Lifting the Iron Curtain:

The Effect of Schooling on Entrepreneurial Intentions

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ABSTRACT

This paper exploits Germany's recent history of separation and reunification to identify the effects of an unexpected change in the school system on individual entrepreneurial intentions. East German students experienced a sudden change from socialist schooling to entrepreneurial schooling under the free market system. Using a difference-in-differences framework, we compare East German students with 0-10 years of entrepreneurial schooling to a West German control group. We estimate that one additional year of entrepreneurial schooling increases students' entrepreneurial intentions by about 4.9 percent. Controlling for parents' values and norms supports our argument that we measure an effect of schooling on entrepreneurial intentions that is not confounded by the social environment. Robustness tests include matching and student fixed effects confirm the validity of our results.

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1. Introduction

What makes an entrepreneur? This simple question is equally important for politicians who are looking for ways to sustain economic growth as for researchers who are trying to understand the determinants driving entrepreneurship. On the political agenda, entrepreneurship gained increasing importance over the last two decades. The most recent initiative by the European Union, the Entrepreneurship 2020 Action Plan, aims at unleashing Europe's entrepreneurial potential and advancing a culture of entrepreneurship. One of the initiative's main goals is to invest in entrepreneurship education as "one of the highest return investments Europe can make" (EU, 2013, p. 5).[1] From the academic side, we know little about the effectiveness of entrepreneurship education. Only a few papers exploit experimental variation to evaluate entrepreneurship courses in the Netherlands (Oosterbeck et al. 2010; Rosendahl Huber et al., 2012), training measures for individuals at working age in the US (Fairlie 2012), or training sessions for micro-entrepreneurs in Peru (Karlan and Valdivia, 2010). All studies find at best limited effects on individual entrepreneurial intentions or success. These initial findings clearly question the effectiveness of public investments in entrepreneurship education.

In this paper, we take a broader perspective on entrepreneurship education. Instead of looking at the effect of specific entrepreneurship courses that teach entrepreneurial skills, we focus on schooling in general.[2] Specifically, we look at the virtues transmitted in the schooling system that may affect individual entrepreneurial intentions in the future. In a very basic sense, this may involve the perception of entrepreneurship as an occupational choice; but we may also think of stimulating non-cognitive skills such as individual initiative or creativity and discrete thinking as basis for problem solving skills and innovativeness.[3] Knowing about this potential leverage is especially important from a public policy perspective since it provides a viable way to increase individual entrepreneurial intentions and the perception of entrepreneurship as occupational choice. An increasing attractiveness of entrepreneurship as occupational choice may subsequently raise the effectiveness of entrepreneurship courses.

[1] The other goals are to change the public perception of entrepreneurs, to provide better access to entrepreneurial finance, and to supporting underrepresented groups. Kerr and Nanda (2011) provide a comprehensive overview of the literature on entrepreneurial finance and Fairlie and Robb (2007) and Sanders and Nee (1996) are nice examples of research on immigrant entrepreneurship.

[2] To our knowledge, Sobel and King (2008) and Falck and Woessmann (2012) are the only papers that consider the effect of the school system on entrepreneurship. They find a positive effect of competition from private schools on students' entrepreneurial intentions. One explanation for this finding may be that competition leads to more innovative curricula.

[3] Heckman and Rubinstein (2001) make a case for the importance of non-cognitive skills in determining labor market outcomes in general.

To test the hypothesis that the school system affects individual entrepreneurial intentions, we have to overcome the empirical challenge that schooling and other aspects of socialization simultaneously affect individual entrepreneurial intentions. To disentangle the effect of schooling, we exploit the 1990 reunification of the Federal Republic of Germany (FRG) and the German Democratic Republic (GDR) as quasi-natural experiment. We compare cohorts of German university students in reunified Germany (GER) who grew up in the East (former GDR) to those who were educated in the West (former FRG). With the reunification, the GDR school system that taught socialist values and discouraged entrepreneurial thinking changed overnight. In this process, one third of the East German teachers were "early retired" and all East German states implemented new school systems that were oriented towards the West German curricula. For example, the federal state Thuringia widely adopted the Bavarian school system where economic education is mandatory in secondary education. While the school environment changed suddenly with the fall of the Berlin wall, the social environment and the parental environment did not change overnight (cf. Alesina and Fuchs-Schuendeln, 2007; Bauernschuster et al. 2012). Even a decade after the reunification, we still find strong indications of socialist norms and values among East Germans. This setup provides us with a change in the school system towards a more entrepreneurship-friendly education, while holding socialization to a great extent constant.

Our analysis exploits a large survey regularly conducted among university students in Germany that includes over 32,000 observations from 4 survey waves conducted between the years 1992 and 2001. This selection ensures that the East German students observed in the survey underwent (at least some years of) schooling in the socialist GDR. The survey covers questions about the study progress, work and learning habits, leisure time activities, attitudes, and job preferences including entrepreneurship as occupational choice. Additional questions provide information about students' family background and schooling. Information about demographic variables, such as age or gender, is also available. Altogether, this survey draws a comprehensive picture of the conditions and perspectives of students at German universities. By restricting our analysis to university students, we explicitly turn our focus to a group of individuals who are particularly qualified to start technology-oriented firms and thus meet the EU's idea of entrepreneurship as "powerful driver of economic growth and job creation" (EU, 2013, p.3).

We evaluate the effect of a change in the schooling system in a difference-in-differences framework where we compare cohorts of students around the time of the German reunification in East and West Germany. The difference-in-differences estimator measures the

effect of one additional year of schooling in reunified Germany on the entrepreneurial intentions of East German students. West German students are the control group. Under the assumption that the social environment in East Germany did not change overnight, this allows us to evaluate the positive effect of changing to an entrepreneurial school curriculum conditional on a large number of individual controls. We find that every additional year under an entrepreneurial school system increases East German students' entrepreneurial intentions by abound 4.9 percent.

We provide a number of robustness tests to support the validity of our results. To assess the assumption of a persistent social environment in East Germany, we include controls for changes in parents' values and find no confounding influences. We use a propensity score matching to reduce East and West German students' observable differences that may bias our estimates. Again, we do not find any indication of confounding effects. Finally, we model the occupational choice to be an entrepreneur or a dependent employee in (in a private company) using two separate questions that evaluate the attractiveness of each choice. Since we observe two observations per student we can include individual fixed effects that absorb any unobserved individual characteristics that are not covered by our rich set of individual controls. All robustness tests point to the same direction as our baseline results: The change to a more entrepreneurial school curriculum increases individual entrepreneurial intentions significantly.

The remainder of the paper is organized as follows. Section 2 describes differences in schooling and education between East and West Germany. Section 3 introduces our empirical strategy, and Section 4 our data set. In Section 5, we present our analyses of the impact of schooling and socialization on university students' entrepreneurial intentions. Section 6 concludes by discussing the implications of our work and offers some suggestions for further research.

2. Short History of Schooling in the GDR and the FRG

2.1. The Education System

After World War II, the western Federal Republic of Germany (FRG) mostly restored the traditional tripartite German schooling system. After four years of primary school, students attend either *Gymnasium* for nine years, *Realschule* for six years, or *Hauptschule* for five years. Access to university was received by passing the *Abitur* after nine years of *Gymnasium*. Educational policy is handled on the state level (*Bundesland*).

Education policies in the eastern German Democratic Republic (GDR) were centrally determined by the ministry for national education. Education was organized in a unitary school (*Polytechnische Oberschule*, POS) that combines primary and secondary school. All students attended POS for ten years (Waterkamp, 1987). A small fraction of students were allowed to continue school for two more years at an extended secondary school (*Erweiterte polytechnische Oberschule, EOS),* which prepared them for academic studies.[4] Access to EOS was not merely based on school achievement but also depended on loyalty to the ruling socialist party (*Sozialistische Einheitspartei Deutschlands, SED*). Entry criteria involved participation in the socialist party's youth organisation (*Freie Deutsche Jugend, FDJ*), a declaration of commitment to serve in the army, and the parents' socialist merits. Overall, only 8-12% of the students in a given year could enter EOS. This strict selection process was meant to insure future graduates' loyalty to the state (Stenke 2004).

2.2. School Curricula

The main difference between the FRG's and GDR's school curricula was the GDR's goal to teach communist convictions and conduct to form socialist personalities. This is explicitly stated in the socialist party's 1989 manifesto (p. 67f.). At large, this means that students were not engaged in the process of critical thinking. Instead, students had to internalize socialist dogmas while any question or discussion on the ideology was taboo (cf. Block and Fuchs, 1993). Beyond that, students had to attend specific classes that taught socialist ideologies. The subject *Staatsbürgerkunde* (social studies) taught from grade seven on lessons in Marxist and Leninist ideology. From 1978 on, this subject was supplemented by an early military training (*Wehrkundeunterricht*) for male students. In contrast, social studies in the FRG (*Sozialkunde*) focused on mechanisms of the democratic process and civil rights. Moreover, the subject economic studies introduced GDR students to socialist production (Judt 1997, pp. 228/29), whereas the FRG curriculum taught mechanisms of a free market economy. Finally, the language education reflected the different political blocs with GDR students learning Russian as compulsory foreign language and FRG students learning English.

Taken together, the GDR school system was designed to educate "socialist" individuals that had a critical attitude towards free market economies and particularly the role of entrepreneurs. When students are taught that entrepreneurs are expropriators time and again, we expect this to sustainably affect their own desire to become an entrepreneur in the future.

[4] An indirect way to obtain a university-entrance degree was to combine a 3-year apprenticeship with additional schooling after ten years of POS.

2.3. Transition to West German Schooling

With reunification, the traditional structures of the West German education system were adopted in East Germany (Wilde 2002, p. 40). First and foremost, this change involved the immediate elimination of any socialist element form the curriculum. Moreover, all ideology-based restrictions on gaining a university-entrance degree were dropped. The new educational goal was now to develop independent personalities, critical thinking, creativeness and initiative, and overall, democratic values in line with the free market economy. Thus with the change in the schooling system, East German students were suddenly exposed to virtues that are also conducive to entrepreneurship. We will term the "treatment" with the more entrepreneurial school system in reunified Germany *entrepreneurial schooling* (*ES*) in the following chapters.

The major challenge of this transformation process was to replace former "socialist" teachers. As the pupil-teacher ratio had been significantly lower in the GDR – 11.8 compared to 15.7 in the FRG in 1985 (Stenke 2004, p. 16) –, there was some room for dismissals. Overall, about one third of the GDR teachers lost their jobs, predominantly those who were politically involved. As a result, students in East Germany were now taught more entrepreneurial curricula by teachers who were not loyal to the socialist system. At the same time, the overall population in East Germany is still leaning towards social values (cf. Bauernschuster et al., 2012), which supports our argument that the social environment did not change overnight.

3. Empirical Strategy

Our empirical strategy to identify the effect of entrepreneurial schooling on individual entrepreneurial intentions is based on difference-in-difference estimations for cohorts in East and West Germany around the time of the German reunification. We estimate the following equation:

$$I_{it} = \beta_1 East + \beta_2 Schooling + \beta_3 (East \times Schooling) + X'\beta_4 + \eta_t + \varepsilon_{it}, \qquad (1)$$

where the dependent variable I_{it} is a binary variable that equals unity if student *i* observed in survey wave *t* reports that he or she certainly wants to be permanently self-employed in the future, and zero otherwise. University students' entrepreneurial intentions is our "as-close-as-possible" measure for entrepreneurial endowments. *East* is a dummy variable that equals unity if the university student finished school in East Germany, and zero if schooling was completed in West Germany. It accounts for time-persistent influences of being raised in the

GDR on students' entrepreneurial intentions. Under the assumption that the social environment in East Germany did not change overnight, β_1 captures persistent effects of the social environment on students' entrepreneurial intentions. *Schooling* indicates schooling in reunified Germany. After 1990, students in East Germany and West Germany were equally "treated" with entrepreneurial schooling; before 1990, students were educated in two distinct systems and only West German students enjoyed the more entrepreneurial school system while East German students were taught socialist values. As we know the year of each student's high school graduation, *Schooling* is calculated either as binary variable

$$Schooling = \begin{cases} 1 \; if \; GraduationYear > 1990 \\ 0 \; if \; GraduationYear \leq 1990 \end{cases}$$

or as continuous variable $SchoolYears = \max\{Graduation\ year - 1990; 0\}$ that ranges from 0 years for students who finished school in 1990 or before to 10 years for the youngest students in our sample who started primary school 3 years before the reunification and were almost fully educated under the more entrepreneurial school system in reunified Germany.[5] The coefficient of interest is β_3, the difference-in-differences estimator that captures the effect of the introduction (or one additional year) of entrepreneurial schooling on East German students' entrepreneurial intentions relative to the West German comparison group. Identification comes from the reunification shock that changed the East German school system overnight into the more entrepreneurial West German school system while the social environment remained unchanged.

The matrix X includes a rich set of control variables relating to the students' demographics, study progress, job expectations, individual characteristics, social network, and family background. Most importantly, X includes university and major fixed effects and an age control. Note that the choice of a certain university and a major can also be considered part of the treatment effect as entrepreneurial schooling may also affect the entrepreneurial intentions through the university and subject choice. University and major fixed effects may thus decrease the size of our coefficient. The age control is equivalent to cohort fixed effects that capture overall trends in the attractiveness of entrepreneurship that may e.g. result from the economic boom following the German reunification. A detailed list of all control variables is provided in the Appendix. Finally, we include survey wave fixed effects, η_t; ε_{it} is an error

[5] We set *ES = 3* for those students who had dropped out of school at the time of reunification but obtained a university entrance degree after reunification. Dropping those late graduates that may be systematically different does not affect our results.

term clustered at the university level (cf. Moulton 1986). As our outcome variable is binary, we use probit models for our estimations.[6]

To assess whether small changes in the social environment are erroneously captured by our schooling variable, we add controls for average values of (i) a broadly defined parent generation aged 30 or older at the time of graduation and (ii) a narrowly defined parental generation aged 30-50 at the time of graduation. We generate this value measure from the German social survey ALLBUS survey and identify the parents' generation in the survey waves 1991, 1994, 1998 and 2000, that nicely match with the years where the student survey was collected. We use the answers to three survey questions that Bauernschuster et al. (2012) show to be significantly affected by socialism in the GDR, and that are correlated with the propensity to become an entrepreneur. Based on the answers to those questions, we construct a variable indicating "socialist values" that ranges between -1 (liberal values) to +1 (socialist values). We calculate mean socialist values by occupational group for both parents and separately for fathers and mothers. We merge every observation from the student survey with the average values of his/her fathers' and mothers' occupational group for parents at the age 30 plus (and 30-50 respectively) in the year the student graduated from school. As we observe values in multiple ALLBUS waves, we thus account for potential changes in the social environment.

4. Data

Student Survey

To assess students' entrepreneurial intentions, we use data from a large student survey regularly conducted at up to 27 German universities by the University of Konstanz (*Studiensituation und studentische Orientierung*). We use the four consecutive survey waves conducted within the decade after German reunification, i.e. in winter terms 1992/93, 1994/95, 1997/98, and 2000/01. Since we are interested in comparing the effect of schooling under the socialist system in the GDR to schooling in the FRG and reunified Germany, we discard observations of students that finished school abroad. Moreover, we discard observations of students that are older than 40 years of age, since they are a likely to be a

[6] Note that Ai and Norton's (2003) point about the use of interaction terms in non-linear models does not apply in the context of our difference-in-differences model (Puhani, 2012). This is because we are interested in the treatment effect, which is given by the on the coefficient of the interaction term and not the cross difference identified by Ai and Norton (2003).

selective group. This leaves us with a sample of 32,460 students at 23 full universities and universities of applied sciences in Germany. The spatial distribution of the observed universities along with the number of observations is shown in Figure 1.

[Figure 1 here]

The survey provides a rich portfolio of background information on the students' demographics, parental background, social activities, study progress, personal characteristics and job perspectives. Most interestingly, the survey asks for the students' occupational plans. We use the survey question "Do you want to be permanently self-employed in the future" to construct a dummy variable indicating entrepreneurial intentions that equals unity if a student answers "Yes, certainly", and zero for the answers "Yes, perhaps", Rather not", "Certainly not", and "I do not know". Furthermore, we use information on where the student finished school to differentiate between East German and West German students. Information on the year of graduation allows us to account for the years of entrepreneurial schooling in reunified Germany. Information on the parents' occupation is used to merge parents' values from the ALLBUS. Table 1 provides some descriptive statistics of the data.

[Table 1 here]

Columns 1 and 2 compare the sample of West and East German students. East German students are somewhat younger, more often female, more junior in their studies, and unsurprisingly, their parents are less likely to be entrepreneurs. As these differences may bias our estimations, we present an alternative specification in Section 5.3.2 where we match East and West German students on all control variables to make the two groups more comparable.

In the subsequent regressions, we always control for survey wave, university, and the students' major field of study. We further add the students' gender, log of age (and its square), degree aspired, marital status, a dummy indicating whether the student has children, father's and mother's educational level, as well as a dummy indicating whether any of the parents is entrepreneur, as baseline controls. Furthermore, we control for study related issues like study progress, motives for starting to study and choosing the major subject, GPA in the high school diploma, whether the student likes being a student, etc. Additionally, we control for job related issues by including information on what the student expects from his/her future job, what s/he considers to be important in his/her future job (e.g. job security), and whether s/he expects problems on the job market, inter alia. We use a comprehensive set of questions concerning personal beliefs, attitudes, and problems to control for individual characteristics. Eventually, we control for the students' social network using information on the students'

contacts to peers, family, friends, individuals working in the occupation aspired, and his/her participation in clubs and organizations.

German Social Survey (ALLBUS)

The German General Social Survey (ALLBUS) is a biennial, representative surveys of the German population collected in personal interviews. We use 4 waves conducted after the reunification in 1991, 1994, 1998, and 2000. Those waves contain the respondents' level of agreement to the statements "Income differences give incentives to work hard.", "Rank differences are performance based and therefore acceptable", and "Differences in social status are just—by and large." Bauernschuster et al. (2012) show that the answers to these questions reflect norms shaped under socialism that are unfavorable of entrepreneurship. Answers are given on a scale from -2 to +2. For each individual with children, we calculate a variable indicating "socialist attitudes" by summing up his or her answer scores and dividing it by the highest number of socialist "scores" possible, given the number of questions answered. Accordingly, our norm variable ranges from -1 indicating a liberal attitude to +1 indicating a socialist attitude. We furthermore use information on the respondents' occupation, gender, and age, to merge mothers and fathers from the ALLBUS survey to individual observations from the student survey according to the students' parents' occupation. We merge each ALLBUS wave to the students' survey wave that had been conducted closest to the time.

5. Results

5.1. Baseline Estimations: Change in the Schooling System

In a first step, we regress the binary outcome variable indicating a students' entrepreneurial intentions on the *East* dummy indicating that the student was raised in East Germany, a dummy variable indicating whether the student experienced any *Schooling* in reunified Germany (upper Panel A) or the years of schooling (*SchoolYears*) in reunified Germany (lower Panel B), and an interaction term $East \times Schooling$ ($East \times School\ Years$) whose coefficient gives us the treatment effect of any entrepreneurial schooling (one more year of entrepreneurial schooling) for East German students relative to the West German control group. Results are reported in Table 2.

[Table 2 here]

First, we observe that students who finished school in East Germany show a significantly lower probability to have entrepreneurial intentions than their counterparts who finished

school in West Germany. The effect decreases when controlling for demographics and family background (Column 2), study related issues (Column 3), personal characteristics (Column 5), the student's social network (Column 6), and particularly job related issues (Column 4), but remains significantly negative throughout all specifications. These results indicate that being raised in East Germany reduces the probability of having entrepreneurial intentions by 5.2-6.3 percentage points on average. Given that 22.11 percent of all students report to have entrepreneurial intentions, 25 percent lower entrepreneurial intentions are clearly an economically relevant effect. However, experiencing some entrepreneurial schooling in reunified Germany makes almost completely up for the negative East German main effect (Panel A). If we look at the effect of one additional year of entrepreneurial schooling instead of any entrepreneurial schooling (Panel B) we find that every additional year of entrepreneurial schooling in reunified Germany increases an East German student's probability of having entrepreneurial intentions by 1 percentage point or 4.9 percent. This is a significant and relevant effect which supports our idea that a schooling system that develops non-cognitive skills like creativity, initiative, or critical thinking can raise individual entrepreneurial intentions.

5.2. Simultaneous Changes in Schooling and the Social Environment

We observe students with less entrepreneurial schooling in earlier waves (i.e. closer to 1990) and students with more entrepreneurial schooling in later waves (i.e. closer to 2000). To assess whether changes in the social environment between these years are erroneously captured by our entrepreneurial schooling variable that follows the same time trend, we add controls for changes in the values of a broad definition of the parental generation (individuals with children aged 30 or older in the year a student graduated from school) and, in a second specification, of a narrow definition of the parental generation (ages 30-50 years when the student graduated from school). Time variation in this variable comes from the fact that we observe these age groups' value statements in different waves between the years 1991-2000. This allows us to capture value changes over time. Additionally, we allow these values to vary across occupational groups and mothers and fathers. Table 3 reports our findings.

[Table 3 here]

It is reassuring to see that the entrepreneurial schooling coefficient is hardly affected by the inclusion of control variables for the parents' norms, suggesting that unobserved changes in values are not a major source of bias in our estimations. This holds for the specifications

where we consider both parents jointly and those specifications where we distinguish between mother and father and where we consider two different age groups. Additionally reassuring is the fact that the coefficients on the value variables are mostly insignificant and of minor size. This supports our assumption that the social environment remained mostly unchanged in the years after the reunification.

5.3. Robustness

5.3.1 Schooling effect by degree levels

In an additional specification, we repeat the estimations from above but aggregate the years of schooling variable in bins. Students who were in grade 10 or higher at the time of the reunification are assigned to the category "senior." They got only 1-3 years of entrepreneurial education. Students who were in grade 5-9 at the time of reunification are assigned to the category "secondary." Finally, students who were in grade 1-4 at the time of reunification are assigned to the category "primary." Beyond that, we create one additional category "graduated" for those students who had dropped out of school in the GDR and chose to get a university entrance degree in reunified Germany. Results for these alternative specifications are reported in Table 4.

[Table 4 here]

Confirming the results of the positive effects of years of entrepreneurial schooling, the positive effect of the change in the schooling system is strongest for students who experienced this change when they were at primary or secondary school. Students who only attended senior high school in reunified Germany show a much less pronounced treatment effect. The effect of entrepreneurial schooling on students who graduated in reunified Germany but had already dropped out of school before reunification is only significant at a 10% level. However, Students who experienced a change in the schooling system when being at secondary school show the strongest treatment effect. This is another indication that schooling does not only measure time of life spent in reunified Germany.

5.3.2 Unobserved heterogeneity

We run a number of additional robustness checks to confirm the validity of our results. Particularly, we account for potential sources of OV biases. In doing so, we repeat the most restrictive estimations with controls for the fathers' and mothers' norms (aged 30-50) in

different specifications and additionally estimate individual fixed effect models for the students' attitude towards the occupational alternatives "dependent employment in the private sector" or "entrepreneurship". Results are reported in Table 5.

[Table 5 here]

First, one might argue that the choice of the major subject itself could be the outcome of either socialist education or schooling in reunified Germany. In this case, we would underestimate the schooling effect. We thus repeat the estimations of Table 3, Column 2b without major fixed effects. The results in Column 1show that the schooling effects remain unchanged when we relax this restriction suggesting that selection into certain majors as a result of more entrepreneurial schooling does not have an effect on individual entrepreneurial intentions. In Column 2 of Table 5, we omit students who had already dropped out of school when Germany reunified, but chose to continue school in reunified Germany. Without those selective late graduates, the schooling effect slightly increases. To rule out that the coding of our outcome variable drives the results, we use OLS to regress the full range of answer categories (Certainly not; rather not; I do not know; Yes, perhaps; Yes, certainly) on all the right hand side variables of the previous probit regressions. As Column 3 shows, we still find the negative effect of education in the GDR and the positive effect of entrepreneurial schooling on this continuous outcome variable. Doing so increases the size of our coefficients significantly but since the categories are rather broad we prefer the conservative specification where we focus on those who tick "Yes, certainly." In Column 4, we use a propensity score matching to create a more homogenous sample of East and West German students conditional on all individual level control variables. We keep East German students' and their 2 nearest West German neighbors and repeat the regressions from above. The effects hold for this more homogenous sample as well. No bias from observable variables is reassuring and raises our confidence that unobserved variables do not bias our estimations as well.

In the next specification, we explicitly address potential biases from unobserved individual characteristics that are not included in our rich set of control variables. To do so, we exploit the fact that each student answers a question on his or her occupational choice to become an entrepreneur and another question on the occupational choice to become a dependent employee in the private sector. With two observations per student we can identify from within student variation by including individual fixed effects. These effects also capture the time-invariant differences between East- and West students. Accordingly, the east (main) effect presents in Columns 5 and 6 represents the interaction term of being an east student with the identifier for the answer to the entrepreneurship- question. This entrepreneurship-main effect

which is not reported in the table is negative, suggesting that on average individuals prefer dependent employment over self-employment. The interaction effect labeled east (main) confirms that conditional on individual fixed effects, East German students are on average still less likely to have entrepreneurial intentions than West German students. The interaction effect with entrepreneurial schooling confirms the positive schooling effect. Since our other right-hand side variables do not vary on the individual level, we cannot add further controls. But we can again match the sample on those control variables (Column 6). Once again, the results are confirmed, suggesting that the positive effect of entrepreneurial schooling is not driven by unobserved heterogeneity of the student population.

Finally, we address potential concerns about the different implications of being self-employed or being an entrepreneur. Medicine and law students are both likely to become self-employed in the future. To assure that this common career path of a subsample of students does not drive our results, we rerun our estimations without these students. As Column 7 shows, this hardly affects our results, so that we are confident that we indeed measure a schooling effect on entrepreneurial intentions and not the willingness to become self-employed. On the other hand, one might ask whether schooling also affects students' that potentially might start technology-oriented firms, or if schooling only affects less technology and growth-oriented entrepreneurs. Thus in Column 8, we repeat our estimations for engineering students, science students, and students of economic sciences only, who can be regarded as high potentials for starting up technology-oriented businesses. Indeed, also this specifically interesting group of students is affected by the change in the schooling system, although the effect is somewhat smaller as it is for the average student. As counterfactual, we look at schooling effects on the entrepreneurial intentions of future teachers. Since teachers aspire a specific degree in Germany that qualifies them a position as public employee, these students are extremely unlikely to have entrepreneurial aspirations. It is reassuring to see that the effect on future teachers reported in Column 9 is insignificant and close to zero.

6. Conclusions

To the best of our knowledge, this paper is the first to analyses the effect of the school system on entrepreneurial intentions. Our findings suggest that changes in the schooling system can be an effective way to stimulate individual entrepreneurial intentions. Using the German reunification as exogenous shock, we can disentangle the effect of a sudden change towards a more entrepreneurial education system that is independent of confounding effect from the

social environment. Our estimations suggest that one additional year of entrepreneurial education increases individual entrepreneurial intentions by about 4.9 percent.

Our results suggest that policymakers can influence entrepreneurial endowments via the education system. Teaching values of a free market economy and with it the formation of non-cognitive skills like creativity, initiative, or critical thinking can be an effective way to increase individual entrepreneurial intentions. From a policy perspective, targeting the development of non-cognitive skills is a low risk investment since these skills are not just conducive to entrepreneurship but of general educational value in a knowledge-based society (Heckman and Rubinstein, 2001).

Unfortunately, we can only speculate which specific changes in the education system have the strongest impact on individual entrepreneurial intentions. A promising direction could for instance relate to the way mathematics is taught. One way is to present formulae and learn how to apply them. One may argue that memorization and applying mathematical formulae is not too different from memorizing socialist dogmas. They both stimulate reproduction and mechanical thinking. Another way of teaching mathematics could involve numeric puzzles and incentives to finding own solutions. This may stimulate problem solving skills and innovativeness.

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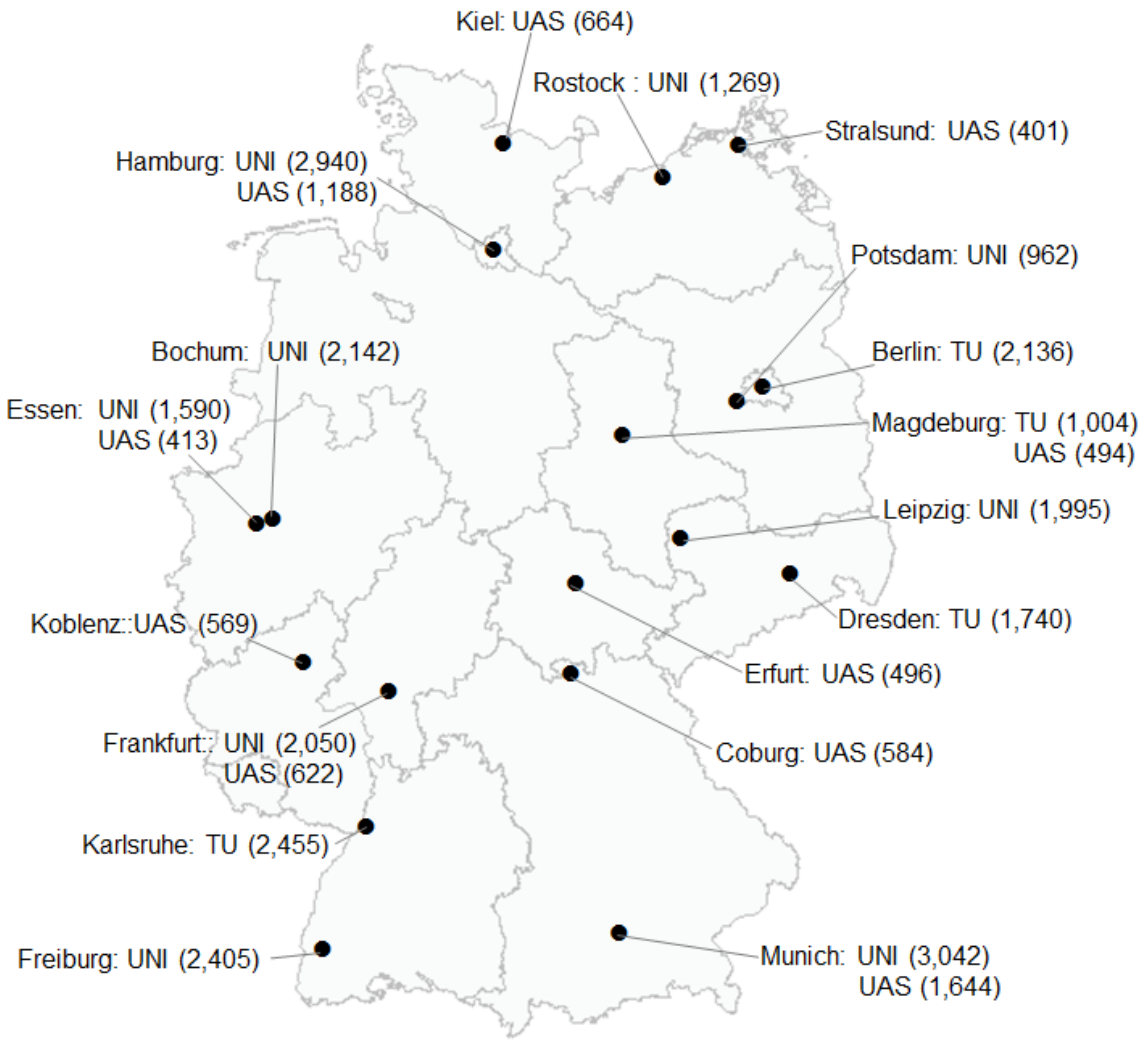
Figure 1: Universities Observed



Notes: Map depicts the sites of Universities (UNI), Technical Universities (TU) and Universities of Applied Sciences (UAS) observed in the study survey. Numbers of observations by university are given in parentheses.

Table 1: Descriptive Statistics

	(1) Raised in FRG (West)	(2) Raised in GDR (East)
Observations	24,257	8,203
Entrepreneurial Intentions	22.58 %	20.32 %
wave 5 (1992/93)	6,831	2,188
wave 6 (1994/95)	6,491	1,838
wave 7 (1997/98)	5,352	1,805
wave 8 (2000/01)	5,583	2,372
main subject		
linguistic & cultural science	13.81 %	11.47 %
psychology	1.86 %	2.03 %
social affairs & pedagogics	7.31 %	8.81 %
sports science	0.98 %	1.72 %
jurisprudence	6.53 %	9.11 %
social sciences	3.55 %	4.54 %
natural sciences	15.98 %	11.84 %
medicine	8.09 %	7.50 %
agronomy & nutrition science	1.82 %	2.34 %
engineering	22.24 %	22.88 %
arts & music	3.20 %	1.96 %
economic sciences	13.83 %	14.57 %
other	0.79 %	1.25 %
semester (avg.)	8.12	5.82
age (avg.)	25.56	22.97
female	41.81 %	52.85 %
with children	7.03 %	6.97 %
parents entrepreneur	16.13 %	13.94 %

Notes: Table reports summary statistics for the students observed in the students' survey. Column (1) refers to students who graduated from school in West Germany. Column (2) refers to students who graduated from school in East Germany.

Table 2: Schooling and Entrepreneurial Intentions

Entrepreneurial Intention	(1) FE	(2) Baseline	(3) Studies	(4) Job market	(5) Characteristics	(6) Network	(7) All Controls
Panel A							
Entrepreneurial Schooling	0.071***	0.062***	0.065***	0.062***	0.069***	0.062***	0.062***
	(0.012)	(0.013)	(0.015)	(0.013)	(0.013)	(0.012)	(0.014)
East (main)	-0.084***	-0.074***	-0.071***	-0.067***	-0.077***	-0.073***	-0.063***
	(0.013)	(0.014)	(0.015)	(0.012)	(0.013)	(0.014)	(0.013)
Schooling (main)	-0.025***	-0.004	-0.008	-0.007	-0.008	-0.003	-0.010
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.007)
Pseudo R-squared	0.0504	0.0746	0.1000	0.121	0.0939	0.0798	0.141
Panel B							
Entrepreneurial Schooling	0.011***	0.010***	0.010***	0.010***	0.011***	0.009***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
East (main)	-0.071***	-0.060***	-0.058***	-0.055***	-0.063***	-0.060***	-0.052***
	(0.010)	(0.013)	(0.012)	(0.011)	(0.012)	(0.013)	(0.011)
SchoolYears (main)	-0.004***	0.002	0.000	0.001	0.002	0.003	0.001
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)
Pseudo R-squared	0.0506	0.0750	0.100	0.122	0.0944	0.0803	0.142
Controls							
FE (uni, year, major)	yes	yes	yes	yes	yes	yes	yes
Baseline	no	yes	yes	yes	yes	yes	yes
study progress & motives	no	no	yes	no	no	no	yes
Job market expectations	no	no	no	yes	no	no	yes
individual characteristics	no	no	no	no	yes	no	yes
social network	no	no	no	no	no	yes	yes
Observations	31,348	30,364	29,962	30,307	30,364	30,364	29,925

Notes: Table reports probit marginal effects at the sample mean where the dependent variable 'entrepreneurial intention' is unity if students answer "Yes, certainly" on the question "Do you want to be permanently self-employed in the future" and zero otherwise. All specifications include university fixed effects, survey wave fixed effects, and fixed effects for the students' major field of studies. Additional control variables are described in more detail in the appendix. Cluster (university) robust standard errors are reported in parentheses. *denotes 10% level of significance, **denotes 5% level of significance, ***denotes 1% level of significance.

Table 3: Schooling, Parental Norms and Entrepreneurial Intentions

	(1)		(2)	
	parents > 30 years of age		parents > 30 / <50 years of age	
Entrepreneurial Intention	(a) parents	(b) father/mother	(a) parents	(b) father/mother
Panel A				
Entrepreneurial Schooling	0.062***	0.061***	0.062***	0.060***
	(0.014)	(0.014)	(0.014)	(0.015)
East (main)	-0.062***	-0.059***	-0.052***	-0.048**
	(0.017)	(0.018)	(0.018)	(0.019)
parents' norms	-0.007	-	-0.066	-
	(0.041)		(0.045)	
mothers' norms	-	-0.009	-	-0.022
		(0.038)		(0.038)
fathers' norms	-	-0.012	-	-0.054*
		(0.025)		(0.031)
Pseudo R-squared	0.141	0.141	0.142	0.142
Panel B				
Entrepreneurial Schooling	0.010***	0.010***	0.010***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
East (main)	-0.052***	-0.049***	-0.041**	-0.038**
	(0.016)	(0.018)	(0.016)	(0.017)
parents' norms	0.001	-	-0.061	-
	(0.046)		(0.048)	
mother's norms	-	-0.003	-	-0.020
		(0.040)		(0.038)
father's norms	-	-0.008	-	-0.050
		(0.026)		(0.032)
Pseudo R-squared	0.142	0.142	0.142	0.142
Controls	All + schooling main effects		All + schooling main effects	
Observations	29,919	29,829	29,919	29,828

Notes: Table reports probit marginal effects at the sample mean where the dependent variable 'entrepreneurial intention' is unity if students answer "Yes, certainly" on the question "Do you want to be permanently self-employed in the future" and zero otherwise. Columns (1) refer to parents that were 30 years or older when student graduated from school, Columns (2) refer to parents who were between 30 and 50 years of age. All specifications include university fixed effects, survey wave fixed effects, and fixed effects for the students' major field of studies. Main effects of schooling are included. Additional control variables are described in more detail in the appendix. Cluster (university) robust standard errors are reported in parentheses. *denotes 10% level of significance, **denotes 5% level of significance, ***denotes 1% level of significance.

Table 4: Levels of Schooling in Reunified Germany

	(1) parents > 30 years of age		(2) parents > 30 / <50 years of age	
Entrepreneurial Intention	(a) parents	(b) father/mother	(a) parents	(b) father/mother
Entrepreneurial Schooling	0.076**	0.075**	0.074**	0.072**
(*since primary school*)	(0.031)	(0.031)	(0.031)	(0.032)
Entrepreneurial Schooling	0.084***	0.083***	0.084***	0.082***
(*since secondary school*)	(0.020)	(0.020)	(0.020)	(0.020)
Entrepreneurial Schooling	0.034**	0.033**	0.034**	0.032*
(*since senior high school*)	(0.016)	(0.016)	(0.016)	(0.017)
Entrepreneurial Schooling	0.035*	0.036*	0.035*	0.035*
(*continued schooling*)	(0.021)	(0.021)	(0.021)	(0.021)
East (main)	-0.061***	-0.058***	-0.051***	-0.048**
	(0.017)	(0.019)	(0.018)	(0.019)
Pseudo R-squared	0.142	0.142	0.142	0.142
Controls	All + schooling main effects + norms		All + schooling main effects + norms	
Observations	29,919	29,829	29,919	29,828

Notes: Table reports probit marginal effects at the sample mean where the dependent variable 'entrepreneurial intention' is unity if students answer "Yes, certainly" on the question "Do you want to be permanently self-employed in the future" and zero otherwise. Columns (1) refer to parents that were 30 years or older when student graduated from school, Columns (2) refer to parents who were between 30 and 50 years of age. All specifications include university fixed effects, survey wave fixed effects, and fixed effects for the students' major field of studies. Main effects of schooling are included. Additional control variables are described in more detail in the appendix. Cluster (university) robust standard errors are reported in parentheses. *denotes 10% level of significance, **denotes 5% level of significance, ***denotes 1% level of significance.

Table 5: Robustness

Entrepreneurial Intention	(1) no major FE	(2) no grads	(3) cont. outcome	(4) matched	(5) individual FE	(6) individual FE matched	(7) no self-employed	(8) Engineers/ scientists	(9) teacher
Panel A									
Entrepreneurial Schooling	0.059***	0.063***	0.087**	0.053***	0.077***	0.071***	0.064***	0.039***	0.007
	(0.015)	(0.015)	(0.038)	(0.016)	(0.020)	(0.020)	(0.013)	(0.014)	(0.006)
East	-0.055***	-0.054***	-0.175***	-0.061**	-0.056***	-0.063***	-0.054**	-0.046*	0.005
	(0.020)	(0.019)	(0.058)	(0.028)	(0.018)	(0.020)	(0.021)	(0.027)	(0.011)
Pseudo/Adj. R-squared	0.132	0.143	0.222	0.149	0.182	0.181	0.147	0.146	0.328
Panel B									
Entrepreneurial Schooling	0.010***	0.010***	0.021***	0.010***	0.015***	0.015***	0.009***	0.007***	0.000
	(0.002)	(0.002)	(0.006)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.001)
East	-0.047**	-0.046***	-0.180***	-0.056**	-0.047***	-0.057***	-0.043**	-0.039	0.012
	(0.019)	(0.018)	(0.051)	(0.025)	(0.013)	(0.016)	(0.021)	(0.025)	(0.017)
Pseudo/Adj. R-squared	0.132	0.143	0.227	0.149	0.182	0.182	0.148	0.147	0.327
Controls									
FE (uni, time)	yes	yes	yes	yes			yes	yes	yes
FE (major)	no	yes	yes	yes			yes	yes	yes
FE (individual)	no	no	no	no			no	no	no
Idiosyncratic	yes	yes	yes	yes			yes	yes	yes
Norms	yes	yes	yes	yes			yes	yes	yes
main effects	yes	yes	yes	yes			yes	yes	yes
Observations	29,939	28,197	29,829	14,431			25,278	14,939	2,809

Notes: Table reports probit marginal effects at the sample mean (columns (1)-(2) and (4)-(7)) and OLS results (column (3)) where the dependent variable 'entrepreneurial intention' is unity if students answer "Yes, certainly" on the question "Do you want to be permanently self-employed in the future" and zero otherwise. Column (8) and (9) report OLS results where the dependent variable is each student's answer to this question and his/her answer to the alternative question for dependent employment in the private sector. Cluster (university (column (1)-(7)), individual (column (8)-(9)) robust standard errors are reported in parentheses. *denotes 10% level of significance, **denotes 5% level of significance, ***denotes 1% level of significance.

Table A1: Detailed Variable Description

Variable	*Survey Question*	Sub-question	Relevant answer category	Type
Outcomes				
entrepreneurial intention	*In which area do you want to be permanently employed in the future?*	self-employed (entrepreneur or freelancer)	"yes, certainly"	binary
entrepreneurial intention (continuous)	*-ditto-*	-ditto-	"certainly not", "rather not", "don't know", "yes, perhaps", "yes, certainly"	continuous
dependent employment	*-ditto-*	in the private sector	"yes, certainly"	binary
Fixed Effects				
survey wave			5-8	categorical
university	*At which site do you study at?*		1-23	categorical
field of studies	*Which subjects do you currently study?*	Major subject	aggregated categories 1-12	categorical
Baseline Controls				
Age	*How old are you?*		log and log^2	continuous
Gender	*Your gender?*		male, female	binary
Children	*Do you have children?*		yes (any children)	binary
marital status	*Your marital status?*		"married", "single, with permanent partner", "single, without permanent partner", "widowed/divorced"	categorical
aspired degree	*Name your aspired degree*		"diploma", "magister artium" state exam (no teacher)", "state exam teacher", "BA", "MA", "other" "do not know yet"	categorical
education_father	*Name the highest degree your father has reached*		"secondary school (8^{th} grade)", "middle school (10^{th} grade)", "high school (12^{th}/13^{th} grade)", "no graduation (less than 8^{th} grade)", "misc/do not know"	categorical
education_mother	*Name the highest degree your mother has reached*			categorical
anyparent_entrepreneur	*Which occupation does your father/mother have*		any "small self-employed (e.g. retailer, craftsman)", "medium self-employed (e.g. big retailer, chief agent)", "big self-employed (e.g. factory owner)"	

Study related Controls				
Terms	*How many terms have you studied at university yet?*			continuous
GPA	*With which Grade Point Average did you graduate from school?*		GPA standardized by east/west average GPA per year of graduation	continuous
changed major	*Have you, in the course of your studies,…*	changed your major subject?	"yes"	binary
any subject science	Which subjects do you currently study?	Major subject, second subject, third subject	aggregated: any subject from the field of science	binary
any subject engineering	*-ditto-*	*-ditto-*	aggregated: any subject from the field of engineering	binary
any subject economics	*-ditto-*	*-ditto-*	aggregated: any subject from the field of economic sciences	binary
study motive: interest in field	In how far do you think studies at a university are useful to you with respect to…	learning more about the chosen field of studies	top 2 positive values	binary
study motive: income	*-ditto-*	receiving a good income	top 2 positive values	binary
study motive: interesting job	*-ditto-*	getting an interesting job later on	top 2 positive values	binary
study motive: social position	*-ditto-*	receiving a high position in society	top 2 positive values	binary
study motive: realize ideas	*-ditto-*	realizing my own ideas	top 2 positive values	binary
study motive: help people	*-ditto-*	helping other people later on	top 2 positive values	binary
study reason: talent	*How important where the following reasons for deciding on your field of studies?*	own talent and skills	top 2 positive values	binary
study reason: future job	*-ditto-*	clear job aspirations	top 2 positive values	binary
study reason: job security	*-ditto-*	good prospects for secure job	top 2 positive values	binary
study reason: leadership	*-ditto-*	good prospects for getting a leading position	top 2 positive values	binary
plans abandoning	*Do you currently seriously think about abandoning studies?*		top 2 positive values	binary
dislikes studying	*All things considered, do you like being a student?*		top 2 negative values	binary
Job related Controls				
student job	*How do you finance your*	By own work during the semester / By own	>0 h/week in either answer	binary

	education?	work in semester breaks		
important at job: security	*What is important for you with regard to a job?*	Job security	top 2 positive values	binary
important at job: ideas	*-ditto*	to have the opportunity to realize one's own ideas	top 2 positive values	binary
important at job: income	*-ditto-*	high income	top 2 positive values	binary
important at job: self-reliance	*-ditto-*	to be able to take decisions independently	top 2 positive values	binary
important at job: leadership	*-ditto-*	possibility to lead other people	top 2 positive values	binary
important at job: tasks	*-ditto-*	to be given new tasks again and again	top 2 positive values	binary
important at job: academia	*-ditto-*	possibility to work at academic tasks	top 2 positive values	binary
important at job: responsibility	*-ditto-*	tasks that require a sense of responsibility	top 2 positive values	binary
important at job: help	*-ditto-*	possibility to help others	top 2 positive values	binary
important at job: advancement	*-ditto-*	advancement possibilities	top 2 positive values	binary
important at job: investigation	*-ditto-*	possibility to investigate unknown things	top 2 positive values	binary
unimportant at job: balance	*-ditto-*	work-life balance	top 2 negative values	binary
unimportant at job: society	*-ditto-*	a job where you do things that are useful to society	top 2 negative values	binary
unimportant at job: relaxation	*-ditto-*	a job where you do not have to strain yourself	top 2 negative values	binary
unimportant at job: free time	*-ditto-*	much leisure	top 2 negative values	binary
no job difficulties	*What describes your job perspectives after graduation best?*		hardly any difficulties to find a job	binary
job alternative: study	*If you could not realize your job aspirations due to the labor market conditions after graduation, what would you do?*	I would continue studying (post graduate studies) to improve my job prospects	top 2 positive values	binary
job alternative: burden	*-ditto-*	I would be willing to accept greater burdens (e.g. move, commute longer distances)	top 2 positive values	binary
job alternative: different job	*-ditto-*	I would look for a job with similar qualification requirements and remuneration	top 2 positive values	binary
job alternative: financial loss	*-ditto-*	I would accept financial loss if the job	top 2 positive values	binary

		matches my qualification / skills		
Controls for individual characteristics				
type: skeptical	*In how far do the following statements apply to you personally?*	I doubt whether I will graduate at all	top 2 positive values	binary
type: hardworking	*-ditto-*	I work intensely and much for my studies	top 2 negative values	binary
type: good learner	*-ditto-*	It is easy to me to learn and remember	top 2 positive values	binary
type: nervous	*-ditto-*	During exams I am often so excited that I forget things that I actually know	top 2 positive values	binary
type: fast	*-ditto-*	I want to finish my studies as fast as possible	top 2 positive values	binary
problem: peer contact	*What causes difficulties for you?*	To get into contact to other students	top 2 positive values	binary
problem: teachers	*-ditto-*	Dealings with lecturers	top 2 positive values	binary
problem: competition	*-ditto-*	Competition amongst students	top 2 positive values	binary
problem: discussion	*-ditto-*	To participate in discussions during seminars	top 2 positive values	binary
burden: orientation	*In how far do you perceive the following issues to be a burden?*	Problems to keep orientation	top 2 positive values	binary
burden: anonymity	*-ditto-*	anonymity at university	top 2 positive values	binary
burden: exams	*-ditto-*	examinations	top 2 positive values	binary
burden: financial situation	*-ditto-*	current financial situation	top 2 positive values	binary
burden: personal problems	*-ditto-*	personal problems (e.g. fears, depression)	top 2 positive values	binary
burden: job perspectives	*-ditto-*	uncertain job perspectives	top 2 positive values	binary
important: politics	*How important are the following areas of life to you?*	politics and public life	top 2 positive values	binary
important: culture	*-ditto-*	arts and culture	top 2 positive values	binary
important: studies	*-ditto-*	university and studies	top 2 positive values	binary
important: science	*-ditto-*	science and research	top 2 positive values	binary
important: job	*-ditto-*	job and work	top 2 positive values	binary
important: partner	*-ditto-*	partner/own family	top 2 positive values	binary
important: technology	*-ditto-*	technics and technology	top 2 positive values	binary

unimportant: leisure	*-ditto-*	leisure and hobby	top 2 negative values	binary
attitude towards competition	*How much do you agree on the following statements?*	Mutual competition destroys people's solidarity	top 2 positive values	binary
attitude towards incentives	*-ditto-*	People do not exert themselves without competition	top 2 positive values	binary
Controls for social network				
participation: anything	*How often to you participate in the activities of the following groups and organizations?*	students association, student council, senate, political groups, fraternities, informal action groups, sports, religious groups, cultural activities, miscellaneous	any top 2 positive value	binary
contact: friends	*How often do you have contact to the following people?*	friends and acquaintances from outside the university	top 2 positive values	binary
contact: family	*-ditto-*	parents and siblings	top 2 positive values	binary
contact: peers	*-ditto-*	students from own field of studies	top 2 positive values	binary
contact: lecturers	*-ditto-*	teachers and lecturers of own field of studies	top 2 positive values	binary
contact: job	*-ditto-*	people working in the aspired occupational field	top 2 positive values	binary
contact: foreigners	*-ditto-*	foreign students	top 2 positive values	binary