Competitive Peers: The Way to Higher Paying Jobs?

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Abstract

We merge experimental data on competitiveness of a large sample of students with their complete educational history for up to ten years after the initial assessment. Exploiting quasi-random class assignments, we find that having competitive peers as classmates makes students choose and secure positions in higher-paying occupations. These occupations are also more challenging and more popular. On the cost side, competitive peers do not lead to a lower probability of graduating from the subsequent job-specific education, but they significantly increase the probability of requiring extra time to do so.

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1 Introduction

At least since Niederle and Vesterlund (2007) empirically measured competitiveness as a personality trait, it has emerged as an important determinant in explaining individual differences in educational trajectories and labor market outcomes. The external relevance of competitiveness has subsequently been documented in various articles (e.g., Buser et al., 2014, 2024). While competitiveness is recognized for its role in shaping educational and labor market outcomes, there is also a rich history of empirical research on the influence of peers on these outcomes. A recent strand of the peer effects literature emphasizes the role of peer personalities, showing that these significantly impact academic achievement (Golsteyn et al., 2021; Hancock and Hill, 2022; Shure, 2021). In this paper, we combine these two strands of empirical literature by analyzing the effect of experimentally elicited peer competitiveness - a novel dimension in the literature on individual competitiveness and a personality trait that has not yet been investigated by the recent peer effects studies. Additionally, we expand the scope of the latter literature beyond academic achievement and include labor market outcomes.

Specifically, we use our unique dataset to analyze how peer competitiveness influences students' occupational choices and the expected income levels of those occupations. Our findings show that having peers who are 1 standard deviation (SD) more competitive leads individuals to choose occupations with average annual earnings that are 1520 US$ higher. These occupations are both more challenging in terms of academic requirements and more popular in terms of the ratio of supply and demand. Additionally, students with competitive peers are more likely to start their careers without delay, suggesting that such peers enable students to be successful in the labor market without pushing them into unrealistic occupations. After they start working, people who previously had more competitive classmates do not suffer from a lower probability of graduating, but they are significantly more likely to require extra time to do so, with some changing to easier, lower-paying occupations. Still, competitive peers increase the average earnings of the

graduated occupation by 1130 US$.

The key to our empirical strategy is to exploit that classes are mixed up when students transition from primary to lower-secondary school. Lower-secondary schools have usually larger catchment areas than primary schools. In addition, tracking is introduced at this stage. Therefore, new classes need to be formed and this opportunity is also purposefully used to expose students to new peers. Conditional on school and school track, it is as good as random how competitive the peers in the new class are.

In terms of data, we have merged the experimental dataset used in Buser et al. (2017), Buser et al. (2022), and Lüthi and Wolter (2023) to federal administrative data. This allows us to access the complete educational history of the students and, therefore, follow them up to ten years after their competitiveness was experimentally measured. Due to the high quality of the data, this merge resulted in less than 5% sample attrition. Additionally, we incorporated further occupational-level data. Unlike the previous three studies, we exploit having data on class composition to analyze the effects of (not) having competitive peers. For this, it is particularly valuable that the experiments measuring competitiveness were conducted in the schools. Thus, we have the complete set of class-peers for each student. Finally, the data also includes a rich set of control variables, including an array of different non-cognitive skills.

The study is set in Switzerland, where most students choose to apply on the labor market for three- to four-year-long apprenticeships after lower-secondary school.[1] Aside from data quality and availability, the Swiss setting is particularly suitable for this study, as the apprenticeship system leads to an occupational choice process that is typically condensed to a few months during 8th grade, when classmates are a stable and influential peer group.

These apprenticeships represent the first step in a person's career and studying them allows us to use a wealth of interesting data. We can observe whether students began

[1] A minority chooses instead to attend additional general education that qualifies them for university; we also observe this choice.

their apprenticeships immediately after lower-secondary school or required an additional year to secure one. We also track their chosen occupation from roughly 200 options, any changes in occupation, whether they graduated, and the time taken to graduate. Additional datasets allow us to analyze key characteristics of these occupations. Most importantly for this study, we can use data from the Swiss Labour Force Survey (SLFS) to estimate the expected average earnings for a hypothetical person in each occupation. Furthermore, we have data on the academic requirements of nearly every apprenticeship, as assessed by the professional organizations of each occupation. Finally, we measure the popularity of each apprenticeship using the ratio of search queries and posted positions for every individual profession on the national online database for apprenticeship vacancies.

Access to experimental data on competitiveness, combined with participants' complete educational histories and their first occupational choices, is uncommon in the literature. A notable exception is Almås et al. (2016), who use Norwegian data and analyze the gender gap in college dropouts.

More generally, the literature on competitiveness has a strong focus on showing how women avoid competitive situations more than men and the consequences thereof. We refer to Markowsky and Beblo (2022) for a meta study of papers that followed the seminal work by Niederle and Vesterlund (2007). More recently, Schilter (2024) shows that girls are not only discouraged by a competitive environment, but that boys behave instantly differently when the setting is framed more competitively. Most related to the current paper are the following three studies that follow the approach in Niederle and Vesterlund (2007) and use the same dataset as the current paper. Buser et al. (2017) confirm that boys opt for more competition and show that this can explain parts of the gender gap in math-intensive education choices. In the long term, Buser et al. (2022) show that willingness to compete predicts study and career choices. Building on this, Lüthi and Wolter (2023) show that competitive women (but not men) are more likely to terminate their apprenticeship contract prematurely. We contribute to this literature by using the same approach to

measure competitiveness but investigating the effect of the peers' competitiveness on an individual. Moreover, we do not analyze the selection into an environment with competitive peers, but instead analyze the effects such an environment has.

We also contribute to the literature on peer effects. Earlier work often analyzes if peers simply follow other peers' actions with mixed results (see Paloyo (2020) for an overview). For example, Sacerdote (2001) finds that students' major choice is not affected by the study choice of their randomly allocated roommates, and, similarly, Arcidiacono and Nicholson (2005) find no significant effect of peers affecting specialty choices in US medical schools. Conversely, Poldin et al. (2015) do find evidence for peer effects in study specializations in Russia. Some more recent publications have started to focus on peers' non-cognitive characteristics. Golsteyn et al. (2021) analyze the effects of peers' persistence, self-confidence, anxiety, and risk attitude on exam performance and find strong effects for peers' persistence and possible effects for peers' risk attitude. Relatedly, Shure (2021) and Hancock and Hill (2022) investigate the effects of the Big Five personality traits. They find a significant positive effect of peer conscientiousness on math scores and academic team performance respectively. In terms of peer competitiveness, we are only aware of the study by Shan and Zölitz (2024). Their study examines the impact of peer personality traits, including competitiveness measured through a survey question, on personality development and test scores. They find that a one SD increase in peer competitiveness leads to a 0.08 SD improvement in test scores.

Perhaps most related to our paper, Feld and Zölitz (2022) analyze the effect of being exposed to high-achieving peers on both academic and labor market outcomes, Bietenbeck (2024) looks at the effect of peer academic motivation on academic outcomes. Notice, however, that these measures are not only a proxy for competitiveness, but also for ability and possibly other characteristics (like socioeconomic status). In our paper, we have an experimentally sourced measure for competitiveness and we control for peers' grades and SES. In terms of results, Feld and Zölitz (2022) find no effect of high-achieving peers

on educational choices, but Bietenbeck (2024) finds a positive effect of peer academic motivation on academic success.

The remainder of this paper is organized in the following fashion: Section 2 outlines setting and data, Section 3 discusses the empirical strategy and possible threats to identification, Section 4 presents the main results of peer effects on occupational income, Section 5 discusses in more detail how peers affect the occupational choice and to what extent this effect can also be costly, and, finally, Section 6 concludes.

2 Setting and Data

At the time of data collection in 2013, our students were in early 8th-grade in the canton of Bern, Switzerland. Approximately two-thirds of Swiss students enter a three- to four-year apprenticeship after completing nine years of schooling. They typically choose their apprenticeship occupation from over 200 options in mid to late 8th grade and then apply for positions on the open market. Most of the remaining students pursue a high school diploma that qualifies them to enter a university.

The data collection was carried out in schools with all the students of the selected classes participating. Part of this data collection was an incentivized experiment to measure competitiveness in the fashion of Niederle and Vesterlund (2007). In each of three rounds, students either added two-digit numbers or counted how many times a specific letter appears in a random sequence of letters. Whether the task involved numbers or letters was randomized at the classroom level. In round 1, students earned a piece-rate for every correct answer. In round 2, they competed against three randomly selected anonymous classmates, with only the winner being paid (but four times as much compared to round 1). Finally, in round 3, they could choose (in private) which of the previous two schemes they would like to do a second time. We label those students as competitive who chose the tournament mode. More details on the setting and data collection are outlined in Buser

et al. (2017) and Buser et al. (2022) who use the same dataset.

We merged the full educational history of the students (from a Swiss administrative register dataset called LABB) with our dataset, achieving a match for over 95% of the experimental data. The attrition is balanced across observable characteristics, as detailed in Appendix A, with the exception of Swiss nationality, for which we consistently control. While Appendix B discusses whether students opt for an apprenticeship or the university route, our primary analysis focuses on those who begin an apprenticeship after lower-secondary school. Apprenticeships serve as both the first occupation in our students' careers (with most continuing to work in the same field) and as a form of upper-secondary education, which why it is still included in the LABB data. Therefore, we observe 1) whether students delay their entry into an apprenticeship by a year (e.g., if they cannot secure a position), 2) the specific apprenticeship occupation they choose, 3) whether they graduate from an apprenticeship, and 4) the time taken to graduate. Graduation may be delayed if students change their apprenticeship, fail their final exam and must repeat the last year, or if they need to repeat another year. Approximately one-fifth of apprenticeship contracts are terminated prematurely, often resulting in the student completing their apprenticeship with a different employer and possibly in a different occupation, commonly leading to delayed graduation. Delaying the start of an apprenticeship with an additional year of schooling is not uncommon (22% in our sample) and intended to support students who either failed to secure an apprenticeship or did not feel prepared to begin the search.

Moreover, we incorporate additional datasets on occupation-specific characteristics. Most importantly, we use the same dataset as Brenøe and Wasserman (2024) in order to have predicted average earnings for a representative person for (almost) every apprenticeship occupation. Specifically, we use a 30 year old childless unmarried person living in non-rural Bern who was surveyed in January 2019.[2] In brief, this earnings predictor uses data from the 2015 to 2019 SLFS for people aged between 20 and 50 who work full time,

[2]The difference between men and women is just a constant that is picked up by the female-dummy in the controls anyways, so we use expected male earnings in all our analyses.

have completed an apprenticeship, and work in occupations that are either the apprenticeship occupations themselves (same 5-digit CH-ISCO-19 professional activities code) or in natural follow-up occupations for a specific apprenticeship occupation (e.g., after gaining more experience or completing further education; this match is made manually, but using ISCO-08 3- and 4-digit groups). The expected earnings are then predicted using a simple OLS regression with the variables available in the SLFS.[3]

In addition, we use the "requirement profile" data for the apprenticeship occupations. The Swiss Conference of Cantonal Ministers of Education (EDK) and the Schweizerischer Gewerbeverband (sgv) measure the requirements of each apprenticeship on a scale from 1 to 100, taking into account information from the employer associations of the apprenticeship occupations. These requirements are displayed online and are meant to help students find occupations that match their profile. Therefore, students are generally aware of the difficulty of the occupation they are aiming for.

Finally, we have data from the official national online database on apprenticeship advertisements (LENA). We observe both the number of search queries for each apprenticeship occupation as well as the number of open positions from firms in each occupation. For each occupation, we divide the total number of search queries by the average number of open positions to create our popularity measure.[4]

3 Empirical Strategy

3.1 Identification

Upon entering lower-secondary school, students are placed into different tracks: a low track, a high track, and, occasionally, a pre-academic track. A school has multiple classes

[3] Namely: age, age^2, age^3, number of children, female dummy, married dummy, canton dummy, rural dummy, year of survey dummies, month of survey dummies, apprenticeship-occupation dummies, and interactions between age-buckets (20-19, 30-39, and 40-50) and the field of education (first 2 digits of the ISCO-19 code of the apprenticeship).

[4] We take the log of this fraction to obtain the final measure that we use in this paper.

of the same track if there are enough students.[5] In that case, primary school classes are intentionally broken up, and students are assigned to lower-secondary school classes with similar gender ratios, in a way that is as good as random - at least with respect to the competitiveness of their new peers.[6] To identify the effect of having competitive peers, we employ a school-track-by-school fixed effect, along with a rich set of control variables. Because gender shares are kept similar, the identifying variation in peer competitiveness does not mirror variation in peer gender.

Our sample contains 1008 students, 611 of whom were in the situation that there was more than one possible lower-secondary class to which they could have been allocated. For a first balance table, we measure the competitiveness of a class by the share of people who chose the tournament mode in the experiment's third round. In most cases, there were two classes for the same track at the same school, where naturally one is more competitive than the other. In some cases there were three (four in one instance). For a test of balance displayed in Table 1, we compare the most competitive class in a track and school against the other, less competitive classes. There are no significant differences, except of course competitiveness.

We use OLS to estimate the following model to analyze the impact of competitive peers. For our measure of peer competitiveness, we compute the share of a person's classmates that have opted for the tournament mode. We always control for own competitiveness to avoid endogeneity concerns (see Section 3.3).

$$y_{isl} = \beta_0 + \beta_1 PeerComp_i + \beta_2 PeerComp_i * Female_i + \beta_3 Comp_i + \beta_4 Female_i + \beta_5 X_i + \delta_{sl} + \epsilon_{isl}$$

The main outcome of student i in school s and track-level l, y_{isl}, is the occupation-

[5] Less commonly, some schools create classes with a mix of (some of) the tracks. The argument remains the same though: if more than one of such classes exist in a given school, the classes are mixed up in the same fashion.

[6] We have contacted all schools that are in our sample to confirm the assignment is quasi-random with respect to competitiveness. The common criteria when creating the new classes are to mix up primary school classes (often conditional on nobody being the only person from a given primary school in the new classes), equal class sizes, and equal gender shares. Additional criteria of some schools include equal shares of students with behavioral issues and special needs respectively, equal shares of non-native speakers, and, in the rare case of classes with mixed tracks, equal track shares.

specific expected income. However, we will also use other y_{isl} in the discussion in Section 5, namely: requirements of the chosen occupation, popularity of the occupation, delay in starting an apprenticeship, a dummy if the student graduated, and how many extra years it took them to graduate. Our main coefficient of interest is β_1 of $PeerComp_i$, which is our measure of peer competitiveness outlined above. Following the literature on competitiveness, we also interact our measure with a female dummy to identify potential heterogeneity by gender. We always use school times school-track fixed effects, denoted δ_{sl}. The control variables in X_i include risk aversion,[7], locus of control,[8] overconfidence,[9] GPA, dummies for the school tracks, GPA interacted with the school-track-dummies, peers' GPA, socioeconomic status,[10] a dummy for Swiss nationality, a dummy whether the experiment eliciting competitiveness was using letters or numbers, and dummies for their father and mother having tertiary degrees.[11] We cluster the standard errors at the class level.

3.2 Sample Selection

Thanks to the strategy outlined above, we can avoid the classical selection problem that individuals choose their peer group endogenously. However, for our main sample, we focus on those students that start an apprentice after lower-secondary school, which could induce a selection problem. While for students in the lower track, there is virtually no choice, as they cannot enter the general education track leading to university, and therefore, virtually all of them start an apprenticeship,[12] for students in the higher tracks, this choice could potentially be influenced by their peers' competitiveness. Therefore, we conduct a

[7] Measured by a lottery choice measure as well as the "bomb" risk elicitation task, see Crosetto and Filippin (2013).

[8] Using the HILDA measure, see Pearlin and Schooler (1978).

[9] We measure overconfidence as the believed versus actual relative math performance in class.

[10] We use an index that takes into account housing, number of TVs, cars, books, computers etc.

[11] We have also added an additional dummy variable to the control variables to indicate the 23 people that required manual correction to match the data. Not including this dummy does not affect our results.

[12] There are other upper-secondary schools that are neither leading to university access nor are they paired with apprenticeships. Only two people from the lower track students in our data (i.e., 0.5%) enter such schools. We refrain from analyzing this choice.

secondary analysis in Appendix B, using the same methodology, to examine the decision to pursue an apprenticeship. We find no significant effects of peer competitiveness on that choice. Additionally, we replicate our main analysis for low-track students - who do not have the option of the general education track - and find highly similar results as in Section 4 (see Appendix C).

3.3 Reflection Problem

Peer effects are challenging to identify because individuals can influence their peers, creating what is known as the "reflection problem" (see Manski, 1993). This issue is relevant to our study, as class allocations were made one year before the students participated in the experiment measuring their competitiveness. However, our data offers a unique advantage: we have a baseline measure of the outcome variable, desired occupation, taken at the same time as the competitiveness measure. At this point, students were just beginning their occupational choice process, so it is likely that there was little to no prior peer interaction. This only leaves the "problematic" channel that individuals who have more ambitious career goals have affected their peers to be more competitive. However, as shown in Appendix D, we find no significant peer effects at this initial stage. Moreover, our results remain robust when we use deviations between the characteristics of the occupations students eventually chose and those they originally desired, rather than the characteristics of the final occupations themselves. This is again in line with peers affecting individuals during the phase where the occupational choice takes place and is discussed extensively in school.

In addition, as Golsteyn et al. (2021) do for persistence, self-confidence, anxiety, and risk attitude, we can perform the *Test for Random Assignment* proposed by Guryan et al. (2009) for competitiveness. That is, we can regress a student's own competitiveness on the mean-competitiveness of her classmates as well as the mean-competitiveness of all her potential classmates (i.e., people in the same school and track). As required, the

former coefficient is not significant. This only tests the correlation between own and peer competitiveness though. Previous literature suggests that this is positive, but already small when looking at the effects of many peers on one individual (a 1 SD increase in peer competitiveness leading to a 0.07 SD increase in own competitiveness (Shan and Zölitz, 2024)) - and here we look at the reverse direction.

Finally, a related problem is a third factor affecting both the peer characteristic (competitiveness in our case) and the outcome of the individual. However, since all students are in the regressions as both individuals and the peers of other individuals, we can eliminate this concern by always controlling for own competitiveness. For example, class teachers may affect both the students competitiveness and their occupational choice. However, if class teachers make their students more competitive, they will affect - on average - the students themselves just as much as they affect the students' classmates. Since we control for own competitiveness, we implicitly also control for such potential teacher effects and they cannot drive our results.

4 Main Results

Table 2 presents the effect of competitive peers on the expected earnings of the occupations chosen by the students. Columns (1) and (2) examine the expected earnings of the occupations in which students began their apprenticeships after lower-secondary school. As outlined in Section 2, students may change their apprenticeship occupation. Thus, while the first two columns are most informative of the peer effects during lower-secondary school (when the initial occupational choice is made), the last two columns are more relevant for predicting students' actual future income.

The point estimate in the first column indicates that a person whose classmates are all competitive compared to an equivalent person whose classmates are all non-competitive chooses an occupation that pays 7615 Swiss Francs (approximately 9003 US Dollars) more

per year.[13] Relative to the occupations chosen by our study population, this corresponds to an effect size of approximately 0.56 standard deviations. The mean expected earnings in our sample is 89,304 Francs, so the effect is approximately 8.5%. We can confirm this by using log expected earnings as a dependent variable instead (result not shown). If we focus instead on the effect of a one SD change in peer competitiveness—i.e., having 17 percentage points more or fewer competitive classmates—the effect is 1286 Swiss Francs per year, or approximately 0.09 SD, or 1.4%.

Column (2) is motivated by the strong focus on gender differences in the competitiveness literature. The difference between boys and girls is small though and not statistically significant. The sum of the first two coefficients, i.e., the coefficients for girls, is significantly different from 0 (although only on the 10% significance level).

Regarding the expected income of the occupations the students graduated, column (3) displays a point estimate of 5659 Swiss Francs per year (0.41 SD, or 6.3%) for the case of all versus no competitive peers, or 956 Swiss Francs per year (0.07 SD, or 1.1%) if we look at the effect of a one SD change in peer competitiveness. The point estimate is lower compared to column (1), although the difference is not statistically significant. This result already indicates that the positive effect of competitive peers is reduced by people who change the initial occupation to an easier, lower-paying one. We discuss this in more detail in Section 5.2 and Appendix F. In terms of heterogeneity by gender, the coefficient is again not statistically significant.

Finally, the students have filled in an additional survey at the end of ninth grade and have indicated there how much they expect to earn once they are 30 years old. The point estimate on peer effects there is even higher, indicating that the students are aware of the income consequences if they choose better-paying occupations (see Appendix G for details).

[13] The share of competitive classmates in our sample ranges from 0 to 95%, see Appendix E for its distribution.

5 Discussion

In this section, we analyze in more detail, what kind of higher-paying occupations students with competitive peers choose. In addition, we look at possible costs of being steered into these occupations.

5.1 Occupational Choice

In Table 3, we use the additional data on the occupations' requirements and popularity.[14] A student in a class where all their peers are competitive, compared to the same student in a class were none of the peers are competitive, chooses an occupation with significantly higher requirements. The difference of 3.5 points on the requirement-scale corresponds to 0.35 SD in the requirements of the occupations the students started after lower-secondary school, or the difference between commercial employee and information technologist. While the gender difference is not statistically significant, boys have a high and significant treatment effect, while the point estimate on girls is less than half in size and not statistically significant.

Concerning the occupations' popularity, the effect in column (3) is not statistically significant, but close to the 10% level, with a p-value of 0.105. The effect size of 0.44 translates to 0.45 SD. The gender difference reported in column (4) is again not statistically significant, although it is relatively close with a p-vlaue of 0.139. The effect on boys is large at 0.64 SD and highly significant, while the effect on girls is less than quarter in size and insignificant.

Table 3 displays characteristics of the apprenticeships the students have actually started. Since apprenticeships are allocated on the free market, this means that they have applied for them and successfully completed the hiring assessment. Therefore, students with

[14] Note that the sample size in Table 3 is slightly larger compared to Table 2 due to not all occupation having a predicted income. Discarding the additional observations leads to qualitatively very similar results, although the coefficient in column (1) has a p-value just above 0.1.

competitive peers perform better on the apprenticeship market by securing positions in more competitive, more popular, and higher-paying occupations. They were more ambitious within the occupations they qualify for. Our results are arguably facilitated by the fact that the apprenticeship market in 2015 was relatively tight, so that more demanding apprenticeships were in fact available for students who were influenced by their peers. This means that our findings are comparable to settings where students do not compete for a limited number of apprenticeship positions but rather apply to schools that have entry requirements but no significant quantity restrictions.

5.2 Costs of Peer Influence

Peers affecting classmates so that they apply for better paid occupations could, however, also steer them into occupations that are not a good fit for them. This could lead to delays and possibly even prevent students from graduating from their apprenticeship. Table 4 systematically analyzes three possible costs of peer influence.

The first two columns focus on delayed entry. As outlined in Section 2, students who find no apprenticeship - either because they do not search or are not successful - can add an additional year of lower-secondary school and delay their entry into an apprenticeship. If competitive peers were to push classmates into overly ambitious occupations, we would observe a positive effect on delayed entry. However, the effect is actually negative, suggesting that competitive peers do not push their classmates into unrealistic occupations but instead help them succeed in the labor market, e.g., by serving as role models for effective job preparation and application strategies.

In terms of magnitude, the effect size is 0.4 standard deviations (or 0.8 times the mean); when considering a one standard deviation change in peer competitiveness rather than the 0 to 100% difference, the effect is 0.1 standard deviations. Column (2) indicates that the point estimate is considerably larger for girls, but this gender difference is not statistically significant. However, the overall coefficient for girls, which combines the first

two coefficients, is statistically significant.

Columns (3) and (4) investigate any effects on the likelihood of graduating from an apprenticeship. Peers' competitiveness does not affect this likelihood. This is not surprising because graduating is a strong norm. In our sample, over 95% of students graduate from an apprenticeship. It requires more exceptional circumstances not to graduate than initially choosing a more challenging profession or one where the student might have less intrinsic motivation.

Finally, columns (5) and (6) show that students with competitive peers take longer to graduate. Having all competitive peers versus no competitive peers leads to half a year extra time to graduation, i.e., 0.77 SD or 2.5 times the mean. Having 1 SD more competitive peers adds one extra month to the time to graduation, i.e., 0.13 SD or 0.4 times the mean. This effect is rather large. We show in Appendix F that it is a combination of both people repeating years and them changing to apprenticeships with lower requirements. The latter is also the key reason for the lower point estimates in the graduated versus the initial occupation in Table 2.

The effect on repetitions could possibly imply a negative signal on the labor market, leading to an inferior career trajectory. We observe no significant effects on NEET days in our dataset. However, people could be employed in lower earning positions. While we do not observe the realized income of our students, we have access to a different dataset (called SEATS data), that includes repetition, apprenticeship occupations, and realized income. There, we observe a correlation of approximately minus 4 to minus 5 percent between repeating and realized income (result not shown). Using the point estimate of 0.19 for repetitions from Table A5 and the fact that the point estimates in Table 2 translate to an effect of 6 to 8 percent, this suggest that the income cost of repetition reduces the positive income effect of having competitive peers by approximately 12%. If we also consider the benefit of less delay in entry, 88% of the income effect surviving after taking costs into account is likely a lower bound.

6 Conclusion

While the important role of non-cognitive skills for success in education and later in the labor market is undisputed and empirically well studied, far less is known about the influence of peers' non-cognitive skills on individual success. We contribute to closing this gap thanks to three advantages. First, we not only have the observation of experimentally collected non-cognitive skills from a large group of individuals, but also, thanks to the fact that we have taken the laboratory into the schools, the same measures for entire school classes. Second, the quasi-random allocation to school classes at lower secondary level, after transfer from primary school, ensures that selection problems due to non-random class composition should not be a problem and that causal effects can therefore be assumed. Third, the possibility of linking the experimentally collected data with administrative data not only helps us to have a very long observation period after the experiment, but also an extremely small sample attrition.

In this setting, we investigate the influence of peer competitiveness on educational careers and, more specifically, career choices. We find that a higher proportion of competitive peers is associated with a choice of better-paid occupations. Furthermore, we find that although these occupations have higher academic requirements and are more popular (i.e., the supply and demand ratio should make finding such an apprenticeship more difficult), the transition to upper secondary education after compulsory schooling is actually smoother. This is reflected in the fact that students with more competitive peers are less likely to delay their transition to post-compulsory education. While competitive peers enable their classmates into better-paid, more demanding, and more popular occupations, it is conceivable that this also leads to more frequent mismatches, when one is pushed into occupations that are too demanding. We find evidence that this is the case for a small proportion of students, who change their originally chosen occupation during their training into one that is less demanding and less well paid. We also find that students with more competitive peers are more likely to repeat a grade and thus graduate with a

delay. Comparing the positive effects of competitive peers on occupational income with the negative aspects, however, the positive effects clearly outweigh the negative ones.

As for the mechanisms of how competitive peers move their peers into better paid occupations, we can only speculate as these cannot be directly examined with our data and information, and several explanations are possible at the same time. More competitive peers can unconsciously act as role models in a positive sense, showing that one can be successful with a more ambitious career choice, but they can also increase the pressure of expectations on the other classmates (and their parents) through their own success - along the lines of "if they can do it, so can I". However, they can also deliberately create positive spill-over effects by passing on their experience in application processes to their classmates and thus helping them to be more successful in applications for more demanding occupations. In conclusion, whatever the underlying mechanisms are, for it to be peer effects and not simply the success of individual competitive peers, as our empirical results show, it must be the higher level of competitiveness in a class that creates a class climate that encourages students to move into better paying occupations regardless of their own competitiveness.

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Main Text Tables

Table 1: Balance Table

	Other Classes			Most Comp. Classes			
	n	mean	sd	n	mean	sd	Diff
Competitiveness	347	0.39	0.49	264	0.56	0.50	0.162***
Female	347	0.44	0.50	264	0.43	0.50	-0.006
Age	347	14.06	0.50	264	14.02	0.48	-0.043
Socio-Economic Status	347	-0.09	0.99	264	-0.04	1.00	0.053
Mother has HE degree	347	0.12	0.33	264	0.16	0.36	0.034
Father has HE degree	347	0.16	0.37	264	0.17	0.38	0.016
German first language	347	0.80	0.40	264	0.78	0.41	-0.024
Swiss nationality	347	0.88	0.33	264	0.87	0.34	-0.012
Class size	347	17.42	3.44	264	17.15	4.31	-0.273
GPA	347	4.56	0.44	264	4.58	0.43	0.027

We use an index to measure the socio-economic status using housing, number of TVs, cars, books, computers etc.

Table 2: Effect of Competitive Peers on Occupation's Expected Earnings

	Initial Occupation		Graduated Occupation	
	(1)	(2)	(3)	(4)
Peers' Competitveness	7614.55**	7859.08**	5658.71*	6414.85*
	(3187.06)	(3572.97)	(3016.91)	(3724.62)
Female * Peers' Comp.		-617.02		-1871.12
		(4503.13)		(5211.56)
Own Competitveness	-130.61	-131.08	-180.00	-178.13
	(728.82)	(729.36)	(764.69)	(765.11)
Observations	993	993	936	936

OLS estimators, robust standard errors clustered at class level in parentheses. In Columns (3) and (4), the 49 individuals that have not graduated from an apprenticeship are excluded as well as 8 individuals who have changed to an occupation with missing data on expected earnings.
Control variables: Female; Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

Table 3: Effect of Competitive Peers on Occupation's Characteristics

	Requirements		Popularity	
	(1)	(2)	(3)	(4)
Peers' Competitveness	3.53*	4.80**	0.44	0.63**
	(1.85)	(1.97)	(0.27)	(0.31)
Female * Peers' Comp.		-3.22		-0.48
		(3.52)		(0.32)
Own Competitveness	-0.57	-0.58	-0.02	-0.02
	(0.48)	(0.48)	(0.06)	(0.06)
Observations	1008	1008	1008	1008

OLS estimators, robust standard errors clustered at class level in parentheses.
Outcomes: Requirement: Requirement level of chosen occupation; Popularity: Popularity index of chosen occupation.
Control variables: Female; Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

Table 4: Potential Drawbacks of Peer Influence

	Delayed Entry		Graduate		Graduation Delay	
	(1)	(2)	(3)	(4)	(5)	(6)
Peers' Competitveness	-0.18*	-0.11	-0.02	-0.06	0.54**	0.54**
	(0.10)	(0.11)	(0.05)	(0.06)	(0.22)	(0.24)
Female * Peers' Comp.		-0.18		0.10		0.00
		(0.18)		(0.10)		(0.27)
Own Competitveness	-0.04	-0.04	0.00	0.00	-0.01	-0.01
	(0.03)	(0.03)	(0.01)	(0.01)	(0.05)	(0.05)
Observations	1008	1008	1008	1008	959	959

OLS estimators, robust standard errors clustered at class level in parentheses. In Columns (5) and (6), the 49 individuals that have not graduated from an apprenticeship are excluded.
Outcomes: Delayed Entry: Delayed entry into an apprenticeship; Graduate = 1 if individual graduated from upper sec. level, 0 otherwise; Graduation Delay: Number of years until graduating from the apprenticeship minus duration of initially chosen program.
Control variables: Female; Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

Appendix

A Balance Table Attrition from Merging Administrative Data

To merge our survey data with the administrative register data, we first relied on a class identifier in both datasets and then identified individuals using their date of birth, gender, and the occupation stated in the second survey wave. For 23 individuals, we manually corrected the data, mostly for misspelled occupations. We included a dummy for these 23 individuals in all regressions. Using this procedure, we were able to identify 1421 of the 1494 individuals (95%). Table A1 compares the means of those who were matched and those who were not. The main difference is nationality: most of the unmatched individuals have a foreign nationality, as some foreigners are not available in the register data if they are not permanent residents.

Table A1: Matching balance table

	Not matched (N=73)		Matched (N=1421)		Difference	
	Mean	StDev	Mean	StDev	Diff	P-value
Peer's competitiveness	0.500	0.169	0.490	0.166	0.010	0.600
Own competitiveness	0.397	0.493	0.492	0.500	-0.095	0.115
Female	0.548	0.501	0.491	0.500	0.057	0.345
Risk choice	3.041	1.611	2.954	1.542	0.088	0.637
BRET choice	41.740	26.245	37.738	24.306	4.002	0.172
Locus of control	35.986	6.190	37.334	6.359	-1.347	0.077
Overconfidence	-0.105	0.241	-0.124	0.223	0.019	0.484
GPA	4.647	0.586	4.700	0.464	-0.053	0.348
Peer's GPA	4.700	0.180	4.716	0.177	-0.016	0.463
Lower track	0.397	0.493	0.319	0.466	0.078	0.162
Special track	0.137	0.346	0.087	0.282	0.050	0.147
Score during comp. task	-0.213	1.150	-0.024	1.002	-0.189	0.120
Socio-Economic Status	0.143	0.945	-0.035	1.002	0.178	0.137
Mother has HE degree	0.082	0.277	0.181	0.385	-0.099	0.031
Father has HE degree	0.178	0.385	0.215	0.411	-0.037	0.457
Swiss nationality	0.164	0.373	0.868	0.339	-0.703	0.000
Comp. task: counting letters	0.534	0.502	0.483	0.500	0.051	0.391

Two-sided T-tests for all used variables.

B General versus Vocational Education

We use the same regression as in the main text but use the binary y variable to enter general education instead of an apprenticeship. As shown in Table A2 below, the effect of competitive peers is not significant for this choice. We drop the low-track students in column (2). Since general education is not an option for them, they only add noise. However, the coefficients remain stable and insignificant. In terms of magnitude, the point estimates are not small, but they concern the difference between somebody with all competitive classmates versus no competitive classmates. If we look at the effect of 1 SD difference in competitiveness, the insignificant point estimate is approximately -1 percentage point.

Table A2: Effect on upper-secondary type choice

	All		Adv. track	
	(1)	(2)	(3)	(4)
Peers' Competitveness	-0.041	-0.076	-0.065	-0.077
	(0.09)	(0.11)	(0.13)	(0.16)
Female * Peers' Comp.				
Own Competitveness	0.002	0.001	0.005	0.005
	(0.02)	(0.02)	(0.03)	(0.03)
Observations	1229	1229	847	847

OLS estimators, robust standard errors clustered at class level in parentheses.
Outcome: 1 = Individual chose Baccalaureate as first post-compulsory education; 0 = otherwise.
Control variables: Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

C Robustness: Low-Track Students Only

We repeat our main regression for the low-track students only, because they cannot enter the university track and, therefore, this potential selection issue (which is unlikely, see Appendix B) cannot exist for them. The identifying variation comes from locations that have more than one low-track class (or, rarely, mixed classes that include low-track students). As shown in Table A3, the point estimates are even larger compared to Table 2 in the main text. The gender difference is again not significant, but the effect is significant for both boys and girls.

Table A3: Effect of Competitive Peers on Occupation's Expected Earnings

	Initial Occupation		Graduated Occupation	
	(1)	(2)	(3)	(4)
Peers' Competitveness	12573.02***	9632.06**	14590.15***	12070.02*
	(3694.61)	(4182.24)	(5049.35)	(6119.24)
Female * Peers' Comp.		5979.58		4941.94
		(6441.36)		(8549.21)
Own Competitveness	-862.87	-945.91	-508.42	-590.16
	(1003.30)	(1021.20)	(1084.48)	(1121.34)
Observations	370	370	337	337

OLS estimators, robust standard errors clustered at class level in parentheses. In Columns (3) and (4), the 30 individuals that have not graduated from an apprenticeship are excluded as well as 3 individuals who have changed to an occupation with missing data on expected earnings.
Control variables: Female; Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

D Robustness: Originally Desired Occupation

A unique feature of our data is that the students state their desired occupation at the same time as their competitiveness is measured. As shown in Table A4, peer competitiveness has no significant effect on this desired occupation's expected earnings. Since the occupational choice process in school is just about to start, this is not particularly surprising. However, when we use the difference between the expected earnings of the desired versus the initially started or graduated apprenticeship occupation respectively, the results shown in columns (3) to (6) are highly similar to the results shown in Table 2 in the main text.

Table A4: Effect of Competitive Peers on Occupation's Expected Earnings

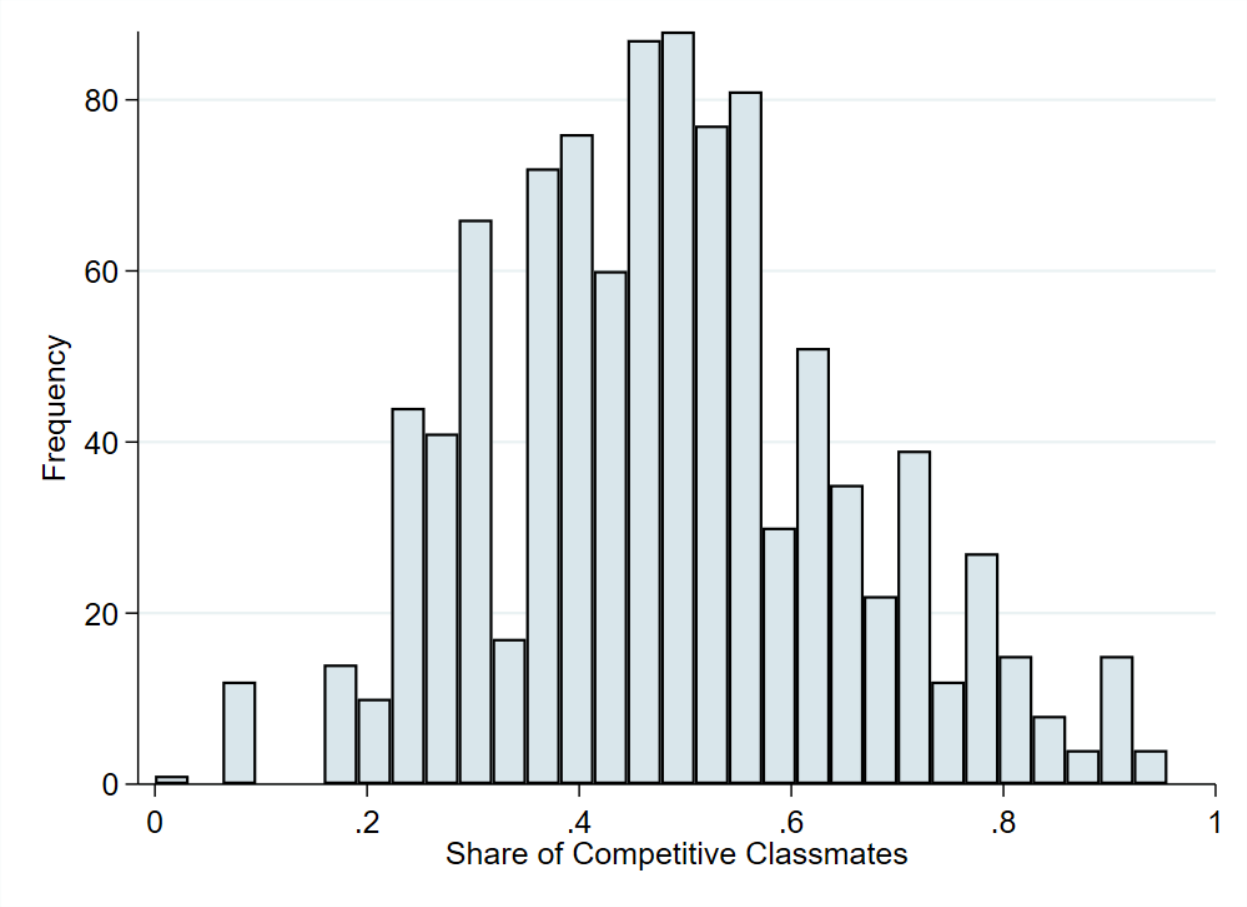
	Desired Occupation		Δ (Initial - Desired)		Δ (Grad. - Desired)	
	(1)	(2)	(3)	(4)	(5)	(6)
Peers' Competitveness	-1437	-247	8280**	6904*	7453**	7581*
	(4025)	(4849)	(3364)	(3562)	(3735)	(4017)
Female * Peers' Comp.		-3037		3506		-318
		(6040)		(5362)		(6021)
Own Competitveness	164	156	-866	-858	-926	-927
	(898)	(898)	(969)	(968)	(939)	(939)
Observations	873	873	862	862	811	811

OLS estimators, robust standard errors clustered at class level in parentheses. In all columns, people are missing who did not fill in a desired occupation that is one of the apprenticeship occupations. In addition, columns (3) and (4) do not include the 11 individuals that started an occupation with missing expected earnings data. Columns (5) and (6) miss the 6 individuals with missing expected earnings data on the occupations in which they graduated as well as the 45 individuals that have not graduated from an apprenticeship.
Control variables: Female; Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

E Sample Distribution of Peer Competitiveness

In our dataset, the share of competitive peer ranges from 0 to 95%. Figure A1 below shows the sample distribution for it.

Figure A1: Sample Distribution of Peer Competitiveness



F Reasons for Delayed Graduation

Table A5 disentangles the "Graduation Delay" examined in Table 4 into finer grained reasons for this delay. Students can change their education (either the occupation or changing to general education) or repeat one or multiple years in vocational school. Moreover, we distinguish changing to an occupation with lower requirements or to one with higher requirements. Having competitive peers leads to a significantly higher probability of both changing to an easier occupation and repeating a grade in vocational school. While there is no statistically significant gender difference in column (4), the point estimate for girls is more than twice that for boys and highly significant.

Table A5: Reasons for Delayed Graduation

	Changed edu.		Changed down		Changed up		Repetition	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Peers' Competitveness	0.17	0.10	0.15*	0.09	0.02	0.01	0.19**	0.19*
	(0.11)	(0.12)	(0.08)	(0.09)	(0.04)	(0.05)	(0.09)	(0.10)
Female * Peers' Comp.		0.15		0.15		0.02		-0.01
		(0.12)		(0.11)		(0.07)		(0.11)
Own Competitveness	0.01	0.01	0.01	0.01	0.01	0.01	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Observations	959	959	959	959	959	959	959	959

OLS estimators, robust standard errors clustered at class level in parentheses. The 49 individuals that have not graduated from upper-secondary level are excluded.
Outcomes: Changed edu.: changed apprenticeship occupation; Changed down (up): Changed apprenticeship occupation to one with lower (higher) requirements compared to the initial occupation; Repetition: repeated a grade in vocational school, prolonging the apprenticeship.
Control variables: Female, Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

G Students' Expectations

At the time of the second survey at the very end of 9th grade, all students that do not delay their apprenticeship know their apprenticeship occupation (as they have signed their contract) - with the some of the other students also having a good idea. The students were asked how much they think they will earn when they are 30 years old, once in case they do any tertiary education after the apprenticeship and once in case they do not.[15] In addition, they were asked if they aim to do such a tertiary education. The first two columns of Table A6 show the effects of competitive peers on the students' income expectations - i.e., we used the students earnings expectations with tertiary education for those that have indicated that they will likely or certainly pursue such education and their expected non-tertiary earnings for the others. The remaining columns show the same, but separately for students' expected income with and without tertiary education respectively.

Table A6: Effect of Competitive Peers on Students' Income Expectations

	Student Exp. Inc.		Non-Tert Inc.		Tertiary Inc.	
	(1)	(2)	(3)	(4)	(5)	(6)
Peers' Competitveness	23960**	24468**	10926	8880	19171***	20430***
	(9245)	(10385)	(7085)	(6687)	(6916)	(7606)
Own Competitveness	-717	1401	-590	202	-1095	96
	(1712)	(2073)	(1445)	(1582)	(1803)	(2003)
Observations	952	748	956	751	958	750

OLS estimators, robust standard errors clustered at class level in parentheses. We use the full sample in the odd columns (subject to them answering the relevant questions in the survey) and drop those students with delayed apprenticeship entry (who do not know their future apprenticeship occupation) in the even columns.
Control variables: Female; Non-cognitive skills (Risk choice; BRET choice; Locus of control; Overconfidence); GPA; GPA × Track; Peers' GPA; Track type; Score during comp. task; SES; Parent's degrees; Swiss nationality; Task type in competitiveness experiment; School × track type FE.
* p <0.1, ** p <0.05, *** p <0.01.

[15] They were asked about monthly incomes that we have multiplied by 12 for the analysis in Table A6. It is relatively common to pay 13 monthly wages in Switzerland (two in December), so the estimates in Table A6 are a lower bound in that sense.