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SCHWERPUNKT

Are there differences in ethnic majority and minority adolescents' friendships preferences and social influence with regard to their academic achievement?

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Abstract Research has established that adolescents both befriend peers based on their academic achievement and adjust their own achievement to that of their friends' over time. However, these processes may be different for ethnic minority students, because some of them may adhere to an oppositional culture that rejects striving for academic success. We examine respective differences between self-identified ethnic minority and majority students using longitudinal social network analysis (stochastic actor-oriented models) in a sample of 1175 students (aged 13) from 12 grade-level networks in Germany secondary schools. Among the students, we find that academically successful students in particular prefer friends with high grades, but that students with poor grades exert more social influence on their friends to adjust their performance. Moreover, while minority students are indeed less inclined to select friends with higher grades, both ethnic majority and minority youth prefer friends with similar academic achievement and are similarly influenced by their friends' achievement. However, social influence is stronger from same-ethnic than from inter-ethnic friends. In sum, there is mixed evidence for an oppositional culture among ethnic minority students in our sample.

Keywords Academic achievement · Ethnicity · Oppositional culture theory · Social network analysis · Social influence

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Unterscheidet sich die Bedeutsamkeit von Schulleistungen für Freundschaftswahlen und soziale Beeinflussung zwischen Jugendlichen der ethnischen Mehrheit und ethnischen Minderheiten?

Zusammenfassung Studien haben gezeigt, dass schulische Leistungen sowohl für die Entstehung von Freundschaften von Jugendlichen bedeutsam sind als auch wiederum von Freunden beeinflusst werden. Diese Prozesse könnten sich jedoch für Schüler der ethnischen Mehrheit und ethnischen Minderheiten unterscheiden, da einige von letzteren einer „oppositional culture" anhängen könnten, die dem Streben nach guten Noten im Weg steht. Wir untersuchen entsprechende Unterschiede zwischen sich selbst als Angehörige ethnischer Minderheiten bezeichnenden Jugendlichen und Jugendlichen der ethnischen Mehrheit mittels einer längsschnittlichen Netzwerkanalyse von 12 Jahrgangsnetzwerken in deutschen Schulen (1175 Schüler im Alter von 13 Jahren). Es zeigt sich, dass vor allem Schüler mit guten Noten Freunde mit guten Noten bevorzugen, Schüler mit schlechten Noten die Noten ihrer Freunde aber stärker beeinflussen. Schüler aus ethnischen Minderheiten neigen weniger stark dazu, Freunde mit guten Noten zu wählen. Sowohl Mehrheits- als auch Minderheitsschüler bevorzugen allerdings Freunde mit ähnlichen Schulleistungen, und beide werden in ähnlicher Weise von ihren Freunden beeinflusst. Freunde der gleichen ethnischen Herkunft beeinflussten Schulleistungen allerdings stärker als interethnische Freunde. Hinsichtlich einer „oppositional culture" fallen die Befunde demnach gemischt aus.

Schlüsselwörter Ethnizität · Oppositional Culture Theory · Schulleistungen · Soziale Netzwerkanalyse · Soziale Beeinflussung

1 Introduction

Ethnic minority students in German schools show lower academic performance than their ethnic majority classmates, are more likely to repeat a school year, and have higher risk of being transferred to a school of a lower academic track (Siegert and Olszenka 2016). These patterns are mirrored in many other European countries where ethnic minority groups disproportionally attend schools of the lower academic tracks. Various explanations for this disadvantaged position of ethnic minority students have been identified, most importantly referring to parental socioeconomic background (Heath et al. 2008; Dollmann 2016), but also to language skills (Van de Werfhorst and Van Tubergen 2007), teachers' expectations (Van den Bergh et al. 2010), and school characteristics (Agirdag et al. 2012).

Peer effects provide another potential explanation for ethnic minority students' lower academic performance. On the one hand, it has long been established that friends generally play an important role in the social, behavioral, and attitudinal development of adolescents because norms and behavioral expectations develop within friendship groups (Coleman 1988). Friends influence each other's classroom engagement and school motivation (Kindermann 2007) through providing information, modeling peer norms with regard to achievement, and reinforcing following of

these norms (Bandura 1977; Harris 1995). On the other hand, adolescents prefer to have friends who are similar to themselves, which includes having the same ethnic background (Stark and Flache 2012; Leszczensky and Pink 2015) and performing similarly in school (Quillian and Campbell 2003; Flashman 2012a). With regard to ethnic minority students' educational performance, the combination of this preference for similar friends and peer influence could lead to a negative Matthew-Effect (Merton 1968): they might disproportionally befriend fellow ethnic minority peers who do not perform well in school and be subsequently negatively influenced by these friends.

The present research investigates whether there is evidence for such a downward spiral among ethnic minority students in German schools. To this end, we study whether students select friends based on academic performance and whether friends influence each other's performance. Using advanced longitudinal network analysis, we disentangle friendship selection from influence processes while accounting for potential differences in these processes between ethnic minority and majority members.

1.1 Social influence and selection in academic achievement

Next to the family and the school context, research on adolescents' academic achievement has identified the peer group as a crucial determining factor (Ryan 2000). Whether students develop better or worse grades thus partly depends on whether they spend time with high- or low-achieving peers, as these may either encourage or reduce their motivation to learn and to engage with school (Altermatt and Pomerantz 2003; Kindermann 2007). Both the group norm theory (Cialdini and Goldstein 2004) and the group socialization theory (Harris 1995) predict that adolescents adopt the pro or anti-school norms of their peer group in order to belong and that adhering to norms is enforced within such groups. Peer groups further serve as a reference point with which students compare their own performance (Festinger 1954). In particular, high-achieving students may act as normative role models who increase their friends' educational motivation and help them to learn (Coleman 1988). Low-achieving peers, by contrast, may likewise set a negative example by following an anti-school norm and thereby reduce their friends' educational motivation.

It is thus no surprise that research has found friends to shape adolescents' educational outcomes both positively and negatively by directly influencing their friends' grades (Ryan 2001; Flashman 2012a; Rambaran et al. 2016), by protecting each other from academic failure (Crosnoe et al. 2003), and motivating more advanced course taking (Riegle-Crumb et al. 2006). Because of these social influence processes, friends tend to become more similar over time in terms of their motivation and achievement in school. If students tend to select friends who are performing well in school and subsequently adjust their own performance to that of these friends, social influence thus could reduce inequality between high- and low-achieving groups.

This leads to the following hypothesis:

H1: Students adjust their own school performance towards that of their friends (social influence).

Unfortunately, an alternative mechanism exists that may reinforce rather than diminish inequality between low- and high-achieving groups, but that is difficult to distinguish from social influence because it also leads to similar achievement levels among friends. The formation of friendships in a school class is a dynamic process that is dominated by students' preference to become friends with similar peers (for an overview, see Brechwald and Prinstein 2011). This phenomenon of "homophily" has been identified in a multitude of social settings (McPherson et al. 2001) and with regard to various characteristics such as having the same sex or the same ethnic background (Stark and Flache 2012; Leszczensky and Pink 2015; Smith et al. 2016).

Research also found that students prefer to have friends who perform similarly in school (Quillian and Campbell 2003; Flashman 2012a). This is because having similar academic orientations increases students' mutual understanding, as it indicates shared values and behaviors. For example, low-achieving students may not value their high-achieving peers' academic aspirations, whereas high-achieving students may in turn not understand their low-achieving peers' non-academic posture (Flashman 2012a). In addition, preferring friends with similar performance may be a consequence of an instrumental approach to friendship formation (Shin and Ryan 2014). Based on social exchange theories (Homans 1974), one can expect that students who perform well in school do not consider friendships with poorly performing students as attractive because such friends cannot provide sufficient resources in terms of academic support (Hartl et al. 2015). Thus, high achievers may select equally good friends because they can help maintain the good academic performance (Dieterich 2015). Low-performing students, in contrast, may turn to similarly low-performing friends who do not value academic achievement much.

Even though the preference for friends with similar academic achievement is typically weaker than the preference for friends with the same sex or ethnicity (Quillian and Campbell 2003), it could enhance educational inequalities if high-achieving students socialize only with other high-achieving students and low-achieving students with low-achieving ones. If similarly performing friends influence each other, inequality would be reinforced, as better performing students would get better whereas worse performing students would get worse.

Since the tendency to befriend peers who perform similarly and social influence lead to similar performance level among friends, it is crucial to account for both processes to avoid wrong conclusions (Shin and Ryan 2014). To address this problem, some researchers used prior achievement levels of friends that were aggregated over all friends to predict change in students' grades (e. g., Altermatt and Pomerantz 2003; Cook et al. 2007) and in the intrinsic value students' assign to grades (Ryan 2001). However, this approach overlooks the dynamics of friendship networks. The strength of peer influence may be overestimated if friendships are ended (and potentially later formed again) and academic performance changes independently of friends in-between the observations of a study (Shin and Ryan 2014). Moreover, by

studying the combined influence of the average grades of all friends, it is difficult to examine whether friends with certain characteristics (e. g., with the same ethnicity) are particularly influential.

Longitudinal social network analysis allows tackling these problems by simultaneously estimating selection and influence processes. Respective network research has recently advanced our understanding of peer effects in academic achievement by providing evidence for peer influence among children and adolescents even when the dynamics of social networks were taken into account (Shin and Ryan 2014; DeLay et al. 2016a; Rambaran et al. 2016). Importantly, most of these network studies also found evidence for homophily, the process that earlier research has largely ignored. For instance, studies in the U.S. found that already preschool children prefer to interact with peers with similar levels of competences (DeLay et al. 2016a). Similar results emerged among U.S. elementary students (Shin and Ryan 2014), middle school students (DeLay et al. 2016b), and high school students (Flashman 2012a; Rambaran et al. 2016). By contrast, the only study we are aware of that used social network methods outside the U.S. found no evidence for selection or influence based on school grades among third graders of one school in Chile (Palacios and Berger 2015).

Based on this earlier research, we expect:

H2: Students select friends with similar performance levels (selection).

1.2 Differences between ethnic majority and ethnic minority students

In principle, the social influence and selection processes with regard to students' academic achievement that we just outlined are general. However, ethnic inequalities and related status differences raise the possibility of differences between ethnic majority and minority members. In fact, the persistent lower performance of ethnic minority students in Germany may be partially caused by differences between ethnic majority and minority students in selection and influence mechanisms. Oppositional culture theory (Ogbu 1978; Fordham and Ogbu 1986) proposes that some students of ethnic/racial minority groups develop negative educational norms. The theory suggests that because of discrimination, these students believe that high education will not pay off in the long term and consider striving for high grades as a characteristic of the discriminatory ethnic majority. Accordingly, such minority students develop an opposing culture that rejects the pro-school norms they consider to belong to the ethnic majority. Oppositional culture theory further predicts that these minority students not only adhere to this opposing culture themselves, but also enforce it among same-ethnic peers by rejecting those who follow the pro-school norm of the majority group. In fact, academically successful black students in the U.S. are considered to be "acting white" by some of their black peers (Downey 2008), and black students who perform well in school have been called "Oreos" because they are accused of trying to adopt school norms of the white majority (Tyson et al. 2005).

While oppositional culture theory was developed with regard to blacks in the U.S., we suggest that it may also be applicable to the situation of ethnic minority students in Germany. Admittedly, the history of ethnic minority students in Germany

differs from those of blacks in the U.S. in many ways. On the other hand, ethnic minority members in Germany and in many other European countries face many structural disadvantages (Thomson and Crul 2007). They more often attend lower-track schools (Heath et al. 2008; Dollmann 2016), have less chance to get internships due to discrimination (Kaas and Manger 2012), and face higher unemployment rates than natives (Bundesagentur für Arbeit 2014). For all these reasons, some ethnic minority students in Germany may also be prone to forming an oppositional culture.

If such an oppositional culture exists among some ethnic minority students in Germany, it could affect their friendship choices in two different ways. First, ethnic minority students may consider similarity in academic achievement as less important for their friendships than ethnic majority members do. If some ethnic minority students believe that good school performance will not pay off, for instance, due to discrimination, they may simply not consider performance an important quality of themselves or their friends. In that case, having similar grades will not represent shared values that may increase mutual understanding. Grades may also be less relevant from an instrumental perspective. If minority students do not value academic achievement, having similarly performing friends would, from their point of view, not provide a helpful resource. The second possibility is that while similar academic achievement may still be equally important for ethnic minority and majority students in selecting friends, minority students may be less inclined to befriend high-achieving peers. This is because some ethnic minority students might reject good school performance as a characteristic of the German majority group and, therefore, disapprove of ingroup members who follow this pro-school norm of the majority.

This leads to the following hypotheses:

H3: Ethnic minority students are less likely to befriend peers with similar school performance than ethnic majority students are.

H4: Ethnic minority students are less likely to befriend high-achieving peers than ethnic majority students are.

Another consequence of opposing cultures among ethnic majority and minority students in Germany could be that social influence with regard to academic achievement may be stronger within rather than between ethnic groups. This is because oppositional culture theory (Ogbu 1978; Fordham and Ogbu 1986) suggests that minority group members who reject pro-school norms enforce this rejection among their same-ethnic peers. Moreover, opposing cultures might reinforce group boundaries between the majority and minority groups with the consequence that social influence on any dimension should mainly take place within instead of between these groups.

This generates the following hypothesis:

H5: Social influence on school performance is more pronounced among same-ethnic than among inter-ethnic friends.

1.3 Restricted opportunity for friendship selection

The oppositional culture effect may, however, be offset by the restricted opportunity for ethnic minority students to befriend same-ethnic peers. Students' preference for friends of their own ethnic group tends to be an important factor even after their preference for friends with similar academic achievement is taken into account (Quillian and Campbell 2003). However, by definition, ethnic minority students belong to a small group with few members in each school class and school cohort. The strong preference for same-ethnic friends may trump the less strong preference for friends who perform equally well or better (see Leszczensky and Pink 2015 for a similar reasoning). In fact, Flashman (2012b) found that minority and majority students in a U.S. study were equally likely to befriend high-achieving peers, but only if the ethnic composition of the school offered minority students the opportunity to do so among their own ethnic group.

Given that a significant amount of ethnic minority adolescents might not have the opportunity to befriend many, or any, same-ethnic peers within their school, academic achievement may therefore not play as much of a role for the selection of same-ethnic friends compared to inter-ethnic friends. That is, minority group students may prefer to have a friend of their own ethnic group who performs very differently in school rather than not having a same-ethnic friend at all. In contrast, students' preference for friends with similar academic achievement levels may be relevant when inter-ethnic friends are chosen from the pool of all remaining classmates. In other words, while similar academic achievement might not discriminate among potential friends within the same ethnic group, it might function as an important friendship marker between adolescents of different ethnic groups.

We therefore expect:

H6: Similarity in school performance is more important for the formation of inter-ethnic friendships than for same-ethnic friendships.

2 Data and methods

2.1 Data

We test our hypotheses using three waves of data from the project "Friendship and Identity in School", a longitudinal study of ethnically diverse year-group friendship networks that surveyed more than 2000 students in Germany (Leszczensky et al. 2015). Data collection started out in the 5th, 6th, and 7th grades (academic year) of nine schools in nine towns in the German federal state of North Rhine-Westphalia. Students in each of these cohorts completed paper-and-pencil questionnaires at three time points. For the study, lower secondary (Hauptschule), intermediate secondary (Realschule), and comprehensive schools (Gesamtschule) with higher shares of immigrant students were sampled. The participating nine schools were randomly chosen within predefined strata regarding different shares of non-native students (school response rate was about 10%).

Table 1 Overview of year-group networks

Network Information		Jaccard Index		GPA Change		Average Outdegree			Average GPA			Moran's I
#	Size	1–2	2–3	1–2	2–3	1	2	3	1	2	3	
1	83	0.40	0.38	12	27	6.35	6.38	6.78	3.20	2.92	2.81	0.13*
2	78	0.33	0.34	17	23	5.62	5.29	5.44	2.83	2.69	2.91	0.22***
3	72	0.33	0.37	11	19	5.62	6.05	5.55	2.62	2.53	2.56	0.18*
4	100	0.37	0.39	29	31	7.59	7.47	6.49	2.78	2.79	2.95	0.09
5	112	0.34	0.38	21	39	6.84	6.65	6.57	2.74	2.76	2.91	0.15**
6	93	0.32	0.46	14	26	5.83	4.76	4.78	2.64	2.67	3.05	0.04
7	120	0.38	0.41	38	34	7.23	7.03	6.74	2.93	2.72	2.94	0.00
8	139	0.37	0.34	48	42	6.80	6.72	6.65	2.90	3.08	2.91	0.18***
9	126	0.44	0.44	42	39	6.81	6.64	5.64	3.09	2.92	2.99	0.14**
10	120	0.41	0.40	36	30	6.42	6.07	6.18	3.39	3.09	3.10	0.13*
11	118	0.39	0.43	34	35	6.93	6.80	6.23	3.27	2.93	3.24	0.06
12	114	0.44	0.42	33	34	6.55	5.78	6.06	3.12	3.10	3.38	0.08

Note: Numbers 1, 2, and 3 refer to data from the first, second, and third wave, respectively; GPA change indicates the number of students becoming either better or worse in terms of their GPA between two time points; Moran's I measures network autocorrelation with positive values indicating a positive correlation between friends' academic achievement

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

In total, 26 year groups were surveyed, most of which consisted of three or four classrooms. In the first wave, an average of 85.2 (SD = 29.9) students belonged to each year group. The intervals between the three waves were nine months each; the first wave was collected in May 2013 when students were about 13 years old (M = 12.8; SD = 1.1). Students' participation was voluntary but required written parental approval. Students were instructed by researchers who also supervised the completion of the surveys. Students' participation rate was 76.5% in Wave 1, 83.3% in Wave 2, and 86.6% in Wave 3. About two-thirds of the students had a migration background, i. e., they or at least one of their parents or grandparents were born outside of Germany.

For the analysis, we excluded year groups with participation rates of less than 75% in any wave. This threshold provides a trade-off between conventionally accepted shares of unit non-response in social network analysis and the amount of information that is necessary to conduct meaningful statistical analyses (Huisman and Steglich 2008; Leszczensky and Pink 2015). This procedure yielded twelve year-group networks featuring 1175 students.[1] Table 1 provides an overview of the central characteristics of the twelve year-group networks. Table 2 provides an overview per academic year group and school form.

[1] More precisely, this procedure yielded a total of 1275 students of whom 1175 participated at least once in the study. However, the statistical models need to be based upon the complete year-group networks (Ripley et al. 2016). By default, values are imputed in the model for friendship nominations of those who did not participate and their incoming friendship nominations are known from classmates who participated.

Table 2 Descriptive statistics for first wave

	Total *N*	Percentage majority (Germans) (%)	Percentage largest minority group (Turks) (%)	Average number of minority groups[b]	Average GPA		Average Age	
					Majority	Minority	Majority	Minority
Year group								
5	442	40.80	26.92	7.8	3.11	3.08	11.5	11.4
6	350	38.60	29.53	6.7	3.01	3.03	12.4	12.4
7	483	47.10	19.08	7.0	2.94	2.90	13.6	13.5
School type[a]								
Lower secondary	161	28.90	27.18	8.0	2.92	3.07	13.1	12.9
Intermediate	729	36.90	30.31	6.9	2.97	3.05	12.7	12.3
Comprehensive	385	56.90	14.29	7.3	3.08	2.83	12.4	12.4

Note: Percentages and averages are based on the first wave in which $N = 915$ students participated
[a]Lower secondary = Hauptschule, Intermediate = Realschule, Comprehensive = Gesamtschule
[b]Average number of minority groups per year group network

2.2 Measures

We capture *friendship networks* based upon whom students nominated as best friends. Students could choose up to ten friends from a roster that alphabetically listed all of their schoolmates from their own year group, separated visually by classrooms. They could also nominate students from their year group who themselves did not participate in the survey.

Academic achievement (*Grade point average, GPA*) is measured by averaging over students' self-reported grades in German, English, and mathematics from the last school report. In the German educational system, grades range from 1 (very good) to 6 (failed); we collapsed the lowest two grades as very few students received the worst possible grade. We further reversed the rounded GPA scale so that higher values indicate higher achievement.

We capture students' *ethnicity* based on information on the country of birth and on students' ethnic self-identification. Students were coded as being German either if they and their parents and grandparents were born in Germany or if the students themselves ethnically self-identified as German. To measure ethnic self-identification, students were asked in each wave, "How do you see yourself?" This item has proven to be a valid measure of ethnic minority youth ethnic self-identification (Leszczensky and Gräbs Santiago 2015). Possible answers were ranked on a five-point scale, 1 "only as German", 2 "more as German", 3 "both equally", 4 "more as a person from the country of origin of my family", 5 "only as a person from the country of origin of my family". Identifying as German comprised the first two categories. Students who were born abroad or who had at least one parent or grandparent born abroad and who did not self-identify as German were coded as ethnic minority students.

Two types of ethnicity variables were generated to test our hypotheses. First, a dummy variable called *minority* was coded 1 if a student had a migration background and did not self-identify as German, and 0 otherwise. Second, we created the dyadic covariate *same ethnic background* to control for tendencies to befriend same-ethnicity peers. This covariate was coded 1 if a pair of students shared the same ethnic background and 0 otherwise. In this variable, we distinguished between several ethnic groups. Three ethnic groups in the sample (students from Germany, Turkey, and Poland) comprised of enough members to keep them separately in the analyses. Students from other countries were collapsed into larger regional groups in order to be able to estimate the complex models. These groups were students from Southern Europe, the former Soviet Union, former Yugoslavia, the Middle East, Western countries, and other non-Western countries (see Leszczensky and Pink 2015).

A dyadic covariate *same classroom* was coded 1 if a pair of students attended the same classroom, and 0 otherwise (in the German educational system, year groups are split into separate classrooms and students attend most subjects with students from the same classroom). In addition, we capture students' sex, with girls being coded 1 and boys 0. Students further provided information on their parents' occupational status, and we used the highest value of the respective ISEI classification.[2] Finally, two dyadic covariates control for additional contexts in which students might have met and befriended each other. *Same elementary school* was coded 1 if a pair of students attended the same elementary school, and 0 otherwise; *same neighborhood* was coded 1 if two students resided in the same city district, and 0 otherwise.

Missing information on the combined measure of academic achievement was 4.3%, on ethnic background 1.3%, on sex 0.2%, on neighborhood 4.1%, and on socio-economic status 10.8%. Elementary school had 11% missing values because this question was not included in the questionnaire of the third wave.

2.3 Analytical strategy

We use stochastic actor-oriented models for the co-evolution of networks and behavior (SAOM; Snijders et al. 2010). SAOM are particularly suited for our purpose as they allow to simultaneously model the intertwined process of network evolution (changes in friendships) and related effects on individual behavior, such as academic achievement (Steglich et al. 2010).

At the heart of SAOM is the so-called objective function from which tendencies of tie formation and maintenance can be inferred. The objective function is calculated based on effects that are of theoretical importance, such as individual preferences for friends of the same gender or with similar levels of academic achievement. A key advantage of SAOM in this respect is that they control for the opportunity structure

[2] We captured students' socio-economic background as a time-constant covariate. All available information on mother's and father's occupational status was first averaged across waves and then across the two parents, ignoring missing values in each step. For the analysis, mean occupational status was divided by ten to align the variables' scale with the remaining covariates. Since the original ISEI scale ranges from 10 to 90, the re-scaled variable ran from 1 to 9, with higher values indicating higher socio-economic status. Because of low frequencies of the categories 1 as well as 8 and 9, we integrated these extremes to the nearest category, thus resulting in the final measure with a range from 1 to 6.

in their parameter estimation, which is essential for studying friendship choices as the empirical distribution of students with different characteristics, such as varying levels of academic achievement, is thus accounted for (see Leszczensky and Pink 2015).

Our analysis consists of two steps. In a first step, we employed SAOM to analyze all twelve year-group networks separately. In a second step, we combined these results by means of a multivariate meta-analysis (An 2015). We used a fixed-effects meta-analysis because the separate estimates were obtained from networks that were both small in number and for which the survey process was identical in the sense that the same questionnaire was used and the same researchers carried out the survey (Borenstein et al. 2009, p. 83).

The computation of each SAOM was carried out using RSiena 1.1 (Ripley et al. 2016). Missing values for individual attributes were treated as non-informative in the estimation process (Huisman and Steglich 2008). To account for students who joined or left between waves, we employed the method of joiners and leavers suggested by Huisman and Snijders (2003). All of the separate models reached convergence, meaning that all overall maximum convergence ratios were smaller than 0.16 (Ripley et al. 2016).

2.4 Model specification

We specified a series of SAOM to test our hypotheses. In what follows, we describe the general components that were similar in the different model specifications. The specific (interaction) effects needed to assess our hypotheses are described when discussing the results of the respective models below.

All of our models consist of two parts that are estimated jointly, each of which has its own dependent variable. The *selection* part of the model aims to explain the evolution of the observed friendship network by accounting for factors that are important to understanding why students become and stay friends, including their academic achievement. The *influence* part of the model aims to explain students' academic achievement by accounting for factors that may affect individual academic performance, including potential social influence based on friends' academic achievement. We proceed by describing the basic effects for both parts of the model.

2.4.1 Selection part

In the selection part of the model, we first control for basic structural effects reflecting various relational mechanisms that have repeatedly been found in research on adolescents' friendships and omission of which would bias other estimates (e. g., Snijders et al. 2010; DeLay et al. 2016b; Rambaran et al. 2016). First, the *out-degree effect* captures how many friends students nominated on average. Second, the *reciprocity* effect reflects the degree to which students reciprocated friendship nominations. Third, the *geometrically weighted edgewise shared partners (gwesp)* effect acknowledges the tendency of students to become friends with the friends of their friends. Fourth, we also include an interaction of the gwesp and the reciprocity effect to capture differences in reciprocity effects when students decided to become

friends with their friends' friends and when they decided to not do that (Block 2015). Finally, the *outdegree-activity, indegree-popularity*, and *indegree-activity* effects model variation in sending and receiving ties with regard to the embeddedness of the individuals in the social network. A potential fourth effect of the variation in sending and receiving ties, outdegree-popularity was not included in the model to avoid multicollinearity issues.

Besides these structural effects, the model includes *ego, alter*, and *same* effects for *sex* and *SES* to account for tendencies to befriend peers of the same sex and with similar socio-economic status as well as potential differences in sociality and popularity. We further account whether students attended the same classroom because most friendships in German schools are formed within rather than between classrooms (Leszczensky and Pink 2015). The dyadic covariates *same neighborhood* and *same elementary school* control for meeting opportunities outside of the present school.

Finally, to test our four hypotheses, we added ego, alter, and similarity effects for academic achievement (GPA) as well as corresponding interaction effects with students' ethnicity. To avoid repetition, we describe these specifications when discussing the respective results.

2.4.2 Influence part

In the influence part of the model, a *linear* and a *quadratic shape* term are included to capture potential general trends of students' academic achievement (GPA) over time. Effects of being a *girl*, being a member of the minority or majority, and *SES* are included to capture well-known differences in academic achievement according to gender, belonging to an ethnic minority, and socio-economic status (e. g., Heath et al. 2008; DiPrete and Buchmann 2013; Siegert and Olszenka 2016). An average similarity effect tests whether students adopted the average level of academic achievement of their friends over time. To test our hypothesis about group differences in social influence, we add an interaction effect between the average similarity effect and the variable indicating whether students and their friends had the same ethnic background or not.

3 Results

3.1 Descriptive results

On average, ethnic majority and ethnic minority students in the twelve year-group networks displayed similar levels of academic achievement. Ethnic majority and minority students' average GPA was almost identical in Wave 1 ($M_{\text{majority}} = 3.01$, *s. e.* = 0.04; $M_{\text{minority}} = 3.00$, *s. e.* = 0.04), in Wave 2 ($M_{\text{majority}} = 2.90$, *s. e.* = 0.04; $M_{\text{minority}} = 2.91$, *s. e.* = 0.04), and in Wave 3 ($M_{\text{majority}} = 3.03$, *s. e.* = 0.04; $M_{\text{minority}} = 3.05$, *s. e.* = 0.04). None of these differences was statistically significant. Accordingly, students' academic achievement was not correlated with being a member of the

ethnic majority or a minority group in any wave ($r_{\text{Wave 1}}$ = –0.008; $r_{\text{Wave 2}}$ = 0.002; $r_{\text{Wave 3}}$ = 0.011; all $p > 0.05$).

The overview of the twelve year-group networks in Table 1 shows that in most year groups students tended to be friends with similar-achieving peers. This is indicated by Moran's I, which is a measure of network autocorrelation (Steglich et al. 2010), with positive values indicating a positive correlation between friends' academic achievement. Consistent with earlier studies on academic achievement, however, this similarity was rather modest (e. g., Shin and Ryan 2014; Rambaran et al. 2016).

Furthermore, Table 2 shows that the sample was ethnically diverse. In fact, the German majority group did not constitute the numeric majority in any year group but they were the numeric majority in comprehensive schools (56.90%). However, the largest ethnic minority group (Turks) also never constituted the numeric majority in any school form or year group, and this group was always smaller than the German majority group. All other ethnic groups were considerably smaller (less than 10% per year group or school form) and there were on average more than 6.9 ethnic groups in the year group networks. Thus, oppositional cultures may have existed in these schools because minority groups were smaller than the ethnic majority.

Table 2 further indicates that there were almost no systematic differences between minority and majority students across the fifth, sixth, and seventh grade (year group) and across the three school types that may influence the multivariate results presented in the following section. The only difference was that minority students in comprehensive schools had significantly lower GPAs than ethnic majority students, t(274) = 2.46, p = 0.01. The three year groups did not differ significantly in the other school types.

3.2 Test of hypotheses

3.2.1 Selection and influence of academic achievement

We observed various well-known network dynamics in the school year-group networks in our study. Since these dynamics are very similar in all model specifications, we summarize them for the first model only. The negative outdegree effect (b = –2.70, *s. e.* = 0.08, $p < 0.001$, see Model 1 of Table 3) indicates that friendships were unlikely to be formed if they did not meet any of the other characteristics included in the model (for instance, if the friendship was not between students of the same sex). Friendship nominations tended to be reciprocated (b = 2.35, *s. e.* = 0.08, $p < 0.001$) and students became friends with their friends' friends (GWESP: b = 1.53, *s. e.* = 0.03, $p < 0.001$). The more friendship nominations students already received, the less likely they were to nominate friends of their own (indegree activity: b = –0.11, *s. e.* = 0.01, $p < 0.001$) and to receive even more nominations in a subsequent wave (indegree popularity: b = –0.02, *s. e.* = 0.004, $p < 0.001$). In contrast, the more friends students already nominated, the likelier they were to nominate even more friends in a subsequent wave (outdegree activity: b = 0.03, *s. e.* = 0.004, $p < 0.001$). Moreover, friendships where more often formed within than between classrooms (same class: b = 0.35, *s. e.* = 0.02, $p < 0.001$), between

Table 3 Meta-analyses of friendship networks (stochastic actor-oriented models for the coevolution of networks and behavior)

	Model 1		Model 2		Model 3		Model 4	
	b	*s. e.*	*b*	*s. e.*	*b*	*s. e.*	*b*	*s. e.*
Selection Effects								
Rate parameter (Wave 1 → Wave 2)	16.25***	(0.41)	16.28***	(0.41)	16.78***	(0.43)	15.73***	(0.40)
Rate parameter (Wave 2 → Wave 3)	14.97***	(0.37)	14.95***	(0.38)	14.64***	(0.37)	14.64***	(0.38)
Outdegree	–2.70***	(0.08)	–2.62***	(0.08)	–2.71***	(0.08)	–2.60***	(0.08)
Reciprocity	2.35***	(0.08)	2.34***	(0.08)	2.35***	(0.08)	2.33***	(0.08)
GWESP	1.53***	(0.03)	1.53***	(0.03)	1.53***	(0.03)	1.52***	(0.03)
Reciprocity × GWESP	–0.88***	(0.06)	–0.88***	(0.06)	–0.89***	(0.06)	–0.90***	(0.06)
Indegree activity	–0.11***	(0.01)	–0.10***	(0.01)	–0.10***	(0.01)	–0.10***	(0.01)
Indegree popularity	–0.02***	(0.00)	–0.02***	(0.00)	–0.02***	(0.00)	–0.02***	(0.00)
Outdegree activity	0.03***	(0.00)	0.03***	(0.00)	0.03***	(0.00)	0.03***	(0.00)
Same class	0.35***	(0.02)	0.35***	(0.02)	0.34***	(0.02)	0.35***	(0.02)
Same neighborhood	0.01	(0.02)	–0.00	(0.02)	–0.00	(0.02)	0.02	(0.02)
Same elementary school	0.05*	(0.03)	0.06*	(0.02)	0.06*	(0.02)	0.05	(0.02)
Female ego	–0.11***	(0.03)	–0.09***	(0.03)	–0.10***	(0.03)	–0.10***	(0.03)
Female alter	0.01	(0.02)	–0.00	(0.02)	0.00	(0.02)	0.00	(0.02)
Same sex	0.30***	(0.02)	0.31***	(0.02)	0.31***	(0.02)	0.32***	(0.02)
SES ego	–0.03*	(0.01)	–0.02	(0.01)	–0.02	(0.01)	–0.03*	(0.01)
SES alter	–0.01	(0.01)	0.00	(0.01)	–0.00	(0.01)	–0.01	(0.01)
SES similarity	0.06	(0.05)	0.06	(0.05)	0.04	(0.05)	0.01	(0.05)
GPA ego	0.01	(0.02)	0.01	(0.02)	–	–	0.01	(0.02)
GPA alter	0.03	(0.02)	0.04*	(0.02)	0.07**	(0.03)	0.04*	(0.02)
GPA similarity	0.24*	(0.10)	0.26	(0.17)	–	–	0.30*	(0.12)
Minority ego	0.06**	(0.02)	0.04	(0.02)	0.06*	(0.02)	–	–
Minority alter	0.00	(0.02)	–	–	0.01	(0.02)	–	–
Same minority/same majority	0.10***	(0.02)	–	–	0.10***	(0.02)	–	–
Minority ego × GPA similarity	–	–	0.02	(0.22)	–	–	–	–
Minority ego × GPA alter	–	–	–	–	–0.09*	(0.03)	–	–
Same ethnic background	–	–	–	–	–	–	0.08***	(0.02)
Same ethnic background × GPA similarity	–	–	–	–	–	–	–0.01	(0.20)
Influence Effects								
Rate parameter (Wave 1 → Wave 2)	0.95***	(0.07)	0.92***	(0.07)	0.91***	(0.07)	0.90***	(0.07)
Rate parameter (Wave 2 → Wave 3)	1.05***	(0.08)	1.00***	(0.08)	1.06***	(0.08)	1.03***	(0.08)

Table 3 Meta-analyses of friendship networks (stochastic actor-oriented models for the coevolution of networks and behavior) (Continued)

	Model 1		Model 2		Model 3		Model 4	
	b	*s. e.*	*b*	*s. e.*	*b*	*s. e.*	*b*	*s. e.*
Linear shape	–0.22	(0.13)	–0.20	(0.14)	–0.29*	(0.13)	–0.23	(0.14)
Quadratic shape	–0.06	(0.08)	–0.04	(0.08)	–0.33***	(0.03)	–0.06	(0.08)
Female	0.11	(0.09)	0.06	(0.09)	0.14	(0.08)	0.09	(0.09)
SES	0.10*	(0.04)	0.09*	(0.04)	0.09*	(0.04)	0.09*	(0.04)
Minority	0.04	(0.09)	0.03	(0.09)	0.10	(0.08)	0.04	(0.09)
Average similarity	3.18***	(0.86)	2.98**	(1.03)	–	–	1.38	(1.01)
Average similarity × Minority	–	–	0.19	(0.88)	–	–	–	–
Average similarity × Same ethnic background	–	–	–	–	–	–	1.78*	(0.74)

Note: All 36 individual SAOM converged. Fixed-effects multivariate meta-analyses were carried out to combine the results to these models
***$p < 0.001$, ** $p < 0.01$, * $p < 0.05$

students who attended the same elementary school ($b = 0.05$, *s. e.* = 0.02, $p = 0.04$), between students of the same sex ($b = 0.30$, *s. e.* = 0.02, $p < 0.001$), and between students who both either belonged to the ethnic minority or the majority group (same minority/same majority: $b = 0.10$, *s. e.* = 0.02, $p < 0.001$). Having a similar socio-economic background, by contrast, did not increase the likelihood of students to become friends (SES similarity: $b = 0.06$, *S. E.* = 0.05, $p = 0.28$), and neither did residing in the same neighborhood ($b = 0.001$, *s. e.* = 0.02, $p = 0.98$).

There was evidence for both selection and social influence with respect to academic achievement. Students with similar GPA were significant more likely to form a friendship than students with different levels of academic achievement (GPA similarity: $b = 0.24$, *S. E.* = 0.10, $p = 0.02$). This is in line with Hypothesis 2. The absolute level of students' performance did not affect friendship formation. Students with higher GPAs were not more likely to be chosen as friends (GPA alter: $b = 0.03$, *S. E.* = 0.02, $p = 0.11$), nor were they more likely to send out friendship nominations (GPA ego: $b = 0.01$, *S. E.* = 0.02, $p = 0.53$). Friends further influenced each other's achievement. The significant average similarity effect ($b = 3.19$, *S. E.* = 0.86, $p < 0.001$), in the influence part of the model indicates that, over time, students moved closer to the average GPA of their friends. This supports Hypothesis 1. Of the control variables, only students' socio-economic background mattered for their grades; students with higher SES had better grades (SES: $b = 0.10$, *S. E.* = 0.4, $p = 0.02$).

To get a better understanding of what the coefficients for friendship selection based on GPA mean substantively, we present log odds representing the attractiveness of friends with certain GPAs depending on a hypothetical students' GPA in Table 4. The tendency of students with higher grades to select other high-achieving students was stronger than the tendency of students with low grades to select other low-performing students. For instance, the likelihood for a student with a GPA of 5 (highest achievement) to send a friendship tie to another student with a GPA of 5 was

Table 4 Likelihood of friendship selection based on student's own gpa and the potential friend's gpa

	Student's GPA (sending friendship nomination)				
Friend's GPA (receiving friendship nomination)	1	2	3	4	5
1	0.09	0.05	0.00	–0.05	–0.10
2	0.06	0.13	0.09	0.04	–0.01
3	0.03	0.10	0.17	0.12	0.08
4	0.00	0.07	0.14	0.21	0.16
5	–0.04	0.03	0.11	0.18	0.25

Note: The values on the diagonal indicate the likelihood of selecting a friend if both students have the same GPA. The values in the cells can be transformed to odds with an exponential function. Using the exponential function on the difference between two cells gives the odds-ration. Calculations are based on Model 1 of Table 3. For an explanation see Ripley et al. (2016)

Table 5 Attractiveness of GPAs that a student could adopt in the next wave given the friends' mean GPA in the current wave (social influence)

	GPA that Student Could Adopt				
Friends' Mean GPA	1	2	3	4	5
1	0.92	0.07	–0.90	–1.99	–3.19
2	0.13	0.86	–0.11	–1.19	–2.40
3	–0.67	0.07	0.69	–0.40	–1.60
4	–1.47	–0.73	–0.11	0.40	–0.80
5	–2.26	–1.53	–0.90	–0.40	–0.01

Note: The values on the diagonal indicate the likelihood of moving to the same GPA that is shared by a student's friends. Calculations are based on Model 1 of Table 3. For an explanation see Ripley et al. (2016)

1.17 times higher than the likelihood for a student with a GPA of 1 (lowest achievement) to select another student with that GPA (OR: exp (0.25–0.09) = 1.17). Thus, especially the good students stuck together. The likelihood that a very good student (GPA = 5) selected another very good student was 1.42 (OR: exp (0.25–(–0.1))) times higher than that he/she selected a very bad student (GPA = 1). In contrast, a very bad student was only 1.14 times more likely to select another very bad student than to select a very good student (OR: exp (0.09–(–0.04))).

Table 5 similarly presents the social influence that a hypothetical group of students that all had the same GPA exerted on a shared friend. The values in each cell of the table give the relative "attractiveness" of adjusting one's GPA towards a certain grade, given the average grade of one's friends (Ripley et al. 2016). Two results are apparent from this table. First, grades on the diagonal, which represent getting the exact same GPA as one's friends, have the highest values and were thus most attractive. Friends, therefore, tended to become more similar over time. Second, attractiveness values on the upper left of the table are higher than those at the lower right corner. This suggests that a group of friends with a low GPA exerted more influence to adjust one's grade to a similarly low GPA than a group of friends with high GPAs did. Social influence was thus stronger among low- than among high-achievers.

3.2.2 Tests for an oppositional culture

Based on oppositional culture theory, we expected differences between ethnic minority and majority students in their likelihood to select peers with similar grades (H3) or high-achieving peers (H4). To test Hypothesis 3, we included an interaction effect between being a self-identified ethnic minority member (minority ego) and the preference for friends with similar academic achievement (GPA similarity) to the selection part of the model. To accurately estimate this interaction, a mirroring interaction between average similarity and being a member of the ethnic minority was added to the influence part of the model. The interaction in the selection part between minority ego and GPA similarity shown in Model 2 of Table 3 was non-significant (b = 0.02, *s. e.* = 0.22, p = 0.94). This suggests that ethnic minority students were as likely as their ethnic majority peers to select friends with similar school performance. This leads to a rejection of Hypothesis 3.

To test Hypothesis 4, we added an interaction effect between being a self-identified ethnic minority member (ethnic minority ego) and the potential friends' academic achievement (GPA alter) to the selection part of the model. The negative interaction effect in Model 3 of Table 3 shows that ethnic minority members were less likely than ethnic majority members to befriend peers with high academic achievement (b = –0.09, *s. e.* = 0.03, p = 0.01). This is in line with Hypothesis 4. However, taking into account the constitutive terms GPA alter (b = 0.07, *s. e.* = 0.03, p = 0.01) and belonging to an ethnic minority (minority ego*:* b = 0.06, *s. e.* = 0.02, p = 0.01) reveals that it would be misleading to conclude that ethnic minority members preferred to befriend peers with low academic achievement. Rather, ethnic majority members tended to befriend peers with higher academic achievement, as indicated by the positive GPA alter effect, which due to the interaction refers only to ethnic majority member (the reference category in the minority ego variable). In contrast, ethnic minority members selected friends irrespective of their academic performance.

To test the remaining hypothesis based on oppositional culture theory, we assessed in Model 4 of Table 3 whether social influence was more likely among same-ethnic than among inter-ethnic friends. This analysis hence distinguishes not only between students of the majority and minority groups but between students who belong to the same ethnic group (e. g. Turks, Poles) and students who belong to a different ethnic group. In the influence part of this model, we included an interaction between students' tendency to adjust their own academic achievement towards that of their friends (average similarity) and a dyadic covariate indicating whether two friends had the same ethnic background. In order to accurately estimate this social influence effect, we included the mirroring interaction in the selection part of Model 4. That is, we added an interaction that tested whether the effect of having similar academic achievement on friendship selection was stronger when two students had the same ethnicity.

Results of Model 4 show that social influence was indeed stronger in same-ethnic friendships than among inter-ethnic ones. The interaction between average similarity and same ethnic background was significant and positive (b = 1.78, *s. e.* = 0.74, p = 0.02). In contrast, the conditional main effect of average similarity was insignificant

(b = 1.38, *s. e.* = 1.01, p = 0.17), which suggest that friends from different ethnic groups did not influence each other academic achievement over time. These results are in line with Hypothesis 5.

3.2.3 Test of restricted opportunity effects

The last hypothesis proposed that the limited opportunity to form same-ethnic friendships for minority students might mean that same academic achievement is more relevant for the selection of inter-ethnic friends.

The selection part of Model 4 in Table 3 shows that students' tendency to befriend peers with similar academic achievement was equally strong for same- and inter-ethnic ties. The positive GPA similarity effect (b = 0.30, *s. e.* = 0.12, p = 0.02) in combination with a non-significant interaction effect between GPA similarity and having the same ethnic background (b = –0.01, *s. e.* = 0.20, p = 0.94) indicates that this process did not differ between same-ethnic and inter-ethnic friends. In other words, irrespective of students' ethnicity, friendships were formed more often between students with similar levels of academic achievement. This leads to a rejection of Hypothesis 6.

4 Discussion

The present study found that secondary school students in Germany selected friends with similar academic achievement and that friends influenced each other's academic achievement. This echoes earlier findings from the U.S., where researchers also found selection and influence processes related to students' GPA (Flashman 2012a; DeLay et al. 2016b; Rambaran et al. 2016). To the best of our knowledge, this is the first study to show social influence of school grades in a sample outside of the U.S. with an appropriate statistical model that accounts for students' tendency to choose friends with similar academic achievement.

Moreover, we found that selection based on academic achievement was more important among students with good grades and that high-achievers were more likely to select other high-achievers than low-achievers were to select other low-achievers. In contrast, the social influence of students' grades turned out to be stronger among friends with poor grades. Thus, it seems the tendency to adjust one's grades to that of one's friends is stronger among low-achievers.

4.1 Mixed evidence for an oppositional culture

In contrast to our expectations, the selection and influence processes differed little between ethnic majority and self-identified ethnic minority adolescents. As one of the few differences, ethnic minority students were less likely than majority students to befriend high-achieving peers. This finding could be considered to be in line with predictions based on oppositional culture theory (Ogbu 1978; Fordham and Ogbu 1986), according to which good performance in school might be considered "acting white" among ethnic minority children (Downey 2008). However, a detailed

look at the results revealed that ethnic minority students did not reject peers with good grades. Instead, majority members had a stronger preference for friends with good grades than minority members did. Thus, ethnic minority group members did not oppose having friends with good grades, but good grades seemed to be less important for their friendship choices.

Two other findings add further doubt to the oppositional culture interpretation of friendship selection. First, students' academic achievement did not significantly differ between ethnic minority and majority students in our sample in the first place. Only in one of three school forms did majority group students outperform the minority group. It is thus rather unlikely that minority students considered academic excellence to be a characteristic of the native majority – a prerequisite for oppositional culture theory. Second, ethnic minority and majority members turned out to be equally likely to select friends with similar academic performance. Similarity in academic achievement thus was an important criterion for friendship formation in both groups. Since minority students had equally good grades as the German students, this also meant that minority students did not have a preference for students with bad grades.

However, there was some support for the prediction derived from oppositional culture theory about the way friends influence students' academic achievement. Our analyses revealed that social influence with regard to academic achievement took mainly place between friends of the same ethnic group. Previous research using social network analysis with U.S. data had already established that friends influence each other's GPA (e. g., Flashman 2012a; DeLay et al. 2016b; Rambaran et al. 2016). We could show that this influence is especially strong among same-ethnic friends. This finding corresponds with the idea that minority group members who reject pro-school norms enforce this rejection among their same-ethnic peers (Ogbu 1978; Fordham and Ogbu 1986).

On the other hand, there is an alternative explanation for this effect that has nothing to do with oppositional cultures. Research has shown that adult members of ethnic minority groups rely heavily on their networks of co-ethnics to gain information about, for instance, the labor market in the host country and to make educational decisions for their children (Bauer et al. 2005). It has been suggested that children of migrants adopt the same strategy and rely more heavily on same-ethnic friends to gain school information and make educational decisions (Flashman 2014). Accordingly, social influence may take place mainly among students of the same ethnic group simply because same-ethnic friendships may provide more reliable or relevant information.

Thus, whereas our results are not entirely consistent with the predictions of oppositional culture theory (Ogbu 1978; Fordham and Ogbu 1986), they are actually consistent with the mixed evidence in the literature. Many U.S. studies found that ethnic minority students did not select high-performing friends (Tyson et al. 2005; Fryer and Torelli 2010). However, many other studies found little evidence for an oppositional culture among ethnic minority students (Ainsworth-Darnell and Downey 1998; A. L. Harris 2006; A. L. Harris and Robinson 2007). For instance, Flashman (2012b) found a similar preference for high-achieving friends among ethnic majority

and minority students when the minority students had the opportunity to select high-achieving friends in their own ethnic group.

More research is needed to examine under which conditions oppositional culture theory holds. For example, minority students did not perform worse than majority students in our sample, even though this is a pattern typically observed in the German and European context (Heath et al. 2008; Dollmann 2016; Siegert and Olszenka 2016). Schools in which the ethnic majority also constitutes the numeric majority and in which an achievement gap between these groups exists thus may provide additional settings for testing the predictions of oppositional culture theory.

4.2 No effects of the opportunity structure

There was no evidence for our expectation that academic achievement may not play as much of a role for the selection of same-ethnic friends compared to inter-ethnic friends. We proposed that the well-established preference for friends of the own ethnic group (Stark and Flache 2012; Smith et al. 2016) would trump students' preference for friends with similar school grades. That is, we hypothesized that same-ethnic friends would be chosen independently of their school performance because minority students typically have very few classmates of their own ethnic group to choose from. They, therefore, may have to accept same-ethnic friends with very different academic performance given that the alternative might be not to have same-ethnic friends at all. Inter-ethnic friendships, in contrast, can be chosen among a much larger group of peers, and thus can be based on similarity in other characteristics, such as similar academic achievement. However, we found no support for this reasoning in our data. Instead, same-ethnic and inter-ethnic friendships were based on similar academic achievement to the same extent. This again suggests that ethnic minority students in our sample did not consider good school performance as "acting white".

4.3 Limitations

Our sample was quite specific, as we focused on ethnically diverse schools in one federal state of Germany. Next to the earlier mentioned restriction that the ethnic majority was not the numeric majority in these schools, this selection also excluded upper secondary schools ("Gymnasien") that are attended by relatively few minority students. In such schools of the highest academic track, school performance might actually be more salient than in lower and middle secondary schools, and might thus matter more for students' friendship choices.

Moreover, our data stem from students after the transition from German primary school (without ability tracking) to secondary schools that are tracked based on academic ability. This may partially explain why minority and majority students in our data had similar grades (with the exception of comprehensive schools). It may also mean that an anti-school norm may not reflect an oppositional culture in some schools of the lowest track but it may actually constitute the mainstream, even among ethnic majority youth. After all, the tracked school system could have signaled many students in our sample that they are worse in school than their peers

who transitioned to a school of a higher academic track. Besides measuring anti-school norms and oppositional culture directly, future research may thus also want to investigate the selection and influence based on GPA in primary schools where students have not yet been separated based on their grades. Thus, even though our analyses offer important insights into the role of academic achievement for friendship formation within the schools under study, it is an open question whether the results are generalizable to students in less ethnically diverse schools, to schools of a higher academic track, and, particularly, to schools that are not academically tracked.

Another limitation of the present study is that we assumed that the same processes take place among all ethnic minority groups. Oppositional culture theory argues that some minority students reject a pro-school norm because they think that education will not pay off in the long term due to existing discrimination (Ogbu 1978; Fordham and Ogbu 1986). This may, however, be more applicable for some groups (e. g., Turks in Germany) than for others (e. g., Italians in Germany). Despite our ethnically diverse sample, we were not able to further distinguish between different countries of origin because even the largest ethnic groups consisted of too few students in each school for separate analyses. This prevented group-specific tests and even forced us to combine students from different ethnic origins into rather crude regional groups. Future research may try to improve upon this approach if data on even larger networks is available.

Another caveat is that we did not account for within-school tracking. For example, while students were taught within their classrooms in most subjects, in some subjects they were also separated, because of either ascribed characteristics (religion), academic interests, or previous achievement. Since adequately controlling for all different meeting opportunities within schools (such as different courses or extra-curricular activities) is hardly feasible, future studies may focus on settings with limited within-school tracking.

4.4 Implications

The finding of friendship selection based on academic achievement and social influence on academic achievement among friends suggests a Matthew effect (Merton 1968) with regard to grades in German schools. High achievers select other high achievers and become even better over time. Poor-performing students, by contrast, are at risk of being left behind, particularly because students with bad grades exert more social influence on their friends than students with good grades do. Flashman (2012b) suggested that such a process could widen existing achievement gaps between ethnic groups because ethnic minority students prefer to befriend other minority students (Stark and Flache 2012; Leszczensky and Pink 2015; Smith et al. 2016). If these friends are low achievers and subsequently influence their same-ethnic friends' academic achievement, the grades of minority students might go down. Our analyses replicate the strong preference for friends of the same ethnic group. Moreover, friends did indeed influence each other's GPA and this happened particularly among friends of the same ethnic group. However, since there was no achievement gap between ethnic minority and majority students to begin with, these processes did not lead to worse academic outcomes for ethnic minority students.

The academic tracking of the German school system may have thus prevented such a downward spiral that could particularly affect students of ethnic minority groups. However, our data do not allow conclusions about what happened before students transferred to the academically tracked secondary schools. A Matthew effect with regard to academic achievement in primary schools may very well disproportionally harm students from ethnic minority groups and be partially responsible for the over-representation of these students in secondary schools of the lower academic tracks in Germany (Siegert and Olszenka 2016). We are looking forward to future research addressing this possibility.

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References

Agirdag, O., Van Houtte, M., & Van Avermaet, P. (2012). Why does the ethnic and Socio-economic composition of schools influence math achievement? The role of sense of futility and futility culture. *European Sociological Review*, *28*(3), 366–378.

Ainsworth-Darnell, J. W., & Downey, D. B. (1998). Assessing the oppositional culture explanation for racial/ethnic differences in school performance. *American Sociological Review*, *63*(4), 536–553.

Altermatt, E. R., & Pomerantz, E. M. (2003). The development of competence-related and motivational beliefs: an investigation of simi-larity and influence among friends. *Journal Of Educational Psychology*, *95*, 111–123.

An, W. H. (2015). Multilevel meta network analysis with application to studying network dynamics of network interventions. *Social Networks*, *43*, 48–56.

Bandura, A. (1977). *Social learning theory*. New Jersey: Prentice-Hall.

Bauer, T., Epstein, G. S., & Gang, I. N. (2005). Enclaves, language, and the location choice of migrants. *Journal of Population Economics*, *18*(4), 649–662.

Block, P. (2015). Reciprocity, transitivity, and the mysterious three-cycle. *Social Networks*, *40*, 163–173.

Borenstein, M., Hedges, L. V., Higgins, J., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. Chichester: John Wiley & Sons.

Brechwald, W. A., & Prinstein, M. J. (2011). Beyond homophily: a decade of advances in understanding peer influence processes. *Journal of Research on Adolescence*, *21*(1), 166–179.

Bundesagentur für Arbeit (2014). *Der Arbeitsmarkt in Deutschland – Menschen mit Migrationshintergrund auf dem deutschen Arbeitsmarkt* (Arbeitsmarktberichterstattung Juni 2014).

Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: compliance and conformity. *Annual Review of Psychology*, *55*, 591–621.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, *94*, 95–120.

Cook, T. D., Deng, Y. Y., & Morgano, E. (2007). Friendship influences during early adolescence: the special role of friends' grade point average. *Journal of Research on Adolescence*, *17*(2), 325–356.

Crosnoe, R., Cavanagh, S., & Elder, G. H. J. (2003). Adolescent friendships as academic resources: the intersection of friend-ship, race, and school disadvantage. *Sociological Perspectives*, *46*, 331–352.

DeLay, D., Hanish, L. D., Martin, C. L., & Fabes, R. A. (2016a). Peer effects on head start children's preschool competency. *Developmental Psychology*, *52*(1), 58–70.

DeLay, D., Zhang, L., Hanish, L. D., Miller, C. F., Fabes, R. A., Martin, C. L., & Updegraff, K. A. (2016b). Peer influence on academic performance: a social network analysis of social-emotional intervention effects. *Prevention Science*, *17*(8), 903–913.

Dieterich, S. E. (2015). The coevolution of adolescent friendship networks and school outcomes. Colorado State University, Fort Collins. https://dspace.library.colostate.edu/handle/10217/167097. Accessed: 14th July 2017.

DiPrete, T. A., & Buchmann, C. (2013). *The rise of women. The growing gender gap in education and what it means for american schools*. New York: SAGE.

Dollmann, J. (2016). Der Übergang von der Primar – in die Sekundarstufe. In C. Diehl, C. Hunkler, & C. Kristen (eds.), *Ethnische Ungleichheiten im Bildungsverlauf. Mechanismen, Befunde, Debatten* (pp. 517–542). Wiesbaden: Springer VS.

Downey, D. B. (2008). Black/white differences in school performance. The oppositional culture explanation. *Annual Review of Sociology*, *34*, 107–126.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*(2), 117–140.

Flashman, J. (2012a). Academic achievement and its impact on friend dynamics. *Sociology of Education*, *85*(1), 61–80.

Flashman, J. (2012b). Different preferences or different opportunities? Explaining race differentials in the academic achievement of friends. *Social Science Research*, *41*(4), 888–903.

Flashman, J. (2014). Friend effects and racial disparities in academic achievement. *Sociological Science*, *1*, 260–276.

Fordham, S., & Ogbu, J. U. (1986). Black students' school success: coping with the "burden of" acting white. *The Urban Review*, *18*(3), 176–206.

Fryer, R. G., & Torelli, P. (2010). An empirical analysis of 'acting white'. *Journal of Public Economics*, *94*(5), 380–396.

Harris, A. L. (2006). I (don't) hate school: revisiting oppositional culture theory of blacks' resistance to schooling. *Social Forces*, *85*(2), 797–834.

Harris, A. L., & Robinson, K. (2007). Schooling behaviors or prior skills? A cautionary tale of omitted variable bias within oppositional culture theory. *Sociology of Education*, *80*(2), 139–157.

Harris, J. R. (1995). Where is the child's environment: a group socialization theory of development. *Psychological Review*, *102*, 458–489.

Hartl, A. C., Laursen, B., & Cillessen, A. H. N. (2015). A survival analysis of adolescent friendships: the downside of dissimilarity. *Psychological Science*, *26*(8), 1304–1315.

Heath, A. F., Rothon, C., & Kilpi, E. (2008). The second generation in Western Europe: education, unemployment, and occupational attainment. *Annual Review of Sociology*, *34*, 211–235.

Homans, G. C. (1974). *Social behavior: its elementary forms*. New York: Harcourt Brace.

Huisman, M., & Snijders, T. A. B. (2003). Statistical analysis of longitudinal network data with changing composition. *Sociological Methods & Research*, *32*(2), 253–287.

Huisman, M., & Steglich, C. E. G. (2008). Treatment of non-response in longitudinal network studies. *Social Networks*, *30*(4), 297–308.

Kaas, L., & Manger, C. (2012). Ethnic discrimination in Germany's labour market: a field experiment. *German Economic Review*, *13*(1), 1–20.

Kindermann, T. A. (2007). Effects of naturally existing peer groups on changes in academic engagement in a cohort of sixth graders. *Child Development*, *78*, 1186–1203.

Leszczensky, L., & Pink, S. (2015). Ethnic friendship segregation in school: testing a rational choice argument of differences in ethnic homophily between classroom- and grade-level networks. *Social Networks*, *42*, 18–26.

Leszczensky, L., & Gräbs Santiago, A. (2015). The development and test of a measure of youth's ethnic and national identity. *Methods, data, analyses*, *9*(1), 87–110.

Leszczensky, L., Pink, S., & Kalter, F. (2015). *Friendship and Identity in School. Field Report on Wave 1, Wave 2, and Wave 3 (Technical Report)*. MZES Working Paper Nr. 161. Mannheim: MZES.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: homophily in social networks. *Annual Review of Sociology*, *27*, 415–444.

Merton, R. K. (1968). The Matthew effect in science: the reward and communication systems of science are considered. *Science*, *159*(3810), 606–623.

Ogbu, J. (1978). *Minority education and caste: the American system in cross-cultural perspective*. New York: Academic Press.

Palacios, D., & Berger, C. (2015). Are good students desirable friends? Evidence for friendship selection among elementary students. *Estudios De Psicologia*, *36*(2), 496–508.

Quillian, L., & Campbell, M. E. (2003). Beyond black and white: the present and future of multiracial friendship segregation. *American Sociological Review*, *68*, 540–566.
Rambaran, A. J., Hopmeyer, A., Schwartz, D., Steglich, C., Badaly, D., & Veenstra, R. (2016). Academic functioning and peer influences: a short-term longitudinal study of network-behavior dynamics in middle adolescenc. *Child Development*, *88*(2), 523–543.
Riegle-Crumb, C., Farkas, G., & Muller, C. (2006). The role of gender and friendship in advanced course taking. *Sociology of Education*, *79*(3), 206–228.
Ripley, R.M., Snijders, T.A.B., & Preciado, P. (2016). Manual for RSiena (Version May 28, 2016). Oxford: University of Oxford, Department of Statistics; Nuffield College. http://www.stats.ox.ac.uk/siena/. Accessed: 14th July 2017.
Ryan, A. M. (2000). The peer group as a context for the socialization of adolescents' motivation, engagement, and achievement in school. *Educational Psychologist*, *35*, 101–111.
Ryan, A. M. (2001). The peer group as a context for the development of young adolescent motivation and achievement. *Child Development*, *72*, 1135–1150.
Shin, H., & Ryan, A. (2014). Early adolescent friendships and academic adjustment: examining selection and influence processes with longitudinal social network analysis. *Developmental Psychology*, *50*, 2462–2472.
Siegert, M., & Olszenka, N. (2016). Ethnische Ungleichheit in der Sekundarstufe I. In C. Diehl, C. Hunkler, & C. Kristen (eds.), *Ethnische Ungleichheiten im Bildungsverlauf. Mechanismen, Befunde, Debatten* (pp. 543–595). Wiesbaden: Springer VS.
Smith, S., Van Tubergen, F., Maas, I., & McFarland, D. A. (2016). Ethnic composition and friendship segregation: differential effects for adolescent natives and immigrants. *American Journal of Sociology*, *121*(4), 1223–1272.
Snijders, T. A. B., Van de Bunt, G. G., & Steglich, C. E. G. (2010). Introduction to stochastic actor-based models for network dynamics. *Social Networks*, *32*(1), 44–60.
Stark, T. H., & Flache, A. (2012). The double edge of common interest: ethnic segregation as an unintended byproduct of opinion homophily. *Sociology of Education*, *85*(2), 179–199.
Steglich, C. E. G., Snijders, T. A. B., & Pearson, M. (2010). Dynamic networks and behavior: separating selection from influence. *Sociological Methodology*, *40*, 329–393.
Thomson, M., & Crul, M. (2007). The second generation in Europe and the united states: how is the transatlantic debate relevant for further research on the European second generation? *Journal of Ethnic and Migration Studies*, *33*(7), 1025–1041.
Tyson, K., Castellino, D. R., & Darity, W. (2005). It's not "a black thing": understanding the burden of acting white and other dilemmas of high achievement. *American Sociological Review*, *70*(4), 582–605.
Van de Werfhorst, H. G., & Van Tubergen, F. (2007). Ethnicity, schooling, and merit in the Netherlands. *Ethnicities*, *7*(3), 416–444.
Van den Bergh, L., Denessen, E., Hornstra, L., Voeten, M., & Holland, R. W. (2010). The implicit prejudiced attitudes of teachers: relations to teacher expectations and the ethnic achievement gap. *American Educational Research Journal*, *47*(2), 497–527.