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ORIGINAL PAPER

On the influence of parents and peers on occupational aspirations in Germany under special regard of secondary school track interactions

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Abstract

International research has established that significant others, such as parents and peers, can influence a student's educational or occupational aspirations. However, this research also reveals that influences differ by educational system, and the effects of peers are strongest in systems with low levels of stratification. For a long time, it was assumed that these effects were weaker in highly stratified systems, such as in Germany. However, our results using large-scale data ($N > 11{,}000$) indicate that the situation is more complex and parents and peers have different influences, depending on the secondary school track a student attends. Occupational aspirations are lower, on average, in non-academic tracks yet more diverse than in the academic track. Parents strongly influence students' occupational aspirations in the academic track, while peers are more relevant in non-academic tracks, where no parental effects are detectable. These results suggest that the influence of significant others is not uniform but rather complex as school track interactions are present. Reporting uniform effects in systems with strong tracking is problematic and needs to be reconsidered.

Keywords Occupational aspirations · Expectations · Tracking · Germany · Secondary schooling

Introduction

It has been convincingly demonstrated in past research that the influence of significant others on a student's aspiration is profound and long-lasting (Sewell et al. 1969, 2003). Significant others are individuals who greatly influence a student regarding his

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or her goals, norms, and values. These others are usually the parents, other relatives, friends, peers, or figures of respect (such as teachers, nurses, or priests). Following the classical arguments of the Wisconsin status attainment model, it has been argued for many decades that other people, such as parents, siblings, friends, or teachers, strongly influence the individual, shaping his or her values and norms. This concerns aspirations and expectations, which indicate (educational) pathways and outcomes a student will likely attend and achieve. In this context, we define educational aspirations as future educational qualifications a student hopes for (while expectations are educational qualifications that students realistically expect to obtain). Similarly, occupational aspirations describe the concrete positions a student wants to occupy in the labour market later in life (for example, being an engineer, doctor, or carpenter) or the approximate status (e.g., white-collar worker or blue-collar worker). In the context of this study, occupational aspirations were measured by surveying the actual occupation a student would like to have later in life. While this general influence of significant others on educational and occupational aspirations has been shown in past research, differential influences still need to be properly investigated, especially when contexts such as institutional settings are also considered. One of the first studies about peer influence on students' educational aspirations in different institutional settings reported that context matters. Influences are the strongest in countries with less educational stratification (e.g., USA or Norway) and weakest in strongly tracked countries (e.g., Germany or Switzerland) (Buchmann and Dalton 2002). This has been the first indication that influences originally believed to be universal can, in fact, actually have rather different effects. Follow-up studies for Germany with larger student samples have revealed that these initial findings probably do not hold (anymore), and peers and parents matter, even in the highly stratified system (Roth 2017). The German system is special as it has implemented strong and early tracking. Tracking means that students are sorted into different school types after elementary schooling.

While these newer results with better data are of greatest interest since they contradict previous results, they are only a starting point, and we have two distinct research questions to answer. First, how do occupational aspirations differ by school track? This question concerns not only average aspirations but also their distributions. Does the German implementation of tracking result in mean differences in aspirations and differences in how varied these aspirations are by school track? Second, as school tracks provide distinct social and learning environments, the question arises whether the effect that significant others exert on a student's aspirations works differently by school track. This tests whether the universal effect of peers on aspirations, as proposed in the older literature, is universal within the tracked system or whether the effects vary greatly by school track. To summarize, the following analyses will provide new insights to understand better how the complex interplay of parental, peer, and student aspirations function in a strongly tracked secondary school system.

Theoretical foundations and hypotheses

The German educational system and its consequences for the process of aspiration formation

Classically, the German educational system in secondary education has been tripartite (Eckhardt 2017). After completing primary schooling, lasting four years (children about ten years old), they can take three school tracks. Based on their prior academic performance and the recommendation of the class teacher in primary schooling, they were sorted (with parents having the opportunity to decide on a lower track but not a higher one since the teacher recommendation was binding in most federal states). In lower secondary education (*Hauptschule*), students were prepared for blue-collar occupations and vocational training, lasting five more school years. The intermediate school track (*Realschule*) offered access to white-collar vocational training, such as in banks. Finally, the academic school track (*Gymnasium*) prepared students for academic professions and offered access to all tiers of tertiary education. The system has slightly changed as the two lower tracks have been merged, and most federal states have introduced comprehensive schools (*Gesamtschulen*) as a fourth track. The main difference is that only the academic track allows direct access to tertiary education.

Due to other reforms and the introduction of bridging options, the dead-end character of the lower track is, however, mostly abolished as good academic performance enables students of all tracks to upgrade their education directly after completing a lower educational qualification and continuing their educational pathway. However, this requires further decisions from the students as it is not a direct pathway to higher education eligibility (HEE, Abitur). This distinction is relevant to the main research question, as educational pathways are still pre-determined. Nowadays, about 50% of a student cohort enters the academic track after primary schooling; these students are positively selected on ability on average (while the binding character of the teacher recommendation has been abolished in almost all federal states). These students display the highest educational and occupational aspirations. They will usually continue up to HEE (unless insufficient academic performance makes them drop out and switch to a lower school track).

In contrast to these students, the lower school tracks have much more variability. These students are usually negatively selected on ability and display lower aspirations (Bittmann and Schindler 2021). However, some might plan directly from the start to continue their education after completing a first qualification to get access to higher educational pathways such as better vocational training positions or even tertiary education. In addition to these selection effects (on initial ability), there are effects due to different curricula and what the school types were initially designated to achieve. On the one hand, the academic track trained students for academic professions, which is still its main goal concerning curricula (Schindler 2014). On the other hand, the non-academic school tracks do allow upgrading to HEE nowadays. However, it is different from what they are initially designed for, resulting in different curricula that are more aimed at preparing for vocational training.

To sum up, the German implementation of tracking creates rather distinct populations by school track (Traini et al. 2021). The academic track mostly consists of

high-performing, socially benefited students who have aspirations for the HEE and often for occupations that require some form of tertiary education. This is a rather homogeneous population. In contrast, in the non-academic school tracks, students either do not perform well or do not hold high aspirations. As these two factors are not perfectly correlated, there are high-performing students with low aspirations (since they are not interested in any tertiary education, even if they could achieve it) but also low-performing students with high aspirations (these students are usually from socially benefited families where the parents have high aspirations, yet these students do not perform well enough in school to have the requirements for the academic track). Moreover, research indicates that there are diverse reasons why some students with initially high aspirations do not choose the academic track (Bittmann 2023). This means that student aspirations are rather uniform in the academic track but more diverse in the non-academic tracks. Based on these theoretical expectations, we derive two testable hypotheses: occupational aspirations are higher in the academic track than in the non-academic track, on average (H1). The variation of occupational aspirations is higher in non-academic school tracks than in academic one (H2). These initial hypotheses serve as a starting point when discussing further theoretical expectations.

The influence of significant others

As the Wisconsin model of status attainment outlines, significant others can have a huge impact on aspirations (Sewell et al. 1969; Sewell and Hauser 1993). In general, a significant other can be any individual who has a long-lasting and profound influence on a child and transmits his or her beliefs, goals, norms, or values to the child. In this analysis, we will focus on occupational aspirations (also known in the literature as expectations, especially when realistic aspirations are investigated).[1] These significant others are, first and foremost, the parents, as they raise and educate a child from the very beginning, teaching them about ethics, values, and norms in life. They transmit their beliefs to the child, which usually accepts them without questioning them rationally[2]. There are also additional ways, which are especially explained by social capital approaches. The parents can support the child with their resources, for example, by providing a protected and well-equipped learning environment or tutoring the child. Similar aspects are relevant for the child's friends and peers, especially in secondary education, when children have entered puberty and become more independent of their parents. These friends can also provide social support, and goals and values are often transmitted and shared within a circle of peers. In the context of

[1] In the context of this analysis, realistic aspirations (often also termed expectations) measure what a student can realistically achieve, considering all limiting factors, such as grades, or social and financial resources. Idealistic aspirations measure wishes and desires regardless of any limitations, providing a broader perspective on a student's aspirations.

[2] In this framework, the aspirations of significant others are often viewed as a (rather static) antecedent. However, newer results also outline that parental aspirations and some filial characteristics, such as academic achievement, can co-develop dynamically over time (Bittmann 2022). This dynamic co-development of aspirations and characteristics is an area that deserves more attention in studies with suitable data available to investigate this aspect in more detail.

secondary education, it is obvious that a student spends much time in this peer group, especially in the classroom, as school can last more than six hours every single workday. These general assumptions lead to the second research question. Do the effects of significant others on occupational aspirations differ by the school track a student attends? As argued above, aspirations are rather uniform in the academic track as most students aspire to higher education eligibility and potentially an occupational position requiring tertiary education.

Furthermore, students were already selected on ability and initial aspirations, which explains the overall homogeneity in this school track. Consequently, it is fair to assume that the influence of significant others is small since the goals are rather pre-determined and homogeneity is high. This picture looks quite different in the non-academic tracks (Lorenz et al. 2020). If aspirations are rather diverse and less homogeneous, each student potentially has diverse aspiration patterns in his or her peer group. Some students want to finish their education quickly to enter the labor market and start earning money; others want to continue their education, maybe even into higher education. Regardless of a student's aspiration, this diversity might have a bigger impact. Some students potentially downgrade their aspirations as they learn that vocational training allows them to earn money sooner and become independent. Others might upgrade their aspirations as they understand, for the first time in their life, that sequential upgrading education is possible, and academic professions provide a much higher income later in life. Based on these assumptions, the following hypothesis is derived: the influence of significant others on a student's occupational aspirations is higher in the non-academic tracks than in the academic track (H3).

State of research

A recent study using German NEPS data focusing on educational aspirations (in contrast to occupational ones) reports highly significant influences on aspirations by parental and peer aspirations (Roth 2017). Recent results also outline that the application of the Wisconsin model, even when already rather old, is still highly relevant and adequate in the German context (Zimmermann 2019). It has been shown that shared norms and values, as predicted by the model, are relevant, much more so than sharing information and knowledge (Helbig and Marczuk 2021). While these results are of robust quality and interesting, they do not investigate the effects of interaction with school tracks. Furthermore, educational aspirations are less relevant in the German system as the type of final degree is pre-determined to some extent already by the track a student is on in secondary education. Consequently, there is less variation regarding this binary outcome variable. What is known is that the aspirations of parents and students do develop already earlier in primary schooling in a flexible process where feedback loops are present (Bittmann 2022). Interestingly, these results contradict earlier results that report no influence of peers or parents on aspirations for Germany (Buchmann and Dalton 2002). Overall, while rather influential for the international comparison of countries and systems, there are valid points of criticism regarding this study from 2002, such as the measuring peer and parent aspirations, which only refers to achievement in mathematics and not overall educational success. Follow-up studies also came to different conclusions and reported significant

influences of parents and peers on aspirations (measured jointly) (Schuchart 2010; Watermann and Maaz 2006). Some more studies support these findings for Germany (Roth 2014; Salikutluk 2016). A study from Switzerland, where secondary school tracking is also implemented, demonstrates that aspirations work differently by school track (Ackermann and Benz 2023) and that school tracks are associated with different trajectories of aspiration development (Basler and Kriesi 2019). In Austria, where a similar tracking system is in place, we also see rather diverse occupational aspiration patterns, which are, to some extent, linked to the tracking itself (Valls et al. 2022). Overall, while some other studies demonstrate the highly relevant influence of significant others on various aspirations or educational outcomes, such as finding an apprenticeship (Roth 2018), there is little evidence for school-track differentials. Up to now, it is rather unknown whether peer and parent aspirations work differently, depending on the place in the educational system a student is in. Based on the theoretical expectations discussed before, this is a highly relevant issue in the field of research due to the strong tracking in Germany.

Data, variables and methods

Data and sample

To answer the research questions, the National Educational Panel Study (NEPS) is utilized (Blossfeld and Roßbach 2019a).[3] The NEPS is the most ambitious research project centered around education in Germany as it includes multiple cohorts, ranges across the entire Federal Republic of Germany (in contrast to smaller studies, that only include selected federal states) and surveys respondents and their families multiple times. It provides panel data for various age groups, including a rich set of variables concerning overall educational pathways and comprehensive test scores, psychological measurements, sociodemographic background, and many more. The NEPS has been implemented to study how students develop over time, which renders it the best source for our study goals. Not only does the NEPS survey students about their occupational aspirations (through the occupations students want to have later in life) but it also amends this raw information with other data to generate continuous measurements of aspirations, such as the ISEI. By surveying students multiple times and including many aspiration-related items, even more information is gathered. This makes the NEPS the first choice when studying educational processes in Germany. To be concrete, starting cohort 4 is used. The population of this cohort is defined as all students in secondary school in the ninth grade in Germany in the school year 2010/11. The average age of these students was about 15 years in January 2010; almost all students attended grade 9 in the first survey wave (Autumn 2010). In Germany, grade 9 is the last grade common to all schooling tracks. The lower tracks are usually completed after grade 9, and students enter another school track, either by

[3] This paper uses data from the National Educational Panel Study. The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network (doi: https://doi.org/10.5157/NEPS:SC4:13.0.0).

entering the dual system (vocational education) or continuing their education within the system (by switching to another school track, such as the academic track). This is a good constellation for the posed research questions since students are already old enough to have formed their own aspirations and goals in life. They also have spent at least nine years in the educational system and have enough knowledge to decide whether they want to continue their education or enter the labor market as quickly as possible.

Nevertheless, they are still in a rather homogeneous context (the classroom or school context), which facilitates the survey process, especially the competence testing. To respect the arrow of causality, the main dependent variable (aspirations) is from wave 2 of the survey (surveyed April to August 2011). The main independent variables (peer and parent aspirations) are measured in wave 1 (surveyed from October 2010 to August 2011). Therefore, the issue of potential reverse causality is amended. The sampling frame consists of 16,106 students participating in wave 1, which is restricted for the following analyses. First, students attending some school forms are removed (special needs schools, Waldorfschulen, or unclear school tracks), which leaves 14,701 students. Second, students lacking information on the key dependent variable (aspirations) are removed. This leaves a total of 11,348 students for analyses. Other forms of missing data are imputed, as explained in more detail below.

Operationalization

The dependent variable of all analyses is realistic occupational aspirations. This information is surveyed as follows: "Based on everything you currently know, what trade/kind of job will you most likely have later on?" The free text response was coded according to the German scheme of occupations (*Klassifikation der Berufe*) and numerically coded with the ISEI values. The ISEI (2008 classification) assigns a numerical value between 11.5 (cleaner) and 88.96 (judge), where higher values represent a higher occupational status. By doing so, aspirations can be treated as a continuous variable in all analyses. We opted for realistic aspirations as they are the more relevant outcome variable. Idealistic aspirations do not take any limitations into account and only survey ideals or wishes. In our view, the realistic aspirations are more relevant as further educational and occupational trajectories depend on the limitations students face.

Parental aspirations are measured using two items: "How important is it to your parents that you (a) get good grades at school and (b) get ahead professionally one day?" The responses are measured on a Likert scale with five values ranging from 1, "not important at all," to 5, "very important". The values of both items are averaged; Cronbach's alpha of this measurement is 0.82. Peer aspirations are measured using four items: "To what extent do the following statements apply to your friends? (a) Most of my friends are very ambitious at school. (b) Most of my friends expect me to try very hard at school. (c) Most of my friends don't care how well they do at school. (d) For most of my friends it is very important to advance professionally in the future." The same Likert scale is utilized; the third item is reversed to compute the average of all responses. Cronbach's alpha of this scale is 0.61. Both scales are

developed and validated by the NEPS team (Hoenig et al. 2016). The generated items are adequate to measure peer and parent aspirations since they include the relevant conceptual information and are, especially, measured as the *perceived* aspirations. As recent research has shown, distinguishing between perceived and factual aspirations of peers is relevant and can lead to different conclusions (Schörner and Bittmann 2023).

The type of school track has two levels: students in the *Gymnasium* (academic track) or in a comprehensive school with specialized track to HEE are coded as on the academic track (code 1). Students on all other school forms (*Hauptschule*, *Realschule*, or comprehensive school with mixed tracks, or not directly leading to HEE) are coded as non-academic tracks (code 0). Further tests have shown that providing a more detailed level with four tracks does not lead to different results as the non-academic tracks are rather homogeneous. Hence, the clearer two-track distinction has been chosen, which also simplifies the interpretation of all results.

In the regression models, we utilize a large number of control variables. These variables are necessary since track placement, a student's aspirations, and peer aspirations depend on social background and context. By including relevant control variables, we would like to account for these factors so that the adjusted effect of peers on aspirations can be measured. Note that this control approach is an approximation, and it is impossible to estimate pure causal effects using observational data. Social origin is measured using three different variables, which have been established as relevant in educational inequalities (Blossfeld 2019b; Schörner and Bittmann 2023). Using multiple indicators, we can account for various potential confounding mechanisms of social origin, which is beneficial for robust results.

1. The highest educational degree in the household of either father or mother, measured with three levels: below HEE (No degree, *Hauptschulabschluss*, *Realschulabschluss* = *0*), any HEE = 1, any tertiary degree = 2).
2. The highest ISEI in the household, based on the occupation in the labor market of either the mother or father, ranges from 11 to 90, with higher values representing a higher occupational status.
3. The total logged household income is adjusted for the number of individuals in the household (OECD definition).

The student's academic performance is controlled using school grades in mathematics and German, measured in wave 1 (the values have been recoded to 0 to 5, with higher values representing better grades for a more convenient interpretation). Furthermore, comprehensive NEPS tests, conducted in the classroom context in wave 1, are utilized as they are a more objective measurement of performance (mathematics and reading) and are independent of the school track (the same tests have been administered by the NEPS in all tracks and classrooms). These scores are z-standardized.

Sociodemographic characteristics are also controlled for. First, the gender of the student is included, as well as age, computed for October 1, 2010. The migration status is measured using four levels: student born in Germany to German parents = 0, student born abroad = 1, one parent born abroad = 2, and both parents born abroad = 3. The total number of individuals in the household is the last control variable. We argue

that these controls are relevant since they can act as confounders (influence the cause and the effect at the same time, leading to wrong conclusions).

Strategy of analysis

Linear (OLS) regression models are utilized to answer the research questions since the dependent variable (occupational aspirations, measured on the ISEI scale) is continuous. To make the best use of the data, classroom fixed-effects (FEs) are applied. Doing so accounts for all characteristics shared within a classroom, such as type of track, teachers, social composition, financial resources of the school, and place of residence. This is a great benefit of the current dataset as it accounts for much across-classroom heterogeneity. By taking care of these aspects, the results are made more robust and are better able to approximate causal effects. To account for even further potential confounding, relevant individual characteristics are added as control variables, which are gender, age in 2010, grades in German and mathematics in school grade 9, NEPS competence test scores in mathematics and reading, highest parental education level, highest parental ISEI level, logarithmized household income (OECD household equivalent), migration status and size of the household. While this cannot guarantee the computation of pure causal effects, most potential confounders are accounted for. The main statistics of interest, the regression coefficients for peer and parent aspirations, and their interaction with the type of track attended in grade 9 can still be estimated even with classroom FEs. A nested regression design is chosen to disentangle the various influences carefully. Multiple imputations with chained equations are applied to account for missing information (50 imputed datasets). In this process, many additional auxiliary variables are included, such as place of residence or language spoken at home. As parental items usually have the highest shares of missingness, information from the student's questionnaire is utilized to predict parental social status (for example, the number of books at home or possessions within the household). The convergence of the imputation approach has been tested graphically and approved. All results are computed with Stata 16.1. Some figures are created using the additional Stata packages coefplot and vioplot.

Results

Descriptive findings

The comparison of average occupational aspirations over different school tracks is of greatest interest. A graphical summary is given in Fig. 1. On the left side, arithmetic means, and standard deviations are provided. Here, it becomes obvious that occupational aspirations, measured by the ISEI of the realistically aspired occupation reported by the students, are much higher in the academic track than in the non-academic tracks. The difference amounts to more than 22 points (on a scale ranging from 11 to 88. To test numerically whether the two groups are statistically different, we utilize *t*-tests and compute p-values. The result is that the difference is statistically highly significant ($p < 0.001$). The variation of aspirations is larger in the non-

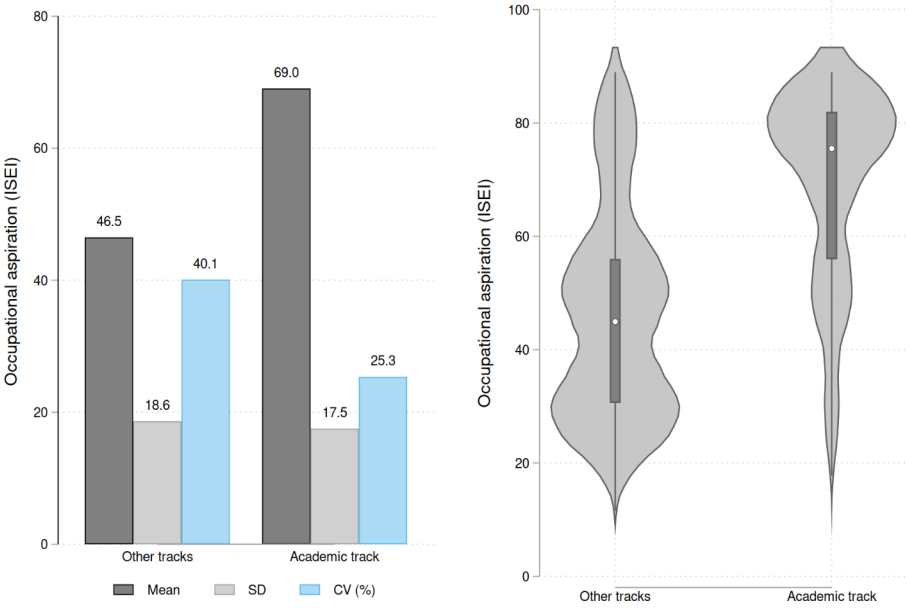

Fig. 1 Bar graphs (left panel) and violin plots (right panel) of occupational aspirations by school track. *Source* NEPS SC4, imputed data ($N = 11{,}348$; M = 50). *SD* standard deviation, *CV* coefficient of variation (SD / Mean)

academic tracks than in the academic track. Here, the difference is about one point. Statistically, the ratio of the two variances deviates significantly from 1 ($p < 0.001$). Note that, while the difference between the two standard deviations amounts to little more than one point (18.6 vs. 17.5), the coefficient of variation (CV) is more suited to reveal the amount of variation (the CV is obtained by dividing the standard deviation by the mean). This statistic is 40.1% in the non-academic tracks but only 25.3% in the academic track. This demonstrates that occupational aspirations are much more diverse in the non-academic school tracks.

On the right side of the graph, violin plots, which combine box plots with kernel-density plots, are provided. For the non-academic tracks, one can see two modes, one around 50 ISEI points and the other around 30 points. These bulges refer to blue-collar and white-collar occupations that require vocational training, while there are only very small shares of students with academic aspirations (ISEI 70 or above). For the academic track, this picture is very different as most students report an academic aspiration, and only a few report a white-collar vocational training position or below. Summarized, these results indicate that hypotheses 1 and 2 can be accepted. Finally, the appendix provides a table with descriptive statistics for all relevant variables in the study (Table A1) and an overview of the distribution of the two main independent variables (parental and peer aspirations, Figure A1).

Regression results

Next, the regression models are presented. In total, there are five different models. Each contains all control variables, but parent and peer aspirations are tested separately for maximum insight. The first model includes parental aspirations, and the second includes peer aspirations. The third has both types of aspirations together. The fourth includes parental aspirations and their interaction term with the type of school track, and the fifth one includes peer aspiration and its respective interaction term with tracks. Note that the main effects of track cannot be estimated in these classroom fixed-effects models since it is a constant within each classroom. The results are presented in Table 1. 95% confidence intervals are included. The average number of participating students per classroom is 11.8.

For M1, we see that the coefficient for parental aspirations is about 0.293, meaning that for each point more on the 5-point Likert scale of parental aspirations, the occupational aspirations increase by about 0.293 points. However, this result is statistically insignificant on the 5% level as the 95% confidence interval includes zero. For M2, when peer aspirations are tested, the result is similar, with the same conclusions. In M3, when both variables are tested together, their respective effect size remains stable, meaning that both types of aspirations work independently. Nevertheless, it has yet to have a meaningful impact. One could conclude from this result that neither parental nor peer aspirations influence a student's aspirations in a model where controls are applied. However, this interpretation changes when the interaction with the school track is tested in models M4 and M5. Here, statistically significant effects of the interaction terms are reported. For a more convenient interpretation, Fig. 2 is generated, which shows the computed regression coefficients with 95% confidence intervals of parent and peer aspiration by school track. The conclusions are interesting. Parental aspirations only affect individuals in the academic track but not students in any other secondary school track. The exact opposite is the case for peer aspirations. This type of aspiration is only relevant for students in the non-academic track but not for students in the academic track. These findings are statistically significant on the 5% level. The added benefit of the interaction effects is also outlined by the increased adjusted R^2 values (adding about five points in M4 and M5).

Regarding hypothesis 3, no simple conclusion emerges. While peers are more relevant in the non-academic tracks, only the parental aspirations show effects in the academic track. Consequently, it is not possible to state that the influence of significant others is, in general, stronger in the non-academic tracks than in the academic track. We reject hypothesis 3, since it is stated too broadly.

Discussion

To summarize the results section, the findings are quite peculiar. As the first descriptive analyses have outlined, occupational aspirations differ clearly between the academic secondary schooling track and all other tracks as aspirations are, on average, much higher in the academic track. This finding itself is not highly surprising, since tracks are intended to select on abilities and higher abilities correlate with higher

Table 1 OLS regression results

	M1	M2	M3	M4	M5
Parental aspirations	0.293		0.248	0.053	
	[−0.13,0.72]		[−0.18,0.68]	[−0.42,0.53]	
Peer aspirations		0.545	0.501		0.856*
		[−0.06,1.15]	[−0.11,1.12]		[0.16,1.55]
Academic track X Parental aspirations (Interaction term)				0.970*	
				[0.04,1.90]	
Academic track X Peer aspirations(Interaction term)					−1.061
					[−2.32,0.20]
Female student	6.366***	6.264***	6.304***	6.393***	6.272***
	[5.53,7.20]	[5.42,7.10]	[5.46,7.15]	[5.56,7.23]	[5.43,7.11]
Age in 2010	−0.869*	−0.902**	−0.894*	−0.864*	−0.907**
	[−1.55,−0.19]	[−1.58,−0.22]	[−1.57,−0.21]	[−1.54,−0.18]	[−1.59,−0.23]
Math test score	1.371***	1.367***	1.376***	1.382***	1.369***
	[0.82,1.92]	[0.82,1.91]	[0.83,1.92]	[0.83,1.93]	[0.82,1.92]
Reading test score	1.181***	1.193***	1.190***	1.197***	1.184***
	[0.69,1.68]	[0.70,1.69]	[0.70,1.69]	[0.70,1.69]	[0.69,1.68]
Grade Math	1.240***	1.237***	1.241***	1.241***	1.241***
	[0.81,1.67]	[0.81,1.66]	[0.81,1.67]	[0.81,1.67]	[0.81,1.67]
Grade German	2.797***	2.783***	2.777***	2.798***	2.791***
	[2.25,3.34]	[2.24,3.33]	[2.23,3.32]	[2.25,3.34]	[2.25,3.34]
Highest parental education					
Below HEE	Ref.	Ref.	Ref.	Ref.	Ref.
HEE	1.843**	1.839**	1.836**	1.851**	1.841**
	[0.62,3.07]	[0.61,3.07]	[0.61,3.06]	[0.62,3.08]	[0.61,3.07]
Tertiary	3.300***	3.295***	3.311***	3.354***	3.276***
	[1.83,4.77]	[1.83,4.76]	[1.85,4.78]	[1.89,4.82]	[1.81,4.74]
Max. Parental ISEI	0.049**	0.049**	0.049**	0.048**	0.049**
	[0.02,0.08]	[0.02,0.08]	[0.02,0.08]	[0.02,0.08]	[0.02,0.08]
Log. equivalent HH income	1.707*	1.696*	1.697*	1.696*	1.692*
	[0.39,3.03]	[0.37,3.02]	[0.38,3.02]	[0.38,3.01]	[0.37,3.01]
Migration status					
Native	Ref.	Ref.	Ref.	Ref.	Ref.
Born abroad	7.125***	7.174***	7.122***	7.093***	7.164***
	[5.38,8.87]	[5.44,8.91]	[5.38,8.86]	[5.35,8.83]	[5.43,8.90]
One parent born abroad	2.191***	2.203***	2.165***	2.154***	2.201***
	[0.98,3.40]	[1.00,3.41]	[0.96,3.37]	[0.95,3.36]	[0.99,3.41]
Both parents born abroad	5.154***	5.195***	5.121***	5.112***	5.175***
	[3.82,6.49]	[3.86,6.53]	[3.79,6.46]	[3.78,6.45]	[3.84,6.51]
Individuals in HH	−0.201	−0.211	−0.207	−0.198	−0.212
	[−0.50,0.10]	[−0.51,0.09]	[−0.51,0.09]	[−0.50,0.10]	[−0.51,0.09]

Table 1 (continued)

	M1	M2	M3	M4	M5
Constant	34.243***	34.415***	33.366***	33.900***	34.628***
	[20.25,48.24]	[20.52,48.31]	[19.36,47.37]	[19.91,47.89]	[20.74,48.52]
Adjusted R^2	0.315	0.315	0.315	0.367	0.368
Number of classrooms	959	959	959	959	959
Observations	11,348	11,348	11,348	11,348	11,348

Source NEPS SC4, imputed data (M = 50). Classroom fixed-effects applied with robust standard errors. 95% confidence intervals included in brackets. *HH* household, *HEE* higher education eligibility. R^2-values reported from regular OLS models without clustering. Unstandardized coefficients. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

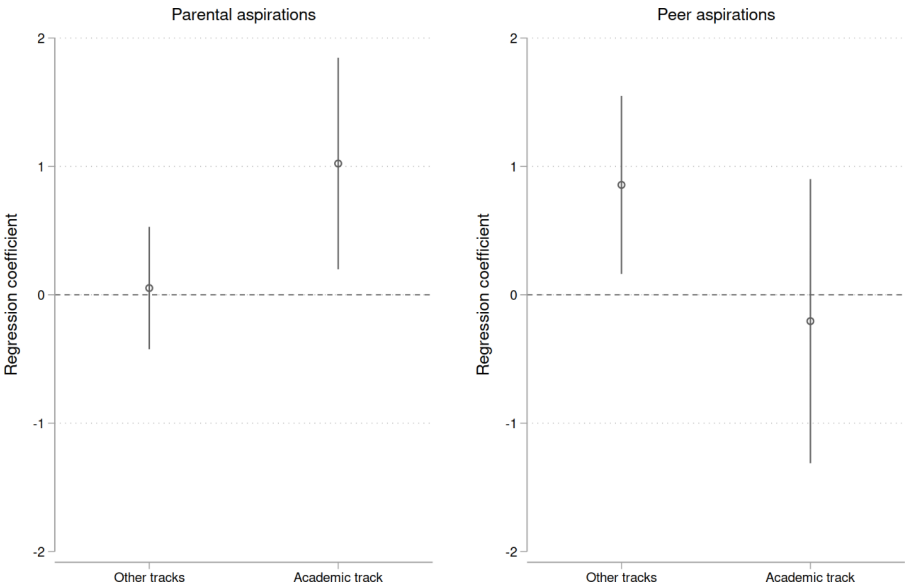

Fig. 2 Coefficient plots for parent and peer aspirations by type of track.
Source NEPS SC4, imputed data (*N* = 11,348; M = 50). Results based on M4 (left panel) and M5 (right panel). 95% confidence intervals included

aspirations. However, the aspirations are also more homogeneous in the academic track, as most students aspire to an academic profession. This is very different in the non-academic school tracks where aspirations are highly diverse. Here, while many students aspire to non-academic professions, some still do. Thanks to sequential upgrading, fulfilling these high aspirations is indeed possible in the German system. What these results indicate is that aspirations are quite diverse in the non-academic tracks, which creates a special learning environment. In contrast to the academic track, where almost all peers hold similar high aspirations, the peer aspirations are heterogeneous in the non-academic tracks. This is a sign that the influence of peers and parents might work differently in these school tracks. And indeed, there are solid empirical results that support this first impression.

When the influence of parent and peer aspirations on a student's aspirations are investigated in more detail in the multivariate analyses, the first conclusions might hint at a null effect. Both variables are not statistically significant on the 5% level, and the effect sizes are close to zero. This finding is in line with older publications, where the same conclusions were reached for the highly stratified German system (Buchmann and Dalton 2002). However, the most interesting conclusions appear only when the interactions with school track are finally considered. They can be summarized as follows: Aspirations work indeed differently for different school tracks. Parental aspirations only affect a student's occupational aspirations in the academic track but not in the other school tracks, while the exact opposite finding is true for peer aspirations. This also means that not all aspirations are created equal, and whether the parents or the friends hold them makes a difference. This is rather surprising, and only few theoretical foundations are available as a resolution. At this point we would like to discuss some potential explanations, even if we cannot back them up with much empirical evidence.

To start with the students in the non-academic school tracks, we have seen that average aspirations are much more diverse, which means that each student is likely to meet other students who have different aspirations from themselves. As our empirical results indicate, higher peer aspirations have a *positive* effect on aspirations, which means that potentially students with initially low aspirations are affected positively. Some students will learn through others that it is even possible to use sequential upgrading to reach higher educational and occupational qualifications, which might lead to increasing occupational aspirations. Since the average social status is lower in the non-academic tracks, students in these tracks might receive little support and guidance from their parents but the diverse peer group might take over their function to some extent.

The situation in the academic school tracks is much different since the peers have homogeneous and high aspirations, on average. Potentially, parents are the most relevant group of social support for students in the academic track. As the average social status is high and parents know better how to navigate the school system and can provide material resources and information, they are the most relevant form of significant others. Potentially, the influence also happens on a higher level, so to speak. Since higher education eligibility, the access to tertiary education, is the default outcome of the academic track, there could be diverse *academic* aspirations. Some parents want their children to reach the highest social levels (like becoming a doctor or lawyer), while others are fine with any white-collar labour market position. This could explain why the parents are of larger influence in the academic tracks where peer aspirations are homogeneous. Unfortunately, it is not possible to test these assumptions with the current data since peer and parent aspirations are *relative* measures and cannot be compared across tracks.

Also keep in mind that these first ideas require a much deeper analytical dive into social structures, selection effects, and psychological aspects, which might be highly relevant for future research. At this point, we can conclude the following: the influence of significant others on a student's occupational aspiration is more complex than known until now. In systems with a strong stratification, such as in Germany, the tracking does not cancel the influence but leads to stratified effects. Consequently, if

one is interested in drawing conclusions about such systems or implementing interventions, it would be foolish to assume that no effects exist. However, it is necessary to study subgroups of interest. Starting points for follow-up studies are: How do students in different tracks differ in social background and peer composition, family climate, and psychological traits? These differences are potentially relevant to explain better why parent and peer aspirations matter differently. Institutional effects, such as the influence of teachers or curricula, might also be worth studying. Earlier studies have given some support to these claims (Lorenz et al. 2020; Traini et al. 2021).

Finally, the limitations of the study must be discussed. First, while one can assume that students in grade 9 have some plans about their future and the occupations they are interested in, the dependent variable aspirations come with a measurement error. Furthermore, students could only report a single occupation in the survey and not a range of potential occupations they are interested in. Second, even when selecting variables attempts to rule out reverse causality, students have already spent some years in their respective classrooms with their friends (the same applies to friends outside of the current classroom). This means that a separation of cause and effect is highly problematic, which also holds for parental aspirations. Consequently, one should carefully interpret the findings as causal effects. Especially in these social settings where different groups act together in the same environments for many years, such separation is potentially even unfeasible regardless of how the data are surveyed. Third, peer and parental aspirations are measured as reported by the students. This means that these variables measure how the students *perceive* these aspirations; the factual aspirations are unmeasured. In the context of this study, we would argue that perceived aspirations are indeed the more relevant ones. Factual peer and parent aspirations are worthless if the student does not receive or understand them, so the perception is of special relevance. We would like to emphasize that this differentiation is important and using factual peer and parent aspirations might lead to slightly different conclusions (Schörner and Bittmann 2023). Finally, participating in the NEPS survey is voluntary. This means that there are student in each classroom that do not participate in the NEPS yet still have their aspirations and can transmit them to others. The average size of participants per classroom reported above is much smaller than the average classroom size in Germany. This is another limitation, as the influence of some peers is unmeasured.

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Data availability Data are available after registration as a researcher from https://doi.org/10.5157/NEPS:SC4:13.0.0.

Code availability Stata do-files are available from the author upon request.

Declarations

Conflict of interest The author declares that he has no conflict of interest.

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