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Classroom composition and language skills: the role of school class and friend characteristics

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ABSTRACT

The present study addresses the question to what extent language skills among students are influenced by the composition of the overall classroom context and the composition of friendship networks within school classes. Furthermore, we ask whether the effects differ between stratified school systems, with a more homogenous student body in school classes, and comprehensive school systems, with a more heterogeneous student body. Focusing only on classroom characteristics, we find positive effects of the socioeconomic and cognitive overall composition of the school class in Germany's selective school system, but not in Sweden's comprehensive system. In contrast, the ethnic composition does not matter significantly in any of the systems, while direct peer interactions, captured with social networks measures targeting friends in a school class, matter slightly more in Sweden's comprehensive school system.

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Contextual effects; peer effects; achievement; language skills; comparative

Introduction

Research has shown that parental educational and social class background are important factors that affect children's learning outcomes (e.g. Björklund and Salvanes 2011; Jackson 2013), while peers appear to have less influence (for an overview, see and Epple and Romano 2011). It is challenging, however, to target educational inequalities between students with different social, ethnic or racial backgrounds with policy on an individual level (Jackson and Jonsson 2013), whereas the student composition of school classes can be manipulated more easily. Not least due to their policy relevance, there is a large body of research on compositional effects on learning outcomes (for an overview of peer effects, see Burke and Sass 2013; Downey and Condron 2016; Epple and Romano 2011; Sacerdote 2011). Yet, there are important research gaps concerning the relationship between school class composition and individual academic performance, two of which we address in our study.

First, little is known about the mechanisms that underlie compositional effects on individual achievement. The literature has largely treated the influence of compositional characteristics on achievement as a 'black box' (Jencks and Mayer 1990: 115, cf. Hanushek et al.

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2003). Two main explanations have been proposed to account for compositional effects of classmates (cf. Veerman, van de Werfhorst, and Dronkers 2013). One strand of arguments stresses the importance of the general learning environment in the class, shaped by the overall class composition irrespective of the direct peer interactions in school classes. Other explanations argue that classroom effects are mainly mediated by direct peer interactions and emphasize the role of school friends in providing help and resources and in shaping educational ambitions, with a subsequent impact on individual achievement and attainment. The distinction between overall classroom effects and school class friend effects is important, as policies targeting educational achievement through changing the classroom composition may be more successful when the classroom composition operates through the overall environment and not through direct peer interactions. Within school classes, students will still make friends with whom they prefer to; friendship is simply not easily reached by policies beyond restricting the opportunity structure in a class.

Second, few studies address country variations in compositional effects, making it difficult to translate results to other countries. Although the potential role of the educational system on the nature and degree of peer composition effects is of immediate policy relevance, it has been rarely studied. Comparative research indicates that the effects of the overall socioeconomic and ethnic composition of the school class are stronger in stratified school systems than in comprehensive school systems (Dronkers, van der Velden, and Dunne 2012; Dunne 2010). However, following the arguments by Buchmann and Dalton (2002), comprehensive school systems may provide more opportunities to form heterogenous friendship networks and make it more likely that friends in a class influence each other than in stratified systems. The findings of stronger classroom composition effects in stratified systems may therefore simply disregard the possibility of stronger direct peer effects in comprehensive systems. Consequently, we argue that studies on compositional effects on individual achievement should be interpreted in consideration of the educational institutional setting.

The present paper aims to address these gaps and contribute to previous research by answering the following questions:

1. Is there an effect of the socioeconomic, ethnic and cognitive composition of the school class on language skills? Is there an overall classroom effect of all classmates, on the one hand, and an effect of school class friends on the other?
2. Do the different processes, occurring at different levels of the school class context, vary in impact depending on the educational system?

We focus on the socioeconomic, ethnic and cognitive composition of the school class simultaneously and try to *differentiate between various underlying processes* proposed with regard to the measured dimensions, and we compare the results between different educational systems. Using data from the Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU), we distinguish two contextual levels in the school class: the overall context, i.e. all students in the class, and the friends within the class, as nominated by students in a sociometric module in the survey. Thus, we are able to separate effects of the general class composition from effects that can be assumed to result from direct peer interactions. Furthermore, the *comparison* between a country with a comprehensive school system (Sweden) and a country with a highly stratified school system

(Germany) makes it possible to identify differences in these processes between different institutional settings.

Theoretical background and previous research

School class composition and educational achievement: potential mechanisms

Classroom composition has been acknowledged as one of the most important peer groups for students' achievement (e.g. Burke and Sass 2013; Hoxby and Weingarth 2005). Research on the role of class composition in individual achievement usually focuses on three compositional dimensions: the average performance, the socioeconomic composition and the ethnic or racial composition in the school class (e.g. Caldas and Bankston 1997; Fekjær and Birkelund 2007; Hanushek et al. 2003, Hanushek, Kain, and Rivkin 2009; Hoxby and Weingarth 2005; Hoxby 2000; Legewie and DiPrete 2012; Szulkin and Jonsson 2007; for a meta-analysis see van Ewijk and Sleegers 2010). While research including all of these possibly intertwined dimensions are rare, the few studies doing so suggest that the ethnic composition of peer groups is less important or even non-significant for achievement than socioeconomic status (Rumberger and Palardy 2005) or achievement of peers (Hoxby and Weingarth 2005) are.

Numerous studies suggest compositional effects of school classes on individual educational achievement, but little is known about the underlying mechanisms (Hanushek et al. 2003; Jencks and Mayer 1990). In general, two different explanations for compositional effects in school classes have been distinguished (Rumberger and Palardy 2005; Rumberger and Willms 1992; cf. also the distinction between the *teaching* and *peer group* perspective by Veerman, van de Werfhorst, and Dronkers 2013: 372). Following the assumption of an 'overall' classroom effect, some scholars hypothesise that compositional effects mainly run through the teacher or the more general classroom environment. We label such effects *contextual effects*. Teachers may respond to the achievement of the overall student body in a school class by adjusting their expectations and the mode of teaching, thereby exaggerating student achievements depending on the study climate. For example, teachers may lower their expectations in classrooms with poor-achieving children (Rumberger and Willms 1992: 379). Furthermore, classrooms with high educational aspirations and low levels of problems with disturbance and distraction may provide a more learning-friendly environment, in which all students profit in a similar way.

Others put forward that classroom effects are mainly or completely mediated by a direct influence of school friends on students (Rumberger and Willms 1992: 379), for example by engaging them in activities that promote academic skills, providing help with school-related work, and shaping educational ambitions. In the following, these effects are called *direct peer effects* or *friend effects*. Despite this theoretical differentiation between mechanisms, few studies have tried to directly test different hypotheses on peer or friend effects and contextual effects (see, e.g. Burke and Sass 2013 for exceptions, who find class room peers to be more important than school grade cohort peers). However, it is important for educational policy implications which compositional dimension contributes to classroom effects, because the student composition in classes is more easily influenced by school teachers, administrators and policy makers than school friendship within classes is.

How does the classroom composition influence individual achievement and what are the underlying mechanisms? We hypothesise that the mechanisms for the effects of the overall class composition and the friend composition in class differ in some respects. The *socioeconomic composition* of a school class could affect the teaching style in class depending on the representation of socioeconomically deprived students. One may assume that teaching styles affect all students to a similar extent, regardless of the relational structure of their friendship network within a school class. The overall socioeconomic composition of the school class can contribute to the general value climate, which may exert an environmental pressure on all classmates, which in turn may enhance achievement acquisition for students in classes with more privileged socioeconomic status (Alexander et al. 1979). In contrast to such overall reference group effects, the teacher's instructional qualities may also be positively affected by an achievement-oriented class climate and thus promote learning. The socioeconomic background of school class friends could influence the ability of providing school-relevant information and encouragement, e.g. with respect to college attendance (Choi et al. 2008). School class friends with college-educated parents may have more information about requirements for college attendance, and having such friends increases the probability of having access to useful information, Furthermore, friends' parents may also serve as positive role models (Flashman 2014).

Similar arguments hold for the *cognitive composition* of school classes. In school classes with a low achievement level on average, the teacher may reduce the difficulty level in order to fulfil the need of the students, hampering the learning progress of all students in the class (Dreeben and Barr 1988). Furthermore, teachers may vary the pace of instruction depending on the achievement level in a school, leading to different outcomes for students in comparably slower school classes (Barr 1973-1974). In contrast, having friends with higher cognitive achievement may be an important resource for the concrete provision of help, improving individual achievement (Kahlenberg 2001).

As to the *ethnic composition* of a school class, it has been shown that ethnic or racial minority concentration in a school class reinforces negative attitudes towards school in the US setting (Mickelson 1990; Ogbu 1990). A competing scenario is that the concentration of students with immigrant origin, who usually possess a comparably high educational aspiration level (e.g. Engzell 2019), contributes to more positive educational outcomes due to positive reference group effects once academic and socioeconomic compositional features are controlled for. Similarly, having immigrant friends with high educational aspirations may be beneficial in the formation of own aspirations. In contrast, the ethnic composition of friends in the class may be a relevant aspect of the opportunity structure for the choice of language spoken among relevant peers. When most or all friends are from the majority population, it is likely that the host country language is spoken between them. Students in classes with various ethnic backgrounds may also use other languages, or, when speaking the language of the receiving country, it may be done with a poorer proficiency. The social context of the best friends and the opportunity structures to speak the host country language is an important predictor of native language proficiency (Carhill, Suarez-Orozco, and Paez 2008) and may therefore also affect language skills of others.

To summarise, there are reasons to expect positive effects of the socioeconomic and achievement composition of both the overall classroom and friendship networks. Regarding the ethnic composition, there are arguments to expect a positive effect of having friends with an immigrant background or being located in immigrant-dense school classes, as a result of their usually high educational aspirations, but there may also be adverse effects

due to possible language problems. We do not hypothesise which compositional measure matters more but leave this as an empirical question. However, in the following section, we outline why we may expect differences in the importance of different levels (classroom versus friends) depending on the educational system under study.

Cross-country differences in compositional effects

Irrespective of the question which compositional characteristic of a school class actually matters for individual academic achievement and of potential underlying mechanisms, another important and policy-relevant question is whether the effect of school class composition varies depending on the institutional setting of an educational system. Answering this question is essential when evaluating the effectiveness of desegregation policies and transferring findings from single country studies to other contexts.

In the following, we concentrate on the question whether the school class composition affects individual achievement differently depending on the stratification of an educational system. Stratified systems with a high degree of tracking, using previous achievement as the main or only selection instrument, typically produce academically homogenous classes with less variation in achievement level than comprehensive systems do. It seems plausible that teachers do not respond to homogenous achievement levels in the same way as they respond to a more varied student body in a class. An increase in the average achievement level of school classes is more likely associated with an increase of test scores of all students in a school class in stratified systems than in comprehensive systems due to the more homogenous student body in stratified systems. A similar argument holds for the socioeconomic composition of the school class. Stratified systems usually track students according to their achievement level, and given the association between socioeconomic status and achievement (e.g. Jackson 2013), the student body in schools within stratified systems can be assumed to be quite homogenous also with respect to their socioeconomic background. Teachers may need to adjust teaching to the various academic ambitions of their student body less in stratified school systems than in comprehensive school systems. Consequently, we expect that the composition of school classes has a stronger influence in stratified systems than in comprehensive school systems.

Previous research supports this assumption. Using PISA 2006 data, Dunne (2010) showed that being in a school with a high average socioeconomic status affects individual achievement less in comprehensive school systems than in highly stratified ones. Using the same data, Dronkers (2010) reported equivalent results for ethnic diversity in schools. A greater ethnic diversity in schools seems to be detrimental to academic achievement, but this effect is larger in stratified systems than in comprehensive systems (ibid.).

Does this mean that classmates do not matter for individual performance in more comprehensive school systems and that we therefore should care less about the school class composition in these systems? Or is the impact of peers in school classes also present at a lower level, in direct school friend interactions, because heterogeneous school classes provide more opportunity structures to form more or less beneficial friendship ties? We expect the latter pattern to be true, as previous research suggests that peer effects in school classes play out more in settings in which differences between students can be observed: when students are 'grouped on the basis of similarities, peer influences are more likely to support students' existing attitudes and values than to affect the formation of different ones' (Buchmann and Dalton 2002; see also Lorenz et al. 2020). Peer influence of educational

aspirations may be higher in comprehensive systems than in stratified systems, in which students are grouped into specific school types and therefore mostly have similar aspirations regarding the educational degree, which is predefined by the track. Similar arguments may hold for achievement composition and the hypothesis of well-achieving friends as a potential helping resource (Buchmann and Dalton 2002).

Summing up, the considerations lead us to the following hypothesis: we expect that the overall school class composition has a larger impact in more stratified systems and that school class friends are more influential on individual academic performance in comprehensive systems because these may provide opportunity structures that lead to more heterogenous friendship patterns that are more likely to influence individual achievement.

Data and measures

We use a unique database that is well suited to address the research questions for several reasons. First, a wide variety of information is available on the socioeconomic and ethnic background of the students and their individual cognitive skills. Second, as the data collection was conducted in the school context and included a sociometric module capturing direct friend interactions, we are able to aggregate these individual measures to the school class and the friendship context. Third, the data was collected in countries with different educational systems, allowing for a country comparison regarding the role of student attributes and contextual processes.

The data stems from the large-scale comparative project Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU; Kalter et al. 2016). Students were interviewed in a classroom setting in the first wave during 2010/2011 in England, Germany, the Netherlands and Sweden. Schools with a high immigrant proportion were oversampled. The subsequent sampling units were classes and students; school classes were selected from the nation-specific grade level in which mainly 14-year-old students attended. In the present study, we use data from Germany and Sweden, representing survey countries with well-defined school classes, including 10,038 individuals nested in 273 schools and 522 school classes (see CILS4EU 2016 and Kalter, Kogan, and Dollmann 2019 for more information on the sample design).[1]

Dependent variable

The studied outcome is standardised language test scores, taken from a multiple-choice test designed to measure children's lexicon in the survey country language. Each country used similar but independent, nation-specific tests, implemented under similar test conditions. In the analyses, language test scores are rescaled for each country separately to have a mean of 0 and a standard deviation of 1.

Independent variables—individual level

One of the main independent variables of interest is students' *migration background*. Students with migration background include children who migrated themselves or who have at least one migrated parent.

Parents' socioeconomic status is derived from questions on parental occupation. Students were asked to name and describe their father's and mother's job. Open-text responses were recoded into ISCO (International Standard Classification of Occupations) 2008 codes, which were then converted into ISEI (International Socio-Economic Index of Occupation Status) rankings. The highest ISEI ranking of either parent is used to measure *parents' highest socioeconomic status (HISEI)*.

Parents' highest education is measured using the parental survey and, in case of missing information, the student survey. Parents were asked about their highest completed education and about their partner's education (if applicable), with the following response alternatives: 'No school leaving certificate', 'Degree below upper secondary school', 'Degree from upper secondary school', and 'University degree'. In the student survey, students were asked about their mother's and father's education, with a set of identical items for each parent, e.g. 'Did your father complete primary school (or similar foreign education)? 'Did your father complete secondary school (or similar foreign education)?' 'Did your father complete university?' Response options were 'Yes', 'No' and 'Don't know'. The responses for each parent were combined into one variable that measures the highest educational qualification held by either parent.

Economic hardship is measured by a question in the parental questionnaire on whether the respondent would be able to get a specific amount of money by tomorrow. For parents' *cash margin*, a missing category is used in the analysis to reduce the number of excluded observations.

The *cognitive ability test score* comes from the cognitive ability test administered to students during the data collection process. It is an important measure of cognitive skills, which is an important precondition to learn a (second) language (e.g. Cummins 1980), especially for immigrants arriving in the country of destination at a rather late age (Dollmann, Kogan, and Weißmann 2019). It is a non-verbal test based on picture pattern problems, designed to be language free and as 'culturally fair' as possible. In both countries, the same test was used, called CFT 20-R (Weiß 2006).

In order to investigate possible mechanisms that contribute to contextual and direct peer effects, we include educational aspirations as well as whether another language than German or Swedish is spoken in the student's home in the analyses. Educational aspirations are measured by the question 'What is the highest level of education you wish to get?', differentiating between 'University degree' and 'Below university degree'. Whether another language than German or Swedish is spoken at home is measured by the answer 'Yes' or 'No' to the question 'Is there a language other than [survey country language] spoken at your home?'.

We include two demographic control variables: *age* and *sex* of the students. Age in years is derived from a survey question asking about students' date of birth. In order to account for possible negative age effects of students having previously repeated school classes, we also include age squared. Students' sex is derived from the question 'Are you a boy or a girl?'.

Independent variables—school class level and friends in class

The individual-level variables migrant background, parents' highest socioeconomic status, students' cognitive skills, educational aspirations, and language spoken at home are used to obtain the measures for characteristics of the school class and for the friendship networks

within school classes. At the school class level, we calculated the *proportion of students with migration background, the proportion of students speaking a second language in the home*, *the proportion of students with university aspirations* within each school class, the *mean HISEI* within families, and the *mean cognitive skills* as school class context measures (disregarding ego from the calculations).[2]

To identify friends in the class, we use the sociometric data collected in the CILS4EU-survey. This data provides a complete picture of the relations and friendships within the school class. Two questions were asked regarding friendship relations: 'Who is your best friend in class?' and 'Who are your five best friends in class?'. For each of their friends, students had to write down an ID, specified on a class list distributed to the students before the survey (cf. Kruse and Jacob 2016 for more details on the collection of the sociometric data). As the nominated students also took part in the survey, it is possible to link different individual and family information from each student's friend, which are then aggregated to all friends a student nominated during the survey. Following the procedure for school class level, we calculate the *proportion of friends with first- or second-generation immigrant background*, *the proportion of friends with university aspirations* and *with a second language spoken at home*, the *mean value of the highest socioeconomic status among friends' families*, and the *mean cognitive skill level among friends*.

Sample restrictions

We exclude very small classes from the analytical sample because the classroom context and friendship network strongly overlap. School classes with less than five students are excluded from the analyses, reducing the analytical sample by 21 cases. Results are consistent when a larger cut-off point is used. Furthermore, another 1,820 cases with missing information on the dependent or on any of the independent variables are dropped from the analyses, resulting in an analytical sample of 8,197 cases in the analyses.

Results

A central aim of our study is to uncover to what extent the overall classroom composition and direct interactions with friends in school classes impact on individual language skills. A first empirical question that needs to be addressed is how large the variation in characteristics of the classroom and friends' characteristics is. Do largely segregated classrooms also imply segregated friendship networks or do we find very different friendship networks within a specific classroom?

Figure 1 shows scatterplots of the composition of parental socioeconomic status, cognitive skills and immigrant background on the school class level as well as on the friendship network level, together with a Pearson correlation coefficient. As can be seen, the measures do correlate, but there is also large variation. A more privileged socioeconomic class room composition enhances friendship networks that are more advantaged in their socioeconomic background. However, it is important to note that, even in socioeconomically privileged classes we find friendship networks that consist of friends with lower parental socioeconomic background. This points to the potential relevance of separating school class composition from friendship relations within a school class. Furthermore, we observe that this

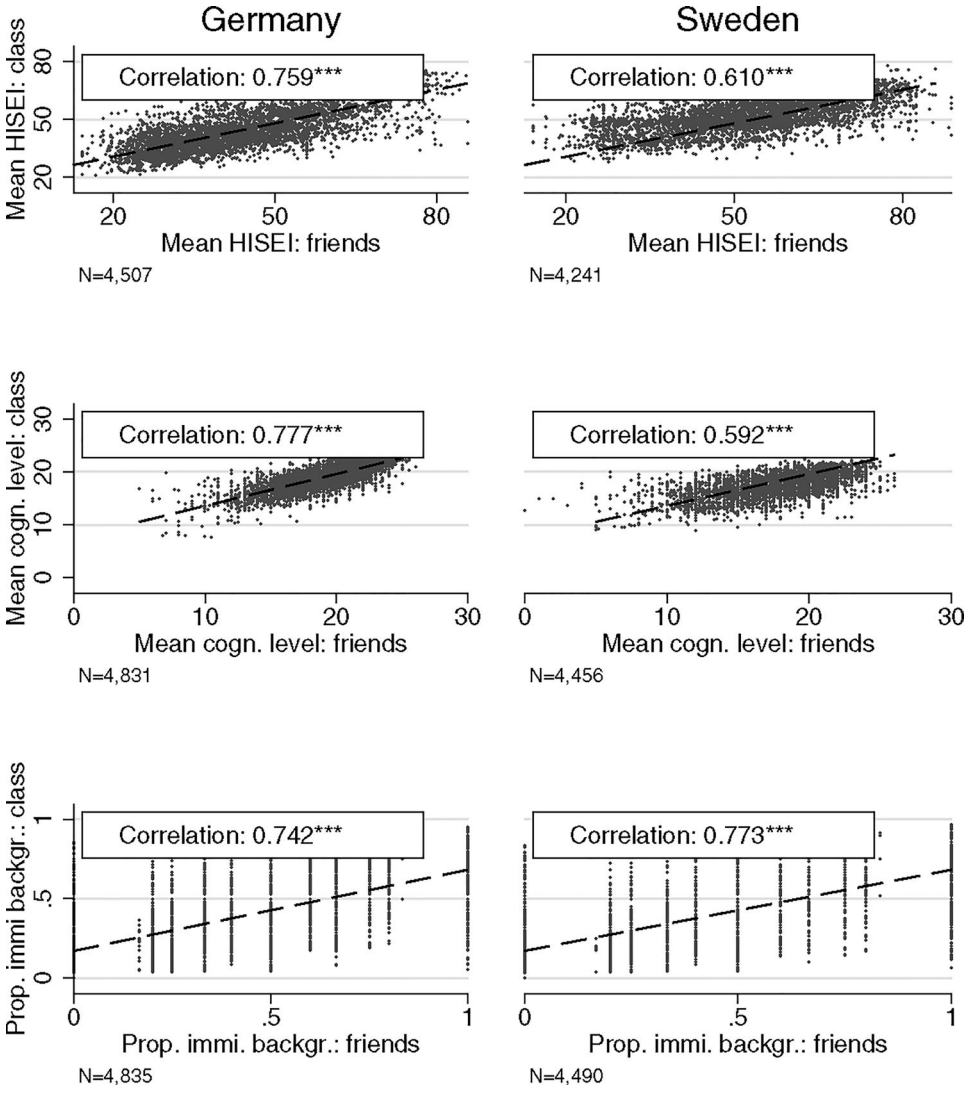

Figure 1. Variation between classroom characteristics and characteristics of best friends in class.

correlation is stronger for the socioeconomic and cognitive composition in Germany, which may be due to the more homogenous opportunity structures to make friendships in the German context with its stratified system and rather homogenous schools.

Given the hierarchical structure of the data, we estimate multilevel models (students nested in school classes, nested in schools; command mixed in Stata 14.2) and run separate analyses for the two countries, as our aim is to study country-specific effects. The different inclusion probabilities on school and school class level are considered by using design weights on the different levels. In the analyses, we first include measures on the school class level—the mean of the highest parental socioeconomic status, the share of students with immigrant background and the average cognitive skills of the school class—before examining the underlying processes of class composition on achievement by adding characteristics of the students' friendship networks. In this way,

we analyse whether the influence of the class context is partly or fully mediated by characteristics of the best friends in class.

Results from multilevel analyses for the two countries are shown in Figure 2. In all analyses, we control for individual cognitive skills and background (estimates are not shown, full results for the models presented in Figure 2 are available in Table S1 in the online supplementary material). The first model in Figure 2 only includes compositional measures of the school class, represented as squares (Model 1: Classroom measures only). We find a positive association between the overall socioeconomic and cognitive ability composition and language skills in Germany, but not in Sweden. The effects for socioeconomic background and cognitive composition are moderate in Germany. An increase in the mean parental ISEI in a school class by one standard deviation increases the individual language test scores by about 19 per cent of a standard deviation, while the effect for the cognitive composition is somewhat smaller with 15 per cent. Being surrounded by an increasing share of immigrants in a school class is not associated with individual language skills in Germany, net of the socioeconomic and cognitive composition of the school class. However, we find a very small negative effect of immigrant density in school classes in Sweden (5 per cent of a standard deviation).

Next, we turn to the question whether the effect of the overall classroom context is mediated by the composition of the friendship network within school classes. In Model 2 (Classroom and friendship network measures) in Figure 2, we add the characteristics of best friends, i.e. the immigrant, socioeconomic and cognitive background of the friends in the class. Results for the three different measures on the two contextual levels are represented

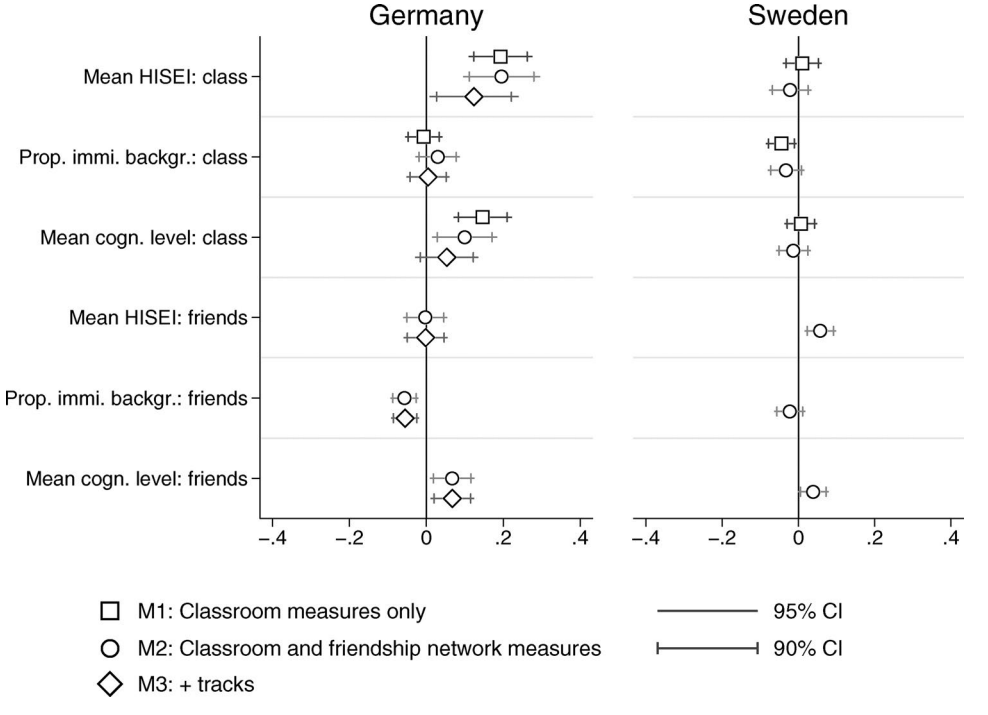

Figure 2. Effects of class composition and friends' characteristics on individual language skills. Multilevel linear regression. Weighted.

Note: Controlling for individual variables as shown in Table S1.

by the circles (Model 2). Focusing on the effects of socioeconomic composition at classroom level in Germany, we see that individual achievement is not influenced by friendship composition effects. The overall classroom effect for mean HISEI in Model 1 remains largely unchanged when introducing the best friends measure in Model 2, also showing that the best friends measure on this dimension does not correlate with individual language skills in Germany.

We learned from the analysis in Model 1 that the immigrant background composition of the class had no influence on individual language skills when controlling for socioeconomic and cognitive composition. Including the composition measures of the direct friends in Model 2 leaves the immigrant background effect at the classroom level virtually unchanged. However, looking at the estimate for the friendship network, we see that having many immigrant friends is negatively correlated with individual language skills in Germany, but less so in Sweden. Additional analyses demonstrate that this negative effect mainly concerns students with immigrant background (not shown, results available upon request). Therefore, as outlined in the theoretical part of the paper, friends may be an important resource for the acquisition of the host country language and thus also for language skills. This could especially affect students with less opportunities to speak and learn this language in other important contexts, such as in the family. Finally, for cognitive ability, the positive effect of the school class composition in Model 1 is partly mediated by the cognitive composition of the friendship network in Germany. Looking at the friendship level, it shows that the better the cognitive skills of the school friends in a class, the higher the language skills of the individual. The overall picture of the results is partly in line with our hypothesis that compositional effects of school classes matter more in stratified school systems, such as in Germany. However, we do not find an overall greater importance of school class friends in a comprehensive system. While this holds true for the socioeconomic composition of friends, the ethnic and cognitive composition of friends matters slightly more in Germany. In addition to this limitation, it has to be noted that the overall effect sizes, especially those of the friendship network, are rather small.

In the following analysis, we examine whether the strong effect of classroom composition in Germany is actually due to the tracking of students into rather homogenous classes, in which a homogeneous student body may enable an easier teaching situation for teachers. We do this by controlling for tracks in the analyses of the German subsample. The results can be seen in Figure 2, represented by diamonds (cf. Model 3 in Table S1 in the online supplementary material). Looking at the three estimates for friendship network composition at the lower end of Figure 2, we see that the results for friend effects shown previously (represented by circles in Figure 2) are not attributable to tracking. The friend effects are no different when controlling for tracks, while this is clearly the case for the overall class composition. When taking track placement and thus student homogeneity into account, all compositional effects change in the same direction. For the cognitive and particularly for the socioeconomic composition of the school class, the estimated positive effect of a more privileged school class composition on language skills becomes smaller. Taken together, the analyses suggest that the socioeconomic composition of a class seems to matter most, but only in the German stratified system, which is probably due to the tracking system.

In the following analyses, we investigate the possible underlying mechanisms in more detail and ask whether these effects on the different compositional dimensions can be attributed to differences in the aspirational levels in school classes and friendship networks.

Furthermore, we ask whether the negative effect of having immigrant friends (given the ethnic composition of the school class) may be attributable to the fact that another language than German or Swedish is usually spoken in immigrant-dense networks.

Figure 3 replicates the results from Model 2 (Sweden) and Model 3 (Germany, controlling for tracks), displayed as squares, and at the same time controls for individual aspirations, the aspirational level in friendship networks and the aspirational level in school classes. As can be seen, having high-aspiring friends seems to be slightly positively related to individual language skills, while the results for the overall aspirational level in the classroom is less conclusive (coefficients displayed as a cross). The effect size of the aspiration measure in classrooms is positive in Germany but negative in Sweden, and it is non-significant in both cases. However, including the aspirational measure slightly reduces the positive effect of the socioeconomic composition of the school class in Germany.

Figure 4 includes the share of students who speak another language than German or Swedish at home. As can be seen, this compositional measure does not correlate with individual language skills for any of the compositional measures (the classroom and friendship network). Including second language use in the home does not affect the results for the other compositional measures, neither in Germany nor in Sweden. Similar analyses were conducted with average school problems and effort put into school work in school classes and friendship networks, and we did not observe any effect of these compositional measures on individual achievement, neither did we find any impact on the other compositional measures (results available upon request).[3]

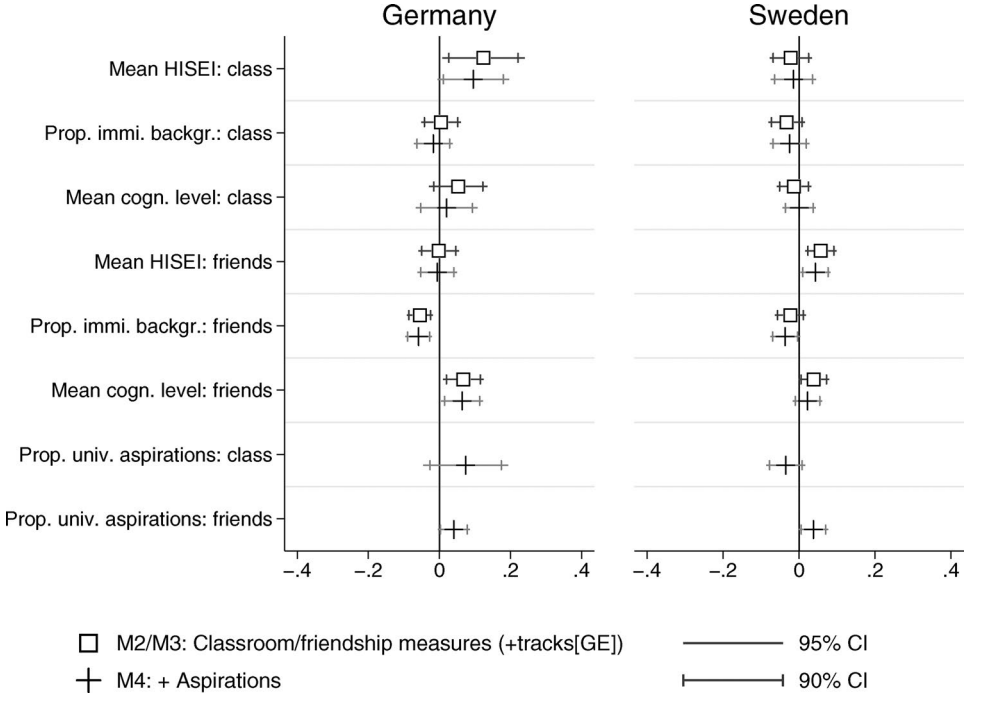

Figure 3. Effects of class composition and friends' characteristics on individual language skills. University aspirations included. Multilevel linear regression. Weighted.

Note: Controlling for individual variables as shown in Table S2.

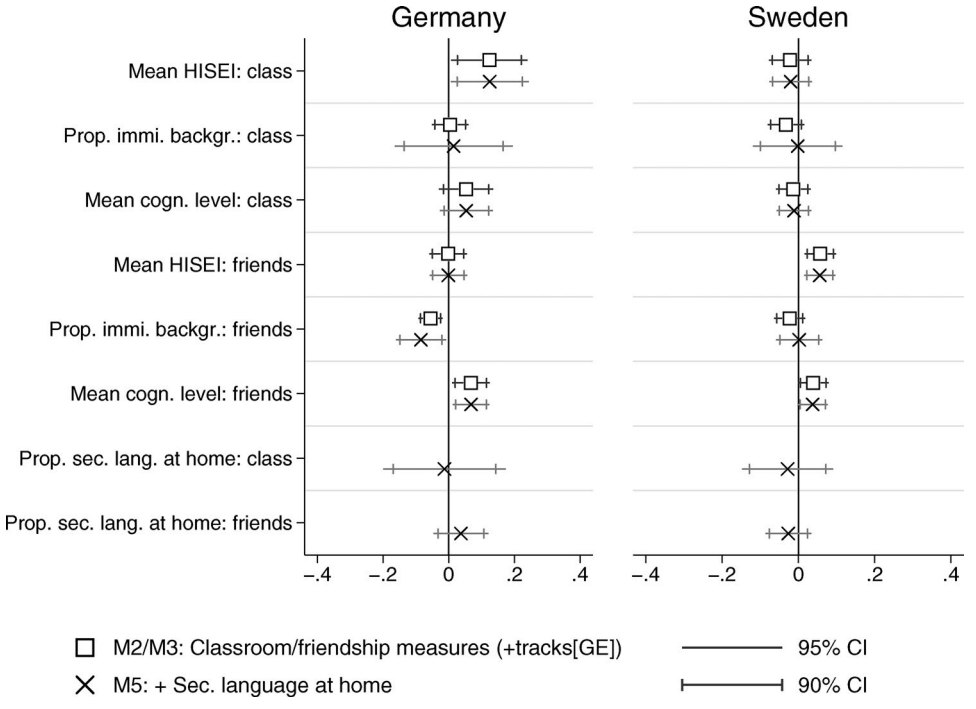

Figure 4. Effects of class composition and friends' characteristics on individual language skills. Second language use in the home is included. Multilevel linear regression. Weighted. Note: Controlling for individual variables as shown in Table S2.

Conclusion

The main contribution of this study was to shed light on the processes underlying the contextual effects on individual language skills, apart from individual and family characteristics, and on how these effects may differ between two countries with different educational systems. A central finding is that the socioeconomic composition of the school class seems to matter more than the ethnic or cognitive composition and that this effect is only observable in Germany. We demonstrate that this is at least partly due to the tracking system. When we also consider characteristics of the best friends in class, the contextual effects are reduced, particularly for the cognitive composition. In contrast, friends' cognitive skills matter in both countries, while their socioeconomic status affects students' language test scores more in Sweden. Furthermore, we find a slightly negative effect of having many friends with an immigrant background in both countries (significant only in Germany).

Regarding possible mechanisms, we tested whether the educational aspirational level, the share of students who speak another language than German at home, the presence of school problems and the average effort put into school work among students—all measured within school classes and among friends—contribute to the effects found for the conventional composition measures. This is however not the case, except for the aspirational level among friends and in classes, which accounted for some of the positive effects of a more privileged socioeconomic composition in German school classes.

Furthermore, our observation that friend effects are similar in the stratified system of Germany and the comprehensive school system of Sweden partly contradicts the argument put forward by Buchmann and Dalton (2002), who hypothesise that relevant others have a smaller influence in contexts in which students are 'grouped on the basis of similarities' and 'peer influences are more likely to support students' existing attitudes and values than to affect the formation of different ones' (Buchmann and Dalton 2002). In addition, it must be noted that these direct peer effects on the dimension on which we are able to observe them are rather small in effect sizes in both countries.

Another key finding is that 'classical' contextual effects at school class level on language skills are reduced once considering characteristics of friendship networks. This finding is important, not least owing to its policy implications. It partly contradicts classical and more recent desegregation strategies discussed and implemented in several countries, e.g. in the United States. A less segregated classroom is not necessarily more effective, at least as long as opportunity structures for less beneficial friendships exist. As we have shown in the present paper, even only slightly diverse classrooms leave room for rather segregated friendship networks, with a probable impact on language learning—an important and useful resource for long-term educational achievement. On the positive side, while friendship is difficult to reach by policy, the teacher strategy to influence who sits next to each other in a classroom may impact on friendship formations and learning (Keller and Takács 2019).

There are several limitations of this study. We share two well-known problems in identifying peer effects: First, the selection into school classes and especially the formation of friendship networks within school classes are not random but are due to selection on the basis of specific traits. Therefore, we cannot separate peer effects from selection effects (the selection problem). Second, it is difficult to separate peer effects on a student from the effect of a student on peers—if high-achieving peers have a positive impact on a student's language test score, the student's high achievement should positively impact the language test scores of the peers (the reflection problem). These problems are present in many studies on contextual effects, and this should be kept in mind when interpreting the results of this study.

Furthermore, our results must also be seen in the light of generally rather instable friendships among youth (Faris and Felmlee 2018). Insofar as the estimated friend effects represent temporary friendship ties, potential long-term effects are a subject of doubt. On the other hand, it could be argued that the effects might be larger if it was possible to focus on long-lasting friendship networks. Longitudinal research with sociometric measures in close intervals is needed to address this issue.

In future research, it would be fruitful to focus more specifically on differential effects of classroom and friendship compositions for specific social or ethnic groups. Are socioeconomically better-off students equally affected by a more positively selected student body in school classes than socioeconomically worse-off students? Are immigrant students in immigrant-dense classes more disadvantaged than native students, as preliminary results suggest for immigrant-dense friendship networks? Answering these questions would further increase our understanding of not only how the socioeconomic and ethnic composition of school classes affects individual achievement but also how school classes contribute to social and ethnic inequalities in educational achievement and how meaningful educational policies may tackle these differences.

Notes

1. The choice of countries in the CILS4EU data was made on the basis of the criteria 1) the sociometric measure was conducted on school class and not on grade level, 2) inclusion of countries where school classes in the respective grade level form rather stable units during the school year, and 3) comparison of clearly different educational systems. In several English schools, the sociometric measure, which is key in identifying the direct peer interactions within school classes, was not conducted on school class level but on grade level, meaning that students could nominate school friends from other classes of the same grade (Kruse and Jacob 2016). In order to not mix up class-level compositional measures with grade-level peer interactions, we decided to drop England from the analyses. A similar problem arises in the Netherlands, where teachers from several schools reported considerable change in the student body within during the school year. In contrast, in Germany and Sweden, school classes remain rather stable and the sociometric test was conducted on class level in all schools. Furthermore, both countries represent two prime examples for different educational systems (stratified vs. comprehensive).
2. In disregarding ego from the calculation of the context measure, we follow previous research (e.g. Hanushek, Kain and Rivkin 2003: 537). The multivariate results do not change substantially when including ego (Pearsons's r between the measures, for all dimensions and countries: >0.99, $p < 0.000$).
3. School problems were measured with a scale resulting from the four following questions: 'How often do you argue with teacher?', 'How often do you get a punishment in school (e.g. being kept in detention, being sent out of class, writing lines)?', 'How often do you skip a lesson without permission?' and 'How often do you come late to school?', with the answer categories 'Every day', 'Once or several times a week', 'Once or several times a month', 'Less often' and 'Never'. For the classroom-level measure, the classroom average of this score was used, while the friendship-level measure consists of the average score of this scale within the friendship network. School effort was measured with the item: 'How much do you agree or disagree with this statement? I put a great deal of effort into my school work.' and the answer categories: 'Strongly agree', 'Agree', 'Neither agree nor disagree', 'Disagree' and 'Strongly disagree'.

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