of study stem from the same distribution ($\chi^2(8) = 19.5$, $p = 0.013$).

In almost all fields of study we find that females exhibit lower confidence than males. However, it is also apparent that the heterogeneity in academic disciplines is not primarily driven by differences in the gender composition. For each gender there is considerable heterogeneity across academic disciplines. This heterogeneity follows a similar pattern for both genders, with Political Science exhibiting the highest and Humanities the lowest confidence.

Figure 1 also reveals that disciplines that are generally taught in business schools (Political Sciences, Law, Economics and Business Administration) rank higher in confidence than the other fields (Wilcoxon rank sum test, $z = -4.084$, $p < 0.0001$). This is also the case when we test only within the Zurich sample ($z = -1.99$, $p < 0.05$), while there is no difference between the two locations among those disciplines ($z = 0.172$, $p = 0.864$).

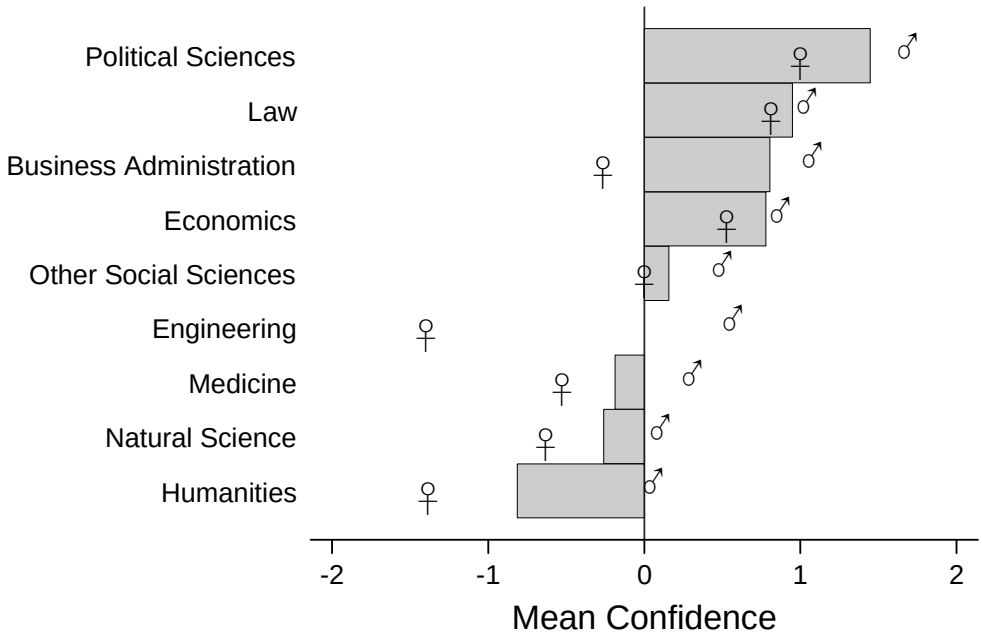

Figure 1: Mean confidence levels by field of study and gender. The symbols ♂ and ♀ indicate mean confidence to male and female subjects, respectively. Political Science, Law, Business Administration and Economic students exhibit the highest confidence levels, whereas Humanities, Natural Science, Medicine and Engineering fall at the other end of the scale. To a large extent ordering of disciplines remains the same when looking at each gender separately. Females generally exhibit lower confidence levels.

Table 1 reports the coefficients for our confidence measure from multinomial logistic regressions where the dependent variable is the field of study, with Political Science as reference category. In Model (1) we explain selection into discipline with confidence, controlling for gender, the question set, and the true performance. In Model (2) we add a control for the subject pool, cohort effects and the size of the reference group. Finally, in Model (3) we add individual controls for age, family background (relative income and number of siblings), and number of subjects known within the session. Wald-tests reject the hypothesis that all coefficients for confidence are simultaneously zero (Model (1): $p = 0.008$, (2): $p = 0.059$, (3): $p = 0.041$). Thus, for example, a person with lower confidence is significantly more likely to study Humanities than Political science. Similarly, testing for differences in the confidence coefficients (in model 1) he is more likely to study Humanities than Law ($p = 0.049$), or Business Administration ($p = 0.062$). In appendix III we report OLS regressions where the dependent variable is overconfidence. It reveals a considerable gender effect. However, it also allows us to show that the duration (measured by the time after enrollment the experiment took place) a student studied a particular discipline is unlikely to affect confidence.

Confidence coefficient for	(1)	(2)	(3)
Law	-0.129	-0.131	-0.147
	(0.097)	(0.111)	(0.111)
Economics	-0.224***	-0.242**	-0.242**
	(0.086)	(0.096)	(0.096)
Business Administration	-0.188***	-0.209***	-0.212***
	(0.066)	(0.074)	(0.075)
Other Social Sciences	-0.250***	-0.265**	-0.290**
	(0.097)	(0.114)	(0.117)
Engineering	-0.267***	-0.282**	-0.316***
	(0.092)	(0.118)	(0.120)
Medicine	-0.378***	-0.408***	-0.441***
	(0.106)	(0.132)	(0.136)
Natural Science	-0.229***	-0.234**	-0.267**
	(0.076)	(0.106)	(0.108)
Humanities	-0.340***	-0.364***	-0.415***
	(0.095)	(0.120)	(0.124)
Controls for			
gender, relative performance, question set	Yes	Yes	Yes
subject pool, cohort, group size	No	Yes	Yes
age, relative income	No	No	Yes
N	711	711	711
Pseudo R^2	0.091	0.278	0.297

Table 1: Multinomial logistic regressions with robust standard errors. Depended variable is the field of study. We show coefficients (standard errors) for Confidence for each academic discipline. The reference discipline is Political Sciences.

4. Conclusion

Laboratory experiments have shown that confidence is an important factor for selection into competitive environments (e.g. Niederle and Vesterlund, 2007, Camerer and Lovallo, 1999). Our results corroborate this finding in making a connection to one of the major decisions in an individual's life: selecting a field of study. We find that a subject's confidence level is a significant predictor for the choice of academic discipline. While our results are supportive of a selection interpretation, we cannot rule out that subjects' varying confidence levels are shaped by the experience they gained in their studies. However, given that our data stems from first year students the exposure to discipline specific material is likely to be too short to influence confidence levels. Evidence that confidence matters when selecting into higher education also comes from Chevalier et al., (2009), who find that high school students with a more positive view of their academic abilities are more likely to expect to continue on to higher education even after controlling for observable measures of ability and characteristics.

Selection into different careers based on confidence has an important impact on an individual's lifetime earnings, as there are sizeable differences among graduates from various disciplines in starting salaries (Paglin and Rufolo, 1990). Indeed, the Swiss graduation survey[4]

[4] www.graduates-stat.admin.ch/

shows that our high confidence disciplines are also generally the fields with higher earnings five years after obtaining a master's degree. For example, averaging median income over the disciplines generally taught at business schools leads to an income of 106'800 Francs compared to 94'100 Francs when averaging over the remaining disciplines.

Independent of their origins, be it selection or education in a particular discipline, heterogeneous confidence levels may subsequently have important consequences. Graduates from disciplines that are generally taught in business schools may be relatively more prone to excess entry into markets, value destroying mergers or other phenomena the literature associates with overconfidence. At the same time those graduates may be more likely to overcome self-control problems and therefore commit to more ambitious projects (see Benabou & Tirole, 2002).

5. References

Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics*, *116*(1), 261-292.

Benabou, R., & Tirole, J. (2002). Self-confidence and personal motivation. *Quarterly Journal of Economics*, *117*(3), 871-915.

Bertrand, M. (2011). New perspectives on gender, in: Ashenfelter, O. and Card, D. (Eds.), Handbook of Labor Economics, Elsevier, Amsterdam, Volume 4B, pp. 1543-1590.

Buser, T., Niederle, M., & Oosterbeek, H. (2014). Gender, competitiveness and career choices. *Quarterly Journal of Economics*, 129(3), 1409–1447.

Camerer, C., & Lovallo, D. (1999). Overconfidence and excess entry: An experimental approach. *American Economic Review*, *89*(1), 306-318.

Chevalier, A., Gibbons, S., Thorpe, A., Snell, M., & Hoskins, S. (2009) Students' academic self-perception. *Economics of Education Review*, 28(6), 716-727

Croson, R. & Gneezy, U. (2009). Gender Differences in Preferences. *Journal of Economic Literature*, 47(2), 1-27.

Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor psychology and security market under-and overreactions. *The Journal of Finance*, *53*(6), 1839–1885.

Dubra, J. (2004). Optimism and overconfidence in search. *Review of Economic Dynamics*, *7*(1), 198-218.

Ewers, M. & Zimmermann, F. (2012). Image and Misreporting. *IZA Discussion Papers 6425*, Institute for the Study of Labor (IZA)

Fischbacher, U. (2007). Z-tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics, 10*(2), 171-178.

Gächter, S. & Riedl, A. (2005). Moral property right in bargaining with infeasible claims. *Management Science,* 51(2), 249-263.

Malmendier, U., & Tate, G. (2008). Who makes acquisitions? CEO overconfidence and the market's reaction. *Journal of Financial Economics*, *89*(1), 20-43.

Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *The Journal of Finance*, *60*(6), 2661-2700.

Niederle, M., & Vesterlund, L. (2007). Do women shy away from competition? Do men compete too much? *Quarterly Journal of Economics*, *122*(3), 1067-1101.

Paglin, M., & Rufolo, A.M. (1990). Heterogenous human capital, occupational choice, and male-female earnings differences. *Journal of Labor Economics, 8,* 123-144.

Scheinkman, J. A., & Xiong, W. (2003). Overconfidence and speculative bubbles. *Journal of Political Economy*, *111*(6), 1183-1220.

Sutter, M., & Rützler, D. (2010). Gender differences in competition emerge early in life. *IZA Discussion Papers No. 5015.*

Svenson, O. (1981). Are we all less risky and more skillful than our fellow drivers? *Acta Psychologica*, *47*, 143-148.

Appendix

I. Instruction

This is the text that was displayed to the students on the computer screen:

In this study we ask you for the years of various events in the 20th century. A question could look like this:
In which year did the reunification of Germany take place?
When you fill in the correct answer (1990), you get 2 Franks. If you fill in a wrong answer, your income depends on the absolute deviation from the correct answer in the following way:
First the absolute difference between your number and the correct date is calculated. For every year your answer deviates from the correct solution (not matter if either upward or downward) you get 0.2 Franks less. If you are 10 or more years from the correct answer, you do not receive any remuneration.
For example, if you put in the year 1992 instead of the correct answer, you will get 1.6 Franks since your answers deviates by two years from the correct one.
If you have any questions, please do not hesitate to direct them to us.

After all subjects participated in the year guessing task instructions for the ranking task were displayed:

In this part of the study you are randomly allocated to a group of 12 persons in total. All persons in your group have answered the same questions as you.
The computer has created a ranking list of all participants in your group. The ranking is based on the sum of all absolute deviations from the correct year. This measure reveals how well the years were estimated altogether.
In doing so the person with the smallest sum of absolute deviations gets the rank 1, the person with the second smallest deviation the rank 2 and so on. The person with the greatest sum of deviation gets the rank 12.
Before you are informed of your rank you will have to fulfill another task. You have to estimate you rank. As before, you get an amount of money if your estimate is correct. If you estimate your rank exactly, you get an additional 5 Franks.
On the next screen you are requested to state the estimate of you rank. If something is not clear to you, please do not hesitate to ask.

After that input screen 'relative rank estimation' was displayed:

What rank do you think you occupy (in your group of 12 participants)?
Rank 1: Smallest sum of deviations between estimated and correct years, that is, years were estimated the best.
Rank 2: Greatest sum of deviations between estimated and correct years, that is, years were estimated the least well.

II. Question sets

Set 1 (n=593)
In which year was the Nobel Prize in physics awarded to Albert Einstein?
In which year was pope Johannes Paul I (the direct predecessor of Johannes Paul II) elected Pope?
In which year did the reactor accident happen in Chernobyl?
In which year was Elvis Presley born?
In which year did the first flight with the supersonic jet Concorde take place?

Set 2 (n=31)
In which year was the Israeli State founded?
In which year was John Lennon murdered?
In which year was John F. Kennedy born?
In which year did the first manned space travel take place?
In which year did the Cuban Missile Crises take place?

Set 3 (n=29)
In which year was the Israeli State founded?
In which year was Boris Yeltsin elected president of the Soviet constituent republic of Russia?
In which year was John F. Kennedy born?
In which year did the Vietnam War end?
In which year did the Cuban Missile Crises take place?

Set 4 (n=16)
In which year did Brazil win the soccer world championship the second time?
In which year did Niki Lauda become the world champion in Formula One for the first time?
In which year did the first Olympic winter games take place?
In which year was the UEFA Champions League introduced?
In which year was Muhammad Ali born?

Set 5 (n=19)
The American scientist Robert Noyce patents the computer chip.
Women get the right to vote in the US.
Alexander Fleming discovers the first antibiotic, Penicillin.
Guglielmo Marconi sends the first radio signal across the Atlantic.
Mahatma Gandhi takes over the leadership of the non-violent reform movement in India.

Set 6 (n=23)
In what year did Japan attack Pearl Harbor?
In what year was the first cloned sheep born?
In what year did Adolf Hitler become Reich Chancellor?
In what year was the first web-site published?
In what year did Lady Di (Diana Spencer) die?

III. Additional Analysis

Table A1 shows OLS regression where the depended variable is our experimental measure of overconfidence. As explanatory variables we included the field of study, gender, the university, and a variable capturing how long students were exposed to their field of study (that is, the number of days from the start of the semester until the experiment). We also add controls for the size of the reference group, the year the study was conducted, the question set, and subjects' actual rank. Controlling for the rank is important as the confidence measure contains floor and ceiling effects: e.g. a person having the highest actual rank cannot overestimate his rank.

This regression allows a more detailed view on (i) gender differences, (ii) whether there are differences between the two subject pools (Zurich and St.Gallen) when we control for the field of study, and (iii) whether the exposure to a particular field has an impact on confidence. This variable was constructed by calculating the duration (in weeks) between the start of the academic year and the date the experiment was conducted.

Table A1, column 1 corroborates the finding of heterogeneity between the fields of studies: Political Science, Law, and Business Administration exhibit higher confidence level than Humanities (our reference category). Differences in confidence also exist between Medicine on the one hand and Political Science, ($p=0.002$), Law ($p=0.029$) and Business Administration ($p=0.064$); Political Science students exhibit higher confidence than all the other disciplines (with the exception of Law).

It also reveals a pronounced gender effect: females are highly significantly less confident than males. On average they guess to have about a 1.5 lower rank. In column 2 we interacted gender with their field of study. In all fields women are less confident. Most pronounced are the differences in Business Administration, Political Science, Other Social Sciences and Natural Sciences. We do not find a difference between the two subject pools when we control for the field of study.

Column 3 and 4 reveal that the exposure to an academic discipline does not seem to be important. The coefficient for the variable in column 3 is not significant. Thus, there is no overall effect. But also when we interact exposure with the field of study we do not find evidence that being exposed to Political Science, Law, Business Administration or Economics increases confidence. The only field of study where we find an effect is Natural Science. In this field we find an increase in confidence.

	(1) confidence	(2) confidence
Political Science	1.566***	2.073***
	(0.517)	(0.719)
Law	1.100**	1.278*
	(0.529)	(0.775)
Economics	0.647	1.189*
	(0.504)	(0.710)
Business Administration	0.794*	1.431**
	(0.462)	(0.658)
Other Social Sciences	0.509	2.055***
	(0.475)	(0.678)
Engineering	0.321	0.553
	(0.442)	(0.642)
Medicine	-0.160	0.0526
	(0.509)	(0.801)
Natural Science	0.589	1.041*
	(0.394)	(0.631)
Female	-1.508***	
	(0.180)	
Female X Political Science		-1.421***
		(0.492)
Female X Law		-0.655
		(0.683)
Female X Economics		-1.548**
		(0.610)
Female X Business Administration		-2.004***
		(0.308)
Female X Other Social Sciences		-3.043***
		(0.569)
Female X Engineering		-0.558
		(0.683)
Female X Medicine		-1.029
		(0.769)
Female X Natural Science		-1.398***
		(0.424)
Female X Humanities		-0.673
		(0.692)
Subject Pool (U. St.Gallen)	-0.163	-0.196
	(0.362)	(0.364)
Const., Controls for cohort, size of ref. group, actual rank, q-set	Yes	Yes
N	711	711
R^2	0.646	0.653

	(3) Confidence	(4) Confidence
Political Science	1.607***	2.206*
	(0.517)	(1.157)
Law	1.124**	1.190
	(0.532)	(1.208)
Economics	0.699	1.304
	(0.511)	(1.116)
Business Administration	0.852*	1.392
	(0.467)	(1.044)
Other Social Sciences	0.532	0.463
	(0.476)	(1.131)
Engineering	0.322	1.669
	(0.443)	(1.349)
Medicine	-0.150	0.102
	(0.508)	(1.870)
Natural Science	0.590	-0.221
	(0.394)	(1.142)
Female	-1.505***	-1.489***
	(0.179)	(0.180)
Exposure	0.00902	
	(0.0123)	
Exposure X Science		-0.00716
		(0.0240)
Exposure X Law		0.0261
		(0.0386)
Exposure X Economics		-0.00951
		(0.0318)
Exposure X Business Administration		-0.00536
		(0.0152)
Exposure X Other Social Sciences		0.0476
		(0.0364)
Exposure X Engineering		-0.0640
		(0.0675)
Exposure X Medicine		0.0181
		(0.115)
Exposure X Natural Science		0.0974**
		(0.0442)
Exposure X Humanities		0.0371
		(0.0692)
Subject Pool (U. St.Gallen)	-0.271	-0.209
	(0.397)	(0.396)
Const., Controls for cohort, size of ref. group, actual rank, q-set	Yes	Yes
N	711	711
R^2	0.646	0.650

Table A1: OLS Regression of gender, field of study, subject pool and the exposure to a particular discipline on overconfidence. Standard errors are in parenthesis. We also included controls for the year the study was conducted, the size of the reference group, the question set and subject's actual rank.