Ethnic Composition and Friendship Segregation: Differential Effects for Adolescent Natives and Immigrants[1]

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Ethnically diverse settings provide opportunities for interethnic friendship but can also increase the preference for same-ethnic friendship. Therefore, same-ethnic friendship preferences, or ethnic homophily, can work at cross-purposes with policy recommendations to diversify ethnic representation in social settings. In order to effectively overcome ethnic segregation, we need to identify those factors within diverse settings that exacerbate the tendency toward ethnic homophily. Using unique data and multiple network analyses, the authors examine 529 adolescent friendship networks in English, German, Dutch, and Swedish schools and find that the ethnic composition of school classes relates differently to immigrant and native homophily. Immigrant homophily disproportionately increases as immigrants see more same-ethnic peers, and friendship density among natives has no effect on this. By contrast, native homophily remains relatively low until natives see dense groups of immigrants. The authors' results suggest that theories of interethnic competition and contact opportunities apply differently to ethnic majority and minority groups.

INTRODUCTION

Social segregation of immigrant groups is one of the biggest issues confronting contemporary societies as they become increasingly multiethnic.

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Ideas, knowledge, and resources are unequally available when social interaction is confined within ethnic boundaries, and this can have considerable consequences. For example, a lack of interethnic contact results in more ethnic prejudice, especially for natives (Pettigrew and Tropp 2006), and the less contact immigrants have with natives, the lower they score on a range of socioeconomic outcomes (Aguilera 2005; Kanas, Van Tubergen, and Van der Lippe 2011; Lancee 2012).

In order to offset segregation and its effects, scholars and policy makers frequently turn to one of society's most influential institutions: schools. Schools are relatively closed institutions wherein lasting socialization experiences can be readily observed by scholars (Coleman 1994) and where policy makers arguably have the greatest capacity to treat a range of social problems. Scholars and policy makers both agree that ethnically diverse schools are essential breeding grounds for the strongest and most positive means of offsetting ethnic segregation and inequality—that of interethnic friendship. Schools strongly socialize youth by exposing them to school subjects like history and math, but they also expose youth to peers who are often from different backgrounds (Khmelkov and Hallinan 1999). It is from this pool of peers and these key contexts that most youth friendships are made (Cotterell 2007). When interethnic friendships arise in schools, they are especially powerful in establishing more positive interethnic attitudes and lessening of ethnic inequality. For these reasons, this study sets out to examine interethnic friendships in school classes.

The ethnic composition of school classes can shape interethnic friendship by at least two mechanisms. First, when school classes are more ethnically diverse, they increase the *opportunities* adolescents have to develop interethnic friendships. This idea has been corroborated by several studies: the observed number of interethnic friendships increases when adolescents have more possibilities to meet peers of another ethnic background in school (Hallinan and Tuma 1978; Joyner and Kao 2000; Fischer 2008). However, this positive relation does not mean that ethnically heterogeneous school classes generate the expected number of interethnic ties. Regardless of the strength of tie or the country of focus, scholars consistently find that the number of interethnic friendships is structurally lower than the number of possible interethnic friendships (Hallinan 1982; Eshel and Kurman 1990; Baerveldt et al. 2007; Wimmer and Lewis 2010). This tendency to have more

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same-ethnic friends than expected by chance suggests a second mechanism by which interethnic friendships arise: that adolescents *prefer* relations with same-ethnic peers because they perceive such individuals to be more familiar and their interactions to be more certain (Byrne 1971; McPherson, Smith-Lovin, and Cook 2001; Wimmer and Lewis 2010).

The distinction between same-ethnic tie opportunities and preferences is important for segregation research and has implications for policy. If preferences for same-ethnic friends amplify with diversity, then we may observe the reverse result of what policy makers intend to bring about by diversifying classes—it may actually encourage greater segregation. Understanding the process of *same-ethnic friendship preferences* is therefore essential to treating ethnic segregation. A social-psychological preference for same-ethnic friendship is difficult to measure directly, and for the purpose of this study it is sufficient to regard such a preference as the incidence of same-ethnic friendships in school classes net of the availability of different ethnic groups in those classes (i.e., the opportunity structure) and several other possible drivers of same-ethnic friendship. Although there is no perfect fit between same-ethnic friendship preferences in theory and our proxy for same-ethnic friendship preferences, it is consistent with prior published work (e.g., Stark and Flache 2012; McFarland et al. 2014; Smith, Maas, and Van Tubergen 2014).

Prior research on ethnic segregation is unclear as to how and why the ethnic composition of a class affects same-ethnic friendship selections above and beyond the opportunity to associate with same-ethnic peers. Part of this confusion can be attributed to different conceptualizations of ethnic composition. Some studies conceptualize ethnic composition as the percentage of ethnic minority or majority members in classes and find no effect on interethnic friendship choice (Eshel and Kurman 1990; Lubbers 2003; Vermeij, Van Duijn, and Baerveldt 2009). Other studies conceptualize ethnic composition as racial or ethnic diversity within schools (i.e., the variety of the ethnic majority group and different ethnic minority groups) and reveal a nonlinear effect: the tendency for having same-ethnic friendships increases with ethnic diversity but diminishes in relevance for the most diverse schools (Moody 2001; Currarini, Jackson, and Pin 2010). Is ethnic composition a function of the majority and minority ethnic group's presence in a setting, or is it a function of the diversity of all ethnic groups?

Another point of confusion concerns explanations for why the ethnic composition of schools relates to interethnic friendship. Some research speculates that members of the majority ethnic group feel threatened by the increasing size of the minority out-group (Moody 2001; Vermeij et al. 2009). Other work argues that minority members are better able to find a suitable same-ethnic friend when the pool of same-ethnic peers increases (Moody 2001). And finally, others contend that minority members feel confident

enough to follow a collective strategy and exclude majority members from their friendship networks when the share of majority members decreases in class (Vermeij et al. 2009). Each explanation has merit at face value, and they suggest that ethnic groups react differently to the ethnic composition of settings they share. Unfortunately, the systematic study of how and why ethnic groups relate differently to ethnic composition has received little scholarly attention.

In sum, what is missing in ethnic segregation research is an account for how and why the ethnic composition of settings relate to adolescents' tendency to have same-ethnic friends. This gap in knowledge means policy makers lack explanation for why some of their efforts at ethnic desegregation (via diversification efforts) have little impact or guidance on how their efforts could be differently designed so as to have their intended effects. This study contributes to ethnic segregation research by presenting theoretical explanations for differential levels of ethnic segregation, and it then carefully tests its derived hypotheses. Our research question reads: how and why does the ethnic composition of school classes relate to the tendency of native and immigrant adolescents to have same-ethnic friends instead of interethnic friends? We answer this question by studying same-ethnic friendships while taking the opportunity structure for same-ethnic friendship and several other possible drivers of same-ethnic friendship into account.

We build on prior literature in three ways. Unlike previous studies, we simultaneously examine ethnic diversity and the share of native students in classes, and we thereby identify multiple aspects of the ethnic composition of classes that relate to ethnic homophily.[2] Ethnic diversity refers to the variety of ethnic groups in class (including majority and different minority group members), and it captures the extent to which adolescents meet out-group peers. However, the concept of ethnic diversity alone does not reflect which ethnic group is numerically dominant in a class. When a group is numerically dominant in a setting its members have greater representation and potential social power. Members of these numerical majorities should therefore experience diminished feelings of ethnic threat. As such, a study of ethnic composition needs to take into account when a particular group is numerically dominant. The share of native students in class is suitable to study in this case, as it indicates whether native students, the dominant group in a particular society, are numerically dominant in the class as well. It does not, however, take the composition of the out-group into account like the concept of ethnic diversity does. If the out-group is formed by one single ethnic group, then it is less diverse and much more salient and more

[2] In this article we use the term "majority" and "native" ethnic group to refer to the prevailing ethnic group in a nation. We understand the numerical majority group is not always "native" (e.g., in the United States), but the terms apply well to the European context and nations of our study.

likely to be perceived as intimidating in comparison to an ethnically diverse out-group (Moody 2001). In sum: the inclusion of both aspects of ethnic composition (i.e., the share of natives and ethnic diversity) is necessary to fully understand the relation between the ethnic composition and same-ethnic friendship. Our focus on ethnic diversity and the share of natives tells us more about how the ethnic composition is related to adolescents' tendency to have same-ethnic friends.

Second, we build on prior studies that examine the interethnic friendship choices of ethnic minority and majority groups as independent factors (González et al. 2007; Goodreau, Kitts, and Morris 2009; Vermeij et al. 2009). We go a step further by examining whether same-ethnic friendship within one group is related to more same-ethnic friendships in another group. For example, if immigrant Turkish students mostly befriend each other in class, will native German students react by withdrawing to their own group as well? Conversely, if native students mostly befriend within their group, will immigrant students react by withdrawing into their group? In-group friendships tend to unify the out-group, and it may be even more threatening as a unified out-group numerically competes with the in-group for status in class. If immigrant same-ethnic friendship relates less strongly to in-group friendships of natives than vice versa, then it will indicate that ethnic threat encourages same-ethnic friendships to form among natives and not among immigrants. Through the study of the interplay of native and immigrant friendship selection processes can we better understand the manner in which different ethnic compositions result in friendship segregation.

Third, we extend friendship segregation research to a far larger array of settings, and to different cultures than heretofore. We examine adolescent social networks in English, German, Dutch, and Swedish secondary school classes using the Children of Immigrants Longitudinal Survey in Four European Countries project (CILS4EU; Kalter et al. 2014). Most of the studies on ethnic diversity and interethnic friendship have been conducted in U.S. schools (Fisher and Hartmann 1995; Moody 2001; Mouw and Entwisle 2006) and classrooms (McFarland et al. 2014), and therefore, our study is an important complement to those studies. In U.S. studies of adolescent friendships, researchers study either a small number of school friends selected from the array of all possible persons in a high school or classroom friends specific to a particular class period and setting. By contrast, studies of European adolescent friendships concern school classes. These classes are sets of 10–35 students who move together as a unit through all the same courses and across multiple settings. They are more akin to U.S. classes in elementary schools, where there is frequent interpersonal exposure and likely strong tie formation. As such, European secondary school classes are the type of contexts where adolescents are more likely to experience genuine interethnic contact instead of mere exposure. Another advantage of using the CILS4EU data is

that schools with many immigrant students are oversampled, which provides us the opportunity to examine friendships of native and immigrant adolescents from different origin countries, whereas previous studies in school classes did not make this elaborate distinction (i.e., they focused on immigrants in general; Lubbers 2003; Vermeij et al. 2009).

THEORY

We start with a brief summary of how same-ethnic friendship in general develops and then provide a working definition of ethnic homophily employed throughout the article. Previous research has studied same-ethnic friendship using a theoretical framework of opportunities, preferences, third-party influence, and network mechanisms (McPherson et al. 2001; Moody 2001; Wimmer and Lewis 2010). First, scholars agree that the likelihood of friendship depends on the *opportunities* to meet each other. It is still the case that adolescents with different ethnic backgrounds are distributed unevenly across schools (Denessen, Driessena, and Sleegers 2005; Mouw and Entwisle 2006; Noreisch 2007; Söderström and Uusitalo 2010) or are separated within schools due to ethnically segregated tracks (Moody 2001) and hence have fewer opportunities to become friends. Second, adolescents are argued to *prefer* same-ethnic peers over interethnic peers because ethnic similarity is more likely to provide shared activities, mutual understanding, and a shared worldview (Byrne 1971; McPherson et al. 2001; Wimmer and Lewis 2010). Third, *third parties* such as parents and friends can amplify the likelihood of having same-ethnic friends either by increasing the opportunities for adolescents to meet out-group peers or by influencing their preferences for same-ethnic friendship (Edmonds and Killen 2009; Smith, Maas, and van Tubergen 2015). In addition, *network mechanisms* such as the tendency to reciprocate friendships and befriend friends of friends amplify friendship within ethnic groups (Moody 2001; Mouw and Entwisle 2006; Goodreau et al. 2009).

The core concern of this study is the aforementioned mechanism of preference, or *ethnic homophily*. Ethnic homophily refers in some studies to the mere occurrence of same-ethnic friendships (McPherson et al. 2001). Today most scholars contend that ethnic homophily concerns the social-psychological preference for same-ethnic friends and not same-ethnic friendships formed for other reasons (Wimmer and Lewis 2010). It is difficult to measure same-ethnic tie preferences directly, so most research now identifies ethnic homophily as the tendency to form more same-ethnic friends than is expected from the opportunity structure and other drivers of same-ethnic tie formation (e.g., net of the reciprocity, transitivity, and opportunities for contact). Consistent with prior research, we measure ethnic homophily in this "proxy" manner or as a residual explanation for the heightened occurrence of same-ethnic friends while taking other factors that drive same-ethnic friendship into account. Because none of the theoretical mechanisms discussed above are developed specifi-

cally for understanding how the ethnic composition of classes drives ethnic homophily, we turn to two commonly used contextual theories in the next section to derive our hypotheses: intergroup contact theory and competition theory.

Intergroup Contact and Competition Theory

The basic premise of intergroup contact theory states that adolescents will develop more positive attitudes toward members of other ethnic groups when they have more interethnic contact (Allport 1954). Negative attitudes are considered to be a consequence of prejudice, which can be effectively adjusted when adolescents get to know peers with a different ethnic background. In such fashion, these youth experience influence from diverse sets of peers. However, many longitudinal studies have also shown a selection effect: favorable interethnic attitudes generate interethnic friendships (Pettigrew et al. 2011). In some cases, adolescents with favorable interethnic attitudes can choose to attend an ethnically diverse school in order to make interethnic friends. Because both of these influence and selection mechanisms are at work, it can be argued that adolescents should at least have some tolerant attitudes toward out-group peers before they befriend them, in order to even consider an interethnic friendship. In line with intergroup contact theory, daily interethnic contact in classes could facilitate that initial tolerance necessary to start investing in interethnic friendship.

An important element of contact theory is its focus on actual contact instead of mere exposure. It has been argued that actual intergroup contact is most efficient when different groups have an equal status, share the same goals, and cooperate and when important authorities support interethnic relations (Pettigrew and Tropp 2006; Tropp and Prenovost 2008). We have no suitable data to measure these conditions.[3] We can, however, reasonably expect that students in European classes have actual contact instead of mere exposure. The adolescents we study (approx. 14 years old) take the same classes with the same group of peers the entire year. Moreover, as classes are

[3] In a previous version of this study, we tried to examine whether tracking in school (equal status), variance in academic orientation, school attachment within classes (shared goals), and interethnic bullying and doing homework together (interethnic cooperation) amplified or dampened the relation between the class's ethnic composition and ethnic homophily in order to approach Allport's conditions of positive interethnic contact. None of these variables explain why classes with similar ethnic compositions show varying levels of ethnic homophily. We did not proceed with this approach eventually because these measures are either very crude or endogenous to our dependent variable. For example, tracking is a country characteristic (German and Dutch schools segregate students by academic achievement, whereas England and Sweden do not) and coincides with many unknown country characteristics, and interethnic bullying and doing homework together is possibly too closely related to interethnic friendship. As such, we believe that this approach did not add to our research question or to the current scientific debate.

relatively small, we know that students within a class meet on a daily basis and experience actual contact with out-group members in their class. For example, class peers are likely to collaborate on group projects and team up during physical education.

There is, however, hardly any empirical evidence that an increase in the share of out-group members in school classes diminishes ethnic homophily (Eshel and Kurman 1990; Lubbers 2003; Vermeij et al. 2009).[4] To the contrary, if studies find an effect of the school's ethnic composition on ethnic homophily, it is usually in line with ethnic competition theory (Moody 2001; Mouw and Entwisle 2006; Currarini et al. 2010). According to this theory, interethnic contact does not lead to positive attitudes toward out-group members but to feelings of threat. Because ethnic groups compete for sought-after scarce goods, be it either perceived or actual competition, the presence of out-group members is theorized to lead to more negative attitudes toward them (Coser 1956; Blalock 1967; Coenders 2001). The theory is mostly applied to adults, but adolescents can experience inherently competitive ethnic relations also when they have developed an ethnicity-based social identity (Tajfel and Turner 1979; Vervoort, Scholte, and Scheepers 2011). Therefore, it can be argued that having out-group class peers leads to a heightened awareness of ethnicity and feelings of ethnic threat.

The early work of Simmel (1964) already proposed that one way to deal with out-group threat is to "centralize" and establish a unified in-group that is able to compete with the out-group. In line with this idea, studies show that as schools become more ethnically diverse (i.e., have a more balanced distribution of ethnic majority and minority members), adolescents develop a stronger tendency to befriend same-ethnic peers (Moody 2001; Mouw and Entwisle 2006; Currarini et al. 2010). Some studies found this relation to be nonlinear: ethnic homophily stabilizes in the most diverse classes (Moody 2001; Mouw and Entwisle 2006; Currarini et al. 2010).

Even though most evidence to date suggests evidence for competition theory, it cannot be regarded as an empirical regularity just yet. To our knowledge, studies that find evidence for competition theory are all based on the same data set, namely, the Add Health data that cover students in U.S. school settings (Moody 2001; Mouw and Entwisle 2006; Currarini et al. 2010). Non-U.S. studies in school classes do not find any significant effects of the share of the minority group on ethnic homophily: ethnic homophily is found to be stable across classes with a varying share of minority group students (Eshel and Kurman 1990; Lubbers 2003; Vermeij et al. 2009). In addition, U.S. school studies generally focus on ethnic diversity, and the non-

[4] Exceptions are the relatively old study of Hallinan and Texeira (1987) and the study by Fisher that does not take statistical dependencies within social networks into account (2008).

U.S. class studies focus on the share of ethnic minority or ethnic majority students in class. This likely matters for the outcomes, as McFarland and colleagues (2014) showed recently that racial homophily increases in racially diverse schools but decreases in racially diverse classrooms in the United States. Because evidence for competition theory coincides with a particular measure of ethnic composition (ethnic diversity), context (schools), and country (United States), we examine the effects of ethnic diversity and share of native students in class on ethnic homophily in European high school classes. The current state of the literature suggests that competition theory has the most explanatory power in the ethnic homophily-diversity relation but leaves many unanswered questions; we focus on competition theory—and not contact theory—to derive our hypotheses in the following section.

Ethnic Diversity and the Share of Natives

We start with retesting the claim that ethnically diverse schools lead to stronger ethnic homophily, especially in moderately diverse schools (Moody 2001; Mouw and Entwisle 2006; Currarini et al. 2010). In line with competition theory, this finding is explained as the consequence of increasing interethnic threat when schools become more ethnically diverse. Threat is argued to be strongest when ethnic diversity is moderate because there will be a few ethnic groups in a class, and they are roughly equal in size in this case. This likely creates a competitive "we versus them" environment, as their in-group size enables all groups to compete for a dominant position. We call this the *threat mechanism*.

At the same time, all groups are likely to satisfy in-group preferences, as there are ample opportunities for all to find a same-ethnic friend in their class. Hence, there are few incentives for all parties to invest in what may be considered less optimal friendships (i.e., interethnic friendships). We call this the *second-order opportunity mechanism*: at least one same-ethnic peer in class is required to have a same-ethnic friend in class (first-order opportunity mechanism), but the chance of finding a same-ethnic friend that also matches other friendship prerequisites (e.g., having the same gender or liking the same music) increases with the absolute number of same-ethnic peers in class (second-order opportunity mechanism).

In contrast to moderately diverse classes, there are many smaller ethnic groups of which none can reach a dominant position by number in the most ethnically diverse classes. Also, the pool of potential same-ethnic friends becomes smaller for every ethnic group, which makes it more difficult to find a suitable same-ethnic friend. Thus, the positive diversity-homophily relation should decrease again when everybody becomes part of a numerical minority group in class. As such, we aim to test the following hypothesis concerning the nonlinear relation between ethnic diversity and ethnic homophily:

HYPOTHESIS 1.—*Ethnic homophily is low in ethnically homogenous classes, high in moderately diverse classes, and low again in the most heterogenous classes.*.

Another frequently studied concept of ethnic composition is the share of natives (or ethnic majority members). Prior studies find no evidence that the share of natives is related to ethnic homophily (Eshel and Kurman 1990; Vermeij et al. 2009). However, the share of native students is highly correlated with the degree of ethnic diversity in a setting (negatively), so we suspect this prior null finding may be incorrect (Eshel and Kurman 1990; Vermeij et al. 2009). Classes with more natives are generally also the least ethnically diverse classes, and classes with few natives are generally also the most ethnically diverse classes.

HYPOTHESIS 2.—*Classes with a larger share of natives show less ethnic homophily, but ethnic homophily decreases again in the classes with the smallest share of natives*.

After retesting findings from previous studies, we further examine why previous research found classes with moderate diversity and numbers of natives to exhibit the strongest homophily. A first explanation is that ethnic out-groups are relatively large and hence threatening (threat mechanism), and a second explanation is that similarly large ethnic groups provide every ethnic group more opportunities to find same-ethnic friends that satisfy other friendship preferences as well (second-order opportunity mechanism). In the following section, we theorize to what extent the nonlinear effect is due to these proposed mechanisms.

Multiple scholars have argued that the threat mechanism is less salient to immigrants than to natives (Stephan and Stephan 2000; Vermeij et al. 2009). Being a numerical minority is a common experience for immigrant adolescents, as there is plenty of exposure to the native population, whereas native adolescents are used to being the numerically dominant group in society. As such, Moody (2001) argues that minority member adolescents favor in-group friendship with increasing ethnic diversity because they are more likely to find a same-ethnic peer they like in a larger pool of same-ethnic peers. His statement implies that immigrants do not feel threatened by natives and therefore befriend according to the second-order opportunity mechanism.

Vermeij and colleagues (2009) also expect immigrant adolescents not to feel threatened by native peers, but for a slightly different reason. They argue that immigrants have learned to cope with their minority status and follow a socially adaptive strategy (i.e., they are relatively open toward befriending native peers). Only when the immigrant in-group size increases will immigrants exclude natives from their friendship networks because a larger in-group is argued to provide more potential for power and resources to take on a collective strategy (McCarthy and Zald 1977; Moghaddam and Perreault 1992).

If it is true that native homophily increases in ethnically diverse classes due to feelings of threat, then natives should feel especially threatened when immigrants form a unified group. One situation in which immigrants appear unified to natives is when immigrants befriend each other and form dense social groups. In that case, natives may expect immigrants to be more able in competing for a dominant position in class.

If it is true that immigrant homophily increases in ethnically diverse classes due to second-order contact opportunities, then immigrants should be indifferent about whether natives form dense in-group friendships. Their homophilous choice depends solely on finding a suitable same-ethnic friend, which is independent from native in-group density.

HYPOTHESIS 3.—*The more immigrants form dense in-group friendships, the stronger native homophily becomes, whereas immigrant homophily is not related to the density of the native group.*

In addition to the distinction between native and immigrant adolescents, we argue the importance of distinguishing between ethnic diversity and the share of natives within a class. Ethnic diversity reflects the chance that two random students in class are of a different ethnic group. Although ethnic diversity provides useful insights into the ethnic composition of a class, it does not reveal which ethnic group is numerically dominant. For example, consider two German classes where the chance of two random students being from a different group is exactly the same, namely, 40%. Class A, however, consists of 14 German students and six students with a Turkish background, whereas class B consists of six German students and 14 Turkish students. In class A, the native students are numerically dominant, and hence, they should feel less threatened by their immigrant peers than in class B where immigrant peers are numerically dominant. In addition, Turkish students may feel more obliged to adapt socially to German students in class A in comparison to Turkish students in class B, and they are more likely to find a suitable same-ethnic friend in class B than in class A.

Ideally, we would consider the in-group size of all ethnic groups in a class. However, for practical reasons and because of the special position of natives, we focus on the size of this latter group.[5] Thus, we distinguish between two aspects of class composition: the share of the native group and immigrant diversity. Excluding natives from the diversity measure allows clearer theoretical reasoning and diminishes the correlation with share of the native group. It is convenient to explain their combined effects using a typology of four classes. Classes can be characterized either by (*a*) natives or immigrants being numerically dominant or by (*b*) a more or less diverse immigrant group (see fig. 1).

[5] Modeling the in-group size of all ethnic groups would require estimating a separate homophily effect for all ethnic groups, which is not feasible with our data.

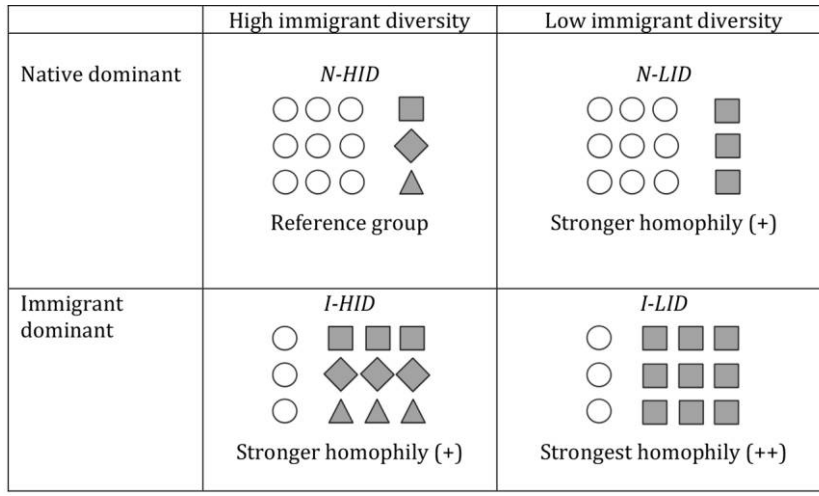

FIG. 1.—Hypothesized strength of ethnic homophily in classes of different compositions. Open shapes denote native students; filled shapes denote immigrant students. Different origin countries of immigrants are denoted by different shapes.

The first type of class is what we call an *N-HID* class (native dominant–high immigrant diversity). For natives, N-HID classes are expected to show weak ethnic homophily. Not only are natives the numerical majority in these classes, but the immigrant out-group also consists of multiple small groups. As such, no immigrant group threatens the dominant position of natives in the class. As a result, natives are not expected to develop negative out-group attitudes and same-ethnic friendship preferences. For immigrants, we also expect weak homophily in N-HID classes. Even though the share of natives is high, immigrants are not expected to feel threatened by this situation, as they are familiar with a large share of natives in their near surroundings. In addition, immigrants are not likely to find many same-ethnic peers in these classes, as most peers are native or from a different nonnative country and are as such likely to choose a strategy in which they socially adapt to their out-group peers. The N-HID type of class is our reference group.

The immigrant group in the *N-LID* type of classes (native dominant–low immigrant diversity) is less diverse and thus more threatening to the native adolescents' dominant position. For example, a native dominant class could consist of 55% native students and 45% students from one particular group. Even though native students are the numerical majority in such a class, the out-group is better able to compete for power than the out-group would be in native dominant classes in which the immigrant group consists of multiple subgroups. Immigrants are more likely to prefer same-ethnic friends in N-LID classes as well, as the less diverse the immigrant group is, the more

likely most immigrant students will have in-group peers in class and the more likely immigrant adolescents will take on a collective strategy. For both groups, ethnic homophily is stronger in N-LID classes compared to the reference group.

In *I-HID* classes (immigrant dominant–high immigrant diversity), native adolescents are a minority group, which leads to more feelings of threat in comparison to classes in which they are the numerical majority. Whereas native adolescents are used to having the dominant status in society, I-HID classes are the opposite situation. Furthermore, in I-HID classes, immigrant adolescents find themselves in ethnically diverse contexts with fewer native peers but relatively many immigrant peers of a different origin than theirs. In comparison to our reference type N-HID, they are, however, more likely to have in-group peers, as the share of natives is smaller than in N-HID classes. For example, take an N-HID class of 10 students in which six students are native, two students are German Turkish, and two students are German Chinese and an I-HID class of 10 students in which two students are native, three students are German Turkish, and three students are German Chinese. Even though the immigrant group is equally diverse (Turks and Chinese comprise 50% of the minority group), both German Turkish and Chinese students have a higher chance to find someone they like when they can choose from two same-ethnic peers instead of one same-ethnic peer. Therefore, ethnic homophily is higher in I-HID classes, compared to the reference group N-HID for both native and immigrant adolescents.

Finally, I-LID classes (immigrant dominant–low immigrant diversity) are the classes in which native students are not only a minority within class but also exposed to one or a few big immigrant groups. There are one or two immigrant groups that are able to compete for resources, and therefore, I-LID classes trigger the strongest feelings of threat for natives. For immigrants, an I-LID class is comparable to a I-HID class in the sense that they are likely to have a larger pool of same-ethnic peers compared to our reference class with a native majority. Yet, most immigrants in classes with a lower immigrant diversity (I-LID) are more likely to find in-group peers in class than immigrants in classes with a higher immigrant diversity (I-HID), keeping the size of the native group constant. For both groups, ethnic homophily increases again in I-LID classes, compared to the reference group N-HID, N-LID, and I-HID classes.

When we examine the general ethnic diversity of the whole class without taking the share of natives into account, we expect ethnic homophily to increase with more ethnic diversity in class (see hypothesis 1). When we examine immigrant diversity simultaneously with the share of natives, we tease two different parts of the class's ethnic composition apart. The first part of the class's ethnic composition correlates with the share of natives: the more diverse a class is, the fewer the natives. The second part that remains is the

diversity of the immigrant group, which is expected to dampen ethnic homophily. Therefore, we expect the following hypothesis to be true.

HYPOTHESIS 4.—*Ethnic homophily among both immigrants and natives decreases with immigrant diversity while controlling for the share of natives.*

DATA

In the CILS4EU project, attribute and friendship data were collected for 18,716 adolescents (around 14 years old) in 958 school classes between October 2010 and June 2011. The schools were located in England, Germany, the Netherlands, and Sweden (Kalter et al. 2014).

Schools were selected with a probability proportional to their size, and the sample is stratified on the number of immigrant children attending the school so that the data include sufficient immigrant children. In the case that schools refused to participate, a similar school in terms of its school type or region was chosen within the same stratum as a replacement.[6] In every school that participated, at least two classes of approximately 14-year-old students were selected (simple random sampling).[7] The overall response rate among schools is 45% before replacement and 85% after replacement. These rates are comparable to other large-scale international school surveys such as the Program for International Student Assessment and the Trends in International Mathematics and Science Study. Moreover, as nonparticipating schools were replaced by schools similar in school type or region and in percentage of immigrant children, bias on a school level should not be a significant problem to our study's results and conclusions.

Parents were informed about the study in advance and could either opt in to the study (Germany) or opt out of the study (England, the Netherlands, and Sweden). To avoid lower participation rates in Germany, students were offered a €10 incentive in the case of participation. In addition to parental refusal, adolescents could be absent on the day of the interview or could object to participate. The overall response rate among students was 85%.

METHOD

We answer our research question using a two-step procedure. In a first step, we estimate ethnic homophily in classes by using exponential random graph models (ERGMs) for each class separately (Lusher, Koskinen, and Robins 2013).[8] In a second step we examine the combined effects using a

[6] Sweden is the only country that did not apply a replacement strategy, as there were no concerns about achieving a representative school sample.

[7] Exceptions are schools with only one class available. In addition, the Netherlands sampled as many as possible classes in schools with a large share of immigrants, in order to increase the sample size of children with an immigrant background.

[8] Using the statnet package (ver. 3.1-0) in R (ver. 3.0.1).

metaregression (Snijders and Baerveldt 2003; Mouw and Entwisle 2006; Lubbers, Snijders, and Van Der Werf 2011; McFarland et al. 2014).[9] ERGMs allow us to simultaneously account for homophily on multiple characteristics, the meeting opportunity structure, and network effects (e.g., transitivity and reciprocity). For example, because friendships are modeled on all possible pairs, ERGMs control for the opportunities adolescents have for interethnic friendship.

We estimate two ERGMs for each class: one with a general parameter of ethnic homophily and one with two homophily parameters reflecting native homophily and immigrant homophily. Five hundred twenty-nine classes have reliable sociometric data, at least 10 students, are not completely homogeneous in terms of ethnicity and sex, and are as such suitable to study our research question.[10]

Issues common to ERGMs are those of convergence and model fit. We apply the same model to each school class separately, although this model does not always describe the observed school class network well enough. In the case of nonconvergence or an insufficient model fit, we chose to exclude classes from our analyses, as these estimates are likely biased. In the appendix, we elaborate on how we identify convergence and model fit and perform four sensitivity analyses to examine how sensitive our results are to sample selection. The sensitivity analyses show that our results on general and native homophily are unlikely due to sample selection, as we can include mostly all 529 classes. For immigrant homophily, however, we are only able to examine classes in which at least some immigrants have the opportunity for same-ethnic friends. It has to be kept in mind, therefore, that the results for immigrant homophily hold for moderately diverse classes with fewer natives and less immigrant diversity. Effects in analyses on immigrant homophily in which we include more classes (that contain relatively more natives and where the immigrant group is more diverse) are smaller in effect size and sometimes not significant.

In the second step, we aim to explain the homophily coefficients obtained from the ERGMs by class characteristics. In order to do so, we make use of meta-analysis techniques (Snijders and Baerveldt 2003; Mouw and Entwisle 2006; Lubbers et al. 2011). We first average the ERGM coefficients

[9] Using the metareg package in Stata 13.

[10] A class has reliable sociometric data when (1) at least 75% of the students participated in the network survey, (2) no more than 10% of all nominations are invalid (e.g., nominating peer 30 when there are only 15 students in class), (3) no more than two students in class have never nominated anyone else in the network-related items ($N_{\text{items}} = 11$); and (4) no more than two students in class have never been nominated in any of the network-related items ($N_{\text{items}} = 11$). Classes are not completely homogenous in terms of ethnicity and sex when there are at least two students with a native background and two adolescents with an immigrant background and at least two boys and two girls.

by weighting the coefficients by their variance using a random effects meta-analysis. This model allows the ERGM coefficients to vary between classes by assuming that they are normally distributed around the averaged coefficient. Next, we conduct a random effects metaregression in which the ethnic homophily coefficients make up the dependent variable and covariates are added. The intercept is the average ethnic homophily effect size, which is the sum of the standard error–weighted ethnic homophily coefficients divided by the sum of weights. Classes in which homophily coefficients have larger standard errors contribute less to the average effect than classes with smaller standard errors.[11] The algorithm used for the meta-analysis and metaregression is the residual (restricted) maximum likelihood (Thompson and Sharp 1999).

MEASUREMENTS

Friendship networks are measured as follows. Students received a class roster with the names and corresponding numbers of all their peers in class. From this roster, students chose their five best friends. From these nominations, we construct class networks with directed ties (i.e., a nomination from one student [ego] to another [alter] is not necessarily a mutual tie).

We measure ethnic homophily by including three dummy variables. Taking interethnic ties as the reference group, we add *same-ethnic background* as a first dummy variable, which captures the tendency to nominate same-ethnic peers in general. In a subsequent analysis, we split this general ethnic homophily variable into two variables: the binary variables *both native* and *both same immigrant group* reflect to what extent ties are more likely between same-ethnic native and immigrant peers, respectively, compared to interethnic peers.

Ethnicity is captured by national origin, that is, by the student's parental birth countries. Native students are adolescents whose biological parents were both born in the host country. Immigrant adolescents are likewise coded to their parents' country of origin. When adolescents have mixed heritage, they are coded to the immigrant parent in the case of a mixed native-immigrant background (15.10%). Even though adolescents with a mixed native-immigrant background may hold a native identity or citizen-

[11] ERGM coefficients within a model are not independent of each other. For example, the effect of reciprocity and transitivity is correlated. McFarland and colleagues (2014) apply a multivariate regression analysis with an unstructured covariance matrix when summarizing ERGM coefficients in order to take the interdependency of ERGM coefficients into account. We also took this approach, but possibly due to a lack of power, the multivariate regression analysis did not converge when summarizing ERGM coefficients in the model with separate homophily effects for natives and immigrants. Models that did converge showed results very similar to the univariate meta-analysis (results available on request), and thus we show the univariate meta-analysis results here.

ship in the host country, it is likely that they identify at least partly with their immigrant background, be it because they choose so themselves or because peers consider them as having a mixed background (Barn and Harman 2006; Song 2010).[12] We code adolescents to the mother's origin country in the case that parents originate from different nonnative countries (4.01%) because child rearing in Europe is still more often done by women than by men (Yeung et al. 2001; Sayer, Gauthier, and Furstenberg 2004). We consider immigrants from every immigrant country as a separate ethnic group. For example, a tie between a Japanese and a Chinese student is considered to be interethnic. This results in examining 158 ethnic groups, and we consider a tie to be same ethnic when students have the exact same background. Some groups will be more culturally similar to each other and may have many friends of the same panethnicity (e.g., immigrants from neighboring countries). This may be especially the case when they cannot find a suitable same-ethnic friend in class.[13] The resulting variable *both same immigrant group* can as such be interpreted as the average tendency of immigrants to choose same-ethnic friends.

The ethnic composition in class is accounted for by three variables. First, the proportion of native students in the class measures *the share of native students in class*. Second, the *total ethnic diversity* is measured by the inverse Herfindahl index to replicate earlier studies. The inverse Herfindahl index reflects the probability that two random students in class are of a different ethnic category and is calculated by

$$I = 1 - \sum_{i=1}^{n} M_i^2,$$

where M_i is the share of a certain ethnic group i, and n is the number of ethnic groups. A higher score on this variable reflects a more ethnically diverse class. For the inverse Herfindahl index, we use the same ethnic groups as we do for capturing ethnic homophily: we consider 158 ethnic groups. We also calculate the inverse Herfindahl index excluding natives, so we derive the variable *immigrant diversity*. The inverse Herfindahl index for immigrants is calculated in the same way as the regular inverse Herfindahl index, except that we exclude natives from it. By doing so, we avoid multicollinearity issues when we estimate ethnic diversity together with the share of natives.

We add native and immigrant in-group density to our models by including two variables: *native* and *immigrant same-ethnic friendship den-*

[12] Citizenship laws are complicated and different across the four countries under study and for simplicity not taken into account.

[13] A sensitivity analysis in which we collapse small immigrant groups into panethnic groups is described in the appendix. The results are in line with our main analyses.

sity. Same-ethnic friendship density is measured as the proportion of same-ethnic friends of the total possible same-ethnic friends in a class, and we calculate it separately for natives and immigrants. We use the same ethnic categorization as for ethnic homophily and ethnic diversity. The higher the value of native and immigrant same-ethnic friendship density is, the more natives and immigrant adolescents are a unified group, respectively.[14]

We control for multiple individual explanations of ethnic homophily. On our first level of analysis, we first control for *same gender*, as adolescents tend to associate with same-sex peers (McPherson et al. 2001; Poulin and Pedersen 2007). When ego and alter report the same sex, we consider them as a same-gender dyad. Also, we control for *popularity difference*, as classes are characterized by strong social hierarchies (Dijkstra, Cillessen, and Borch 2013). Adolescents were asked to nominate the most popular students in class, and we calculate the relative amount of incoming nominations an adolescent receives. Consequently, we take the absolute difference between the relative popularity score between ego and alter: the higher the score on this variable, the more adolescents differ in their social status in class. Finally, we control for the *socioeconomic status difference* between ego and alter. In a similar fashion as popularity difference, we first determine the highest occupational status in an adolescent's household (determined by the ISCO-08 parental occupational status combined with the ISEI ranking; Ganzeboom, De Graaf, and Treiman 1992).[15] Then, we take the absolute difference between ego and alter to control for the tendency of adolescents to associate with peers similar in socioeconomic status.

Since previous research has shown that several structural features characterize high school student networks, we control for those characteristics.[16] First, we control for the baseline density of the network by the variable *edges*. This variable reflects the extent to which adolescents nominate friends within classes and can be seen as an intercept in ERGMs. Second, we control for the tendency of adolescents to reciprocate friendships using the variable *mutual*. Friendships are considered mutual if ego nominates a specific alter and if that specific alter nominates ego as well. Third, we control for

[14] Density scores are affected by our limited friendship nominations (max. five) and group size. For example, when all natives solely have same-ethnic friendships, native density will be lower in a class with 20 natives than in a class with five natives.

[15] The International Standard Classification of Occupations (ISCO-08) is an internationally comparable classification of occupations. In combination with the International Socio-Economic Index of occupational status (ISEI-08), it provides an internationally comparable ranking of occupational status.

[16] Other common parameters to include are sender and receiver effects of similarity measures (Goodreau et al. 2009; Wimmer and Lewis 2010). In this study, we chose to refrain from this practice for practical reasons, as we study so many ethnic groups. As we examine classes with on an average 20 students and 82 friendship nominations, we aim to keep our model as parsimonious as possible.

transitivity. When two adolescents share the same friend, it is likely that they become friends as well, as they meet each other through this common friend and because asymmetry in friendship networks is argued to cause psychological strain (Heider 1958; Feld 1981). We use the "geometrically weighted edgewise shared partner" variable to capture transitivity, also known as *GWESP* (cf. Goodreau et al. 2009; Wimmer and Lewis 2010). The GWESP feature captures ties between students that are more likely to arise when they have more friends in common. The GWESP variable is accompanied by the GWESP θ, which reflects the decreasing marginal returns of additional shared friends. In other words, the more friends you share, the more likely a friendship is (GWESP), but the more friends you share, the smaller the effect of every additional friend on friendship becomes (GWESP θ).

Finally, we control for *class size* (the number of students within the class) and *mean socioeconomic status* (determined by the parental occupational status of all students in class) and add dummy variables for *German*, *Dutch*, and *Swedish* countries (compared to English) to account for possible country differences on the class level.

Descriptive statistics of the attributes are shown in table 1. These descriptive statistics are not weighted for the sampling design and should not be

TABLE 1
Descriptive Statistics of Attributes

	England		Germany		The Netherlands		Sweden	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pupils:								
Native	.61		.55		.71		.59	
Girl	.49		.49		.52		.50	
Popularity	8.78	13.10	10.69	14.70	9.56	15.09	6.56	10.11
Socioeconomic status	50.83	16.47	44.42	15.13	50.90	15.57	50.46	16.45
Classes:								
Proportion natives in class	.60	.23	.53	.21	.70	.16	.58	.22
Total ethnic diversity	.50	.18	.58	.16	.44	.17	.53	.18
Immigrant ethnic diversity	.55	.23	.63	.14	.61	.19	.56	.23
Same-ethnic native density	.16	.07	.20	.08	.17	.04	.20	.07
Same-ethnic immigrant density	.13	.13	.16	.13	.10	.13	.16	.14
Mean socioeconomic status	50.40	8.02	43.64	7.86	50.49	6.47	50.29	7.01
Class size	21.36	5.65	20.58	4.73	22.48	4.37	20.30	3.69
N_{pupils}	1.515		3.781		2.315		3.500	
N_{classes}	70		184		103		172	

Note.—Data are not weighted for sampling design.

generalized to the population. Table 1 shows that the variance of immigrant diversity is close to the variance of the total ethnic diversity in class, which implies that the range is large enough to examine the effect of immigrant diversity on ethnic homophily.

RESULTS

Tie Formation within Classes

Table 2 shows the estimated average ERGM coefficients weighted by their variance (b), the associated standard errors (SE), the estimated variance of coefficients between classes (τ^2), the estimated proportion of residual variation due to heterogeneity (I^2), and the minimum and maximum values of coefficients. In model 1, we estimated one general homophily coefficient in 523 classes. In model 2, we estimated a separate homophily effect for native and immigrant adolescents, and the results shown are based on 517 classes for the native homophily coefficient and 262 classes for the immigrant homophily coefficient.[17]

A negative "edges" coefficient indicates that the friendship networks are relatively sparse. The positive "mutual" coefficient shows that students are likely to reciprocate friendship nominations. The positive GWESP coefficient shows that two students are more likely friends when they have more friends in common. This tendency is, however, not linear: we expect the marginal returns of forming a tie to decrease with an increasing number of shared friends. The significant GWESP θ reflects these decreasing marginal returns. The larger θ is, the more shared friends contribute to tie formation before the returns decrease. The positive "same gender" coefficient shows that students more often befriend class peers of the same gender. A similar tendency is found for socioeconomic status and popularity: the larger a dyad's difference in socioeconomic status and status popularity, the less likely students are to nominate each other as friends.

Most important to our research question, we find that ethnic homophily in friendship choice is a significant factor in high school networks. Controlling for all other tie-generating mechanisms in the model, the results suggest that natives and immigrants are more likely to befriend same-ethnic peers than peers of a different ethnic group ($b_{\text{total}} = 0.19$, $P < .001$; $b_{\text{native}} = 0.17$, $P < .001$; $b_{\text{immigrant}} = 0.63$, $P < .001$).

An averaged coefficient holds less true across classes when the between-class variability is higher, which can be assessed by evaluating the τ^2 and I^2 statistic (Higgins et al. 2003). Table 2 shows considerable differences in

[17] The number of studied classes for immigrant homophily is much lower due to nonconvergence and poor model fit. An elaboration on estimating ERGMs and additional sensitivity analyses to detect possible selection bias are reported in the appendix.

TABLE 2
MEAN COEFFICIENTS ERGMS ON FRIENDSHIP NETWORKS

	b	SE	τ^2	I^2	Min	Max
Model 1:						
Edges	−3.60***	.023	.06	26.80	−4.98	−1.44
Mutual	2.38***	.030	.20	44.75	−.88	4.75
GWESP	.72***	.011	.02	57.02	−.25	2.95
GWESP θ	.79***	.022	.19	84.41	−1.16	2.71
Homophily (ref. = different ethnic background):						
Same ethnic background	.19***	.01	.01	22.81	−.89	1.81
Same gender	.73***	.02	.03	43.28	.06	3.71
Popularity difference	−.13***	.01	.01	39.76	−2.06	3.94
Socioeconomic status difference	−.03***	.01	.00	12.54	−1.88	.94
Model 2:						
Edges	−3.60***	.03	.07	29.28	−4.98	−.20
Mutual	2.35***	.03	.20	45.33	−1.40	4.68
GWESP	.72***	.01	.01	37.72	.12	2.94
GWESP θ	.79***	.02	.19	85.11	−1.16	1.91
Homophily (ref. = different ethnic background):						
Both native	.17***	.01	.00	13.11	−.91	2.38
Both same immigrant group	.63***	.08	1.13	100.00	−4.78	4.97
Same gender	.74**	.02	.03	41.72	−.04	3.45
Popularity difference	−.12***	.01	.01	40.67	−2.17	4.04
Socioeconomic status difference	−.02**	.01	.00	8.34	−.74	1.25

NOTE.—Estimated average ERGM coefficients weighted by their variance (b), standard error associated to the estimated ERGM coefficient (SE), estimated variance of the ERGM coefficients between classes (τ^2), and the estimated percentage of variation due to heterogeneity rather than sampling variation (I^2). Data are not weighted for sampling design.

$^{+}$ $P < .10$.

* $P < .05$.

** $P < .01$.

*** $P < .001$ (two sided).

between-class variability. Whereas the between-class variance is relatively low for native homophily ($\tau^2 = 0.00$; $I^2 = 13.11\%$) it is extremely high for immigrant homophily ($\tau^2 = 1.13$; $I^2 = 100\%$). This suggests that immigrant homophily highly depends on the school class environment, whereas this is less the case for native homophily. The averaged immigrant homophily coefficient is to be interpreted with caution because of the high between-class variance. For example, the averaged immigrant homophily coefficient is about four times as large as the averaged native homophily coefficient, but there is so much variance of immigrant homophily that immigrant homophily will be lower than native homophily in a considerable number of classes. High between-class variance warrants our planned metaregression, and the difference in between-class variance between native and immigrant homophily corroborates our proposal to separately examine native and immigrant homophily.

Ethnic Diversity and the Share of Natives

In a second step of our analyses, we examine the homophily coefficients that were obtained by the ERGMs of each class. Figure 2 shows the ethnic homophily coefficients per class (weighted by their inverse variance) against the total ethnic diversity within classes. This figure partly corroborates studies that examined the same relation in Add Health data on school friendships (Moody 2001; Mouw and Entwisle 2006; Currarini et al. 2010). In line with these studies and our first hypothesis, we find that the preference for same-ethnic friends increases in more ethnically diverse classes. However, whereas studies using Add Health data find that this effect stabilizes in the most diverse classes, our data show no clear stabilization of ethnic homophily. In our data, we mostly find a large amount of variance in ethnic homophily among classes that are similarly ethnically diverse. When we plot the separate native and immigrant homophily coefficients (fig. 3), we see different relations between the ethnic diversity in class and homophily for native and immigrant adolescents. Whereas native homophily slightly increases with more ethnic diversity in classes, the fitted quadratic line suggests that immigrant homophily first increases with ethnic diversity but decreases again in the most diverse classes. The quadratic pattern for immigrant homophily is thus more in line with studies using Add Health data.

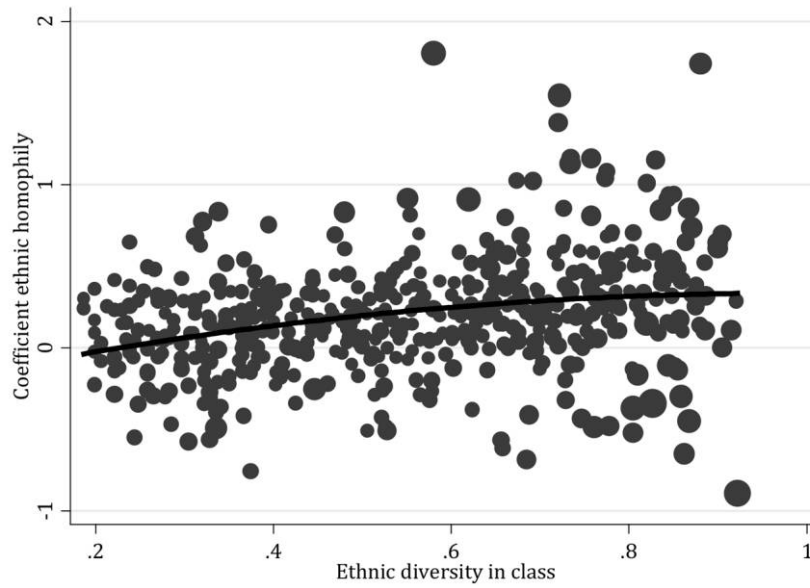

FIG. 2.—Ethnic homophily coefficients estimated using ERGMs (weighted by their inverse variance) plotted by ethnic diversity in class.

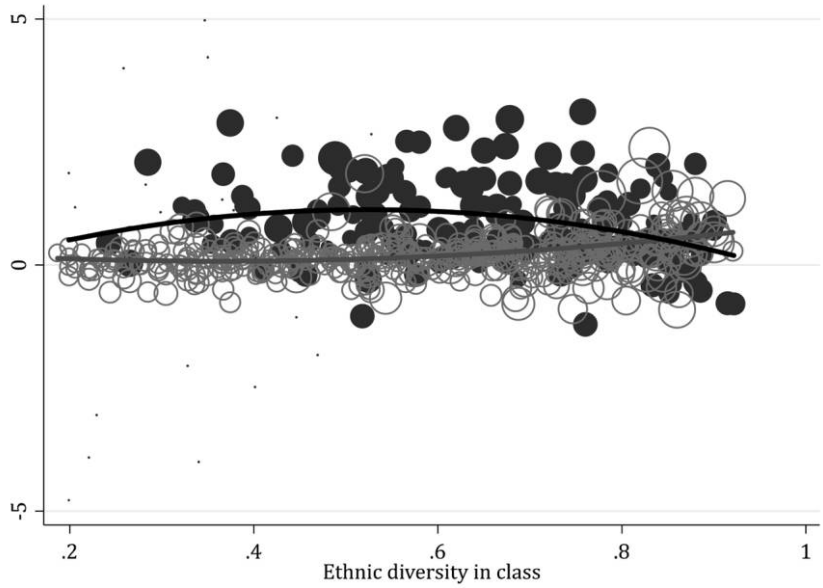

FIG. 3.—Separate native and immigrant homophily coefficients estimated using ERGMs (weighted by their inverse variance) plotted by ethnic diversity in class. Filled circles indicate immigrant homophily; open circles represent native homophily.

Figure 4 shows the relation between ethnic homophily and the proportion of native adolescents in class. In contradiction to earlier findings (Eshel and Kurman 1990; Lubbers 2003; Vermeij et al. 2009), we see an association between ethnic homophily and the share of natives: the larger the share of natives is in class, the weaker ethnic homophily becomes. This is in line with our second hypothesis, except that we do not see a clear quadratic effect. Figure 5 shows that the relation between the share of natives and homophily is again opposite for natives and immigrants. Native homophily is smaller in classes with a higher share of natives, and immigrant homophily is larger in classes with a higher share of natives, although this relation becomes weaker in classes with the highest share of natives.

In order to examine whether the descriptive bivariate results of figures 2–5 hold while we control for other class characteristics, we conduct several random effects metaregression analyses. Table 3 shows the results of the class-level analyses with three different dependent variables, that is, ethnic homophily in general (models 1 and 2), ethnic homophily of native adolescents (models 3, 4, and 5), and ethnic homophily of immigrant adolescents (models 6, 7, and 8). The models with general ethnic homophily as a dependent variable are intended to test the hypotheses that ethnic diversity and the share of native students have (nonlinear) positive effects on ethnic homophily (hypotheses 1 and 2). The first two models with native and

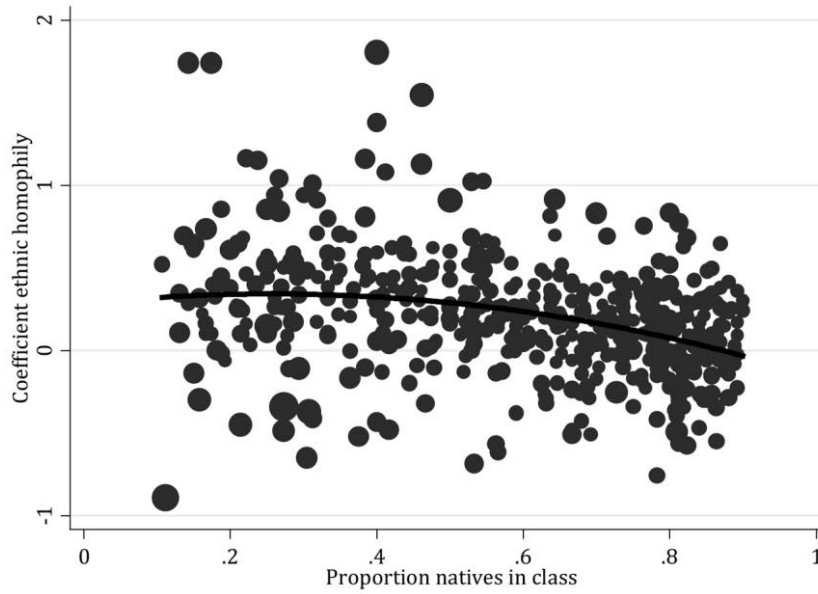

FIG. 4.—Ethnic homophily coefficients estimated using ERGMs (weighted by their inverse variance) plotted by proportion of natives in class.

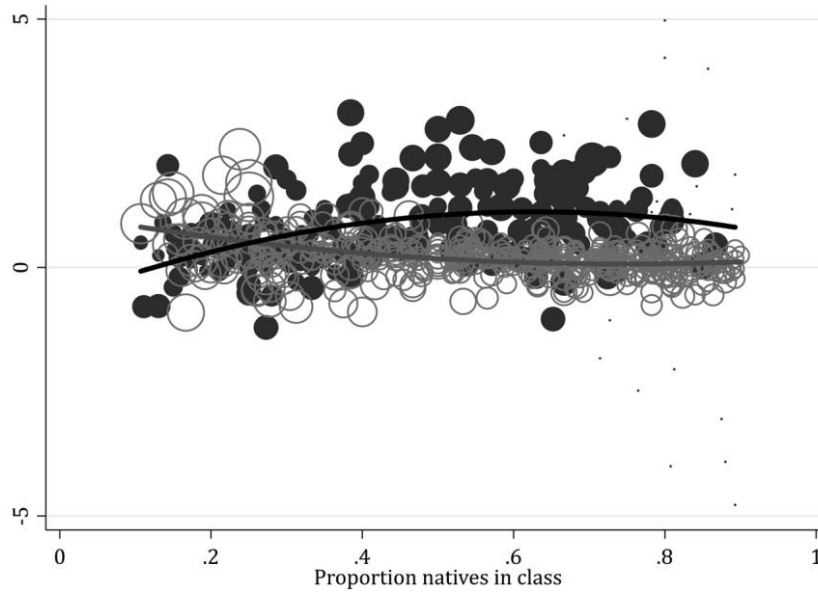

FIG. 5.—Separate native and immigrant homophily coefficients estimated using ERGMs (weighted by their inverse variance) plotted by proportion of natives in class. Filled circles indicate immigrant homophily; open circles represent native homophily.

TABLE 3

COEFFICIENTS AND STANDARD ERRORS OF TOTAL ETHNIC DIVERSITY AND PROPORTION OF NATIVES ON ETHNIC HOMOPHILY WITHIN CLASSES

	General		Native			Immigrant		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	.20***	.22***	.17***	.18***	.16***	.83***	.97***	.84***
	(.03)	(.03)	(.03)	(.03)	(.03)	(.22)	(.233)	(.23)
Total ethnic diversity	.53***		.45***		.39***	−.88		−.89
	(.07)		(.07)		(.07)	(.54)		(.54)
Total ethnic diversity^2	.77*		.83*		1.01**	−7.60**		−7.56**
	(.33)		(.36)		(.35)	(2.36)		(2.36)
Proportion natives		−.51***		−.49***			.77+	
		(.06)		(.07)			(.39)	
Proportion natives^2		−.27		.47			−5.87**	
		(.27)		(.34)			(1.77)	
Native/immigrant same-ethnic density					.39***			.47
					(.08)			(.95)
Class size	−.00	−.00	−.00	−.00	−.00	−.01	−.01	−.01
	(.00)	(.00)	(.00)	(.00)	(.00)	(.02)	(.02)	(.02)
Mean socioeconomic status	−.00*	−.00*	−.00*	−.00+	−.00+	−.01	−.02	−.01
	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)	(.01)	(.01)
Country (ref. = England):								
Germany	−.03	−.03	−.04	−.04	−.14***	−.08	−.18	−.10
	(.04)	(.04)	(.04)	(.04)	(.04)	(.25)	(.25)	(.25)
The Netherlands	−.01	.012	.01	.01	−.05	.01	−.16	.00
	(.04)	(.04)	(.04)	(.04)	(.04)	(.30)	(.30)	(.30)
Sweden	.01	.03	.03	.04	−.04	.29	.15	.27
	(.04)	(.04)	(.04)	(.04)	(.04)	(.26)	(.26)	(.27)
N_{classes}	522	523	517	517	517	262	262	262
I^2_{res}	9.55	9.51	3.05	1.03	0	100	100	100
Adjusted R^2	100	100	100	100	100	3.28	4.25	3.21

NOTE.—Standard errors in parentheses. Continuous variables are centered around their mean. Model fit is shown by the estimated percentage of residual variation due to heterogeneity (I^2) and the relative reduction in the estimated variance between the null model and models with covariates (adjusted R^2). Data are not weighted for sampling design.

+ $P < .10$.

* $P < .05$.

** $P < .01$.

*** $P < .001$ (two sided).

immigrant homophily are intended to examine whether the effects of the class' ethnic composition are different for natives and immigrants. The last model with native and immigrant homophily is intended to test the hypothesis that the native homophily-diversity relation is amplified by immigrant same-ethnic friendship density, whereas the immigrant homophily-diversity relation is not related to native same-ethnic friendship density (hypothesis 3). All the continuous variables are centered around their mean.

The estimated percentage of residual variation due to heterogeneity (I^2) and the adjusted R^2 ($(\hat{\tau}_o^2 - \hat{\tau}^2)/\hat{\tau}_o^2$) are provided with every model, to indicate how much variance the covariates explain (Higgins et al. 2003). General and native homophily only have a small percentage of residual variation due to heterogeneity left after covariates are added to the meta-analysis, but the amount of between-class variance was relatively low to begin with (see table 2). The little variance to be explained is as such quickly explained completely ($R^2 = 100\%$). The immigrant homophily variable remains having high levels of residual variation due to heterogeneity after covariates are added to the meta-analysis ($I^2 = 100\%$). The largest relative reduction in between-class variance is 4.25% and found in model 7.

Model 1 in table 3 shows the effects of the main and quadratic term of ethnic diversity. As the variables are mean centered, the main effect of ethnic diversity shows the slope of the homophily-diversity relation at the mean of ethnic diversity ($M = 0.55$ in the sample on general ethnic homophily). Model 1 shows that ethnic homophily is stronger in classes with more ethnic diversity ($b = 0.53$, $P < .001$). With every standard deviation increase in ethnic diversity (SD = 0.19 in selected sample), ethnic homophily increases with 0.10 points (SD $\times$ b) on average. That is a relevant effect considering that ethnic homophily ranges from -0.89 to 1.81 (see table 2). In line with figure 2, we find no evidence that ethnic homophily stabilizes in the most diverse classes. The quadratic effect is positive instead of negative ($b = 0.77$, $P < .05$), meaning that the slope of the positive homophily-diversity relation is steeper in the more diverse classes.[18] Hence, we find only partial evidence for the hypothesis that ethnic homophily increases with ethnic diversity but decreases again in the most diverse classes (hypothesis 1).

Model 2 in table 3 shows partial evidence for our hypothesis that ethnic homophily decreases with an increasing share of natives (hypothesis 2).

[18] This implies that the positive homophily-diversity relation becomes weaker when classes are less ethnically diverse. For example, if we do not mean center our variables and when the main effect reflects the slope when ethnic diversity would be zero, the main effect of ethnic diversity is small and insignificant ($b = -0.31$, $P = .35$; model not shown). Because a value of zero is not in the range of our observed variables, models without mean centering reflect the linear term worse than models with mean centering. We also checked whether the quadratic effect was due to outliers by reestimating the model while excluding all coefficients larger than 2.5 and smaller than -2.5. The results were found to be robust.

The effect is the reverse from ethnic diversity and is of roughly the same size: the more native peers present in class and the less diversity (the two correlate heavily; $r = -.94$, $P < .001$), the weaker ethnic homophily in general is ($b = -0.51$, $P < .001$). We also tested for a nonlinear effect, but our data show no evidence for it.

Our descriptive analyses in figures 3 and 5 already showed that the homophily-diversity relation is different for natives and immigrant, and so it is necessary to separate the analyses for native (models 3 and 4) and immigrant adolescents (models 6 and 7). Different effects of ethnic diversity for native and immigrant homophily are also observed in the multivariate explanatory analyses. There is a significant positive nonlinear effect for native homophily ($b_{\text{total ethnic diversity}} = 0.45$, $P < .001$; $b_{\text{total ethnic diversity}^2} = 0.83$, $P < .05$), but there is a significant negative nonlinear relation for immigrant homophily ($b_{\text{total ethnic diversity}} = -0.88$, $P = .10$; $b_{\text{total ethnic diversity}^2} = -7.60$, $P < .01$).[19] Models 3 and 6 suggest that native and immigrant adolescents become more homophilous with increasing ethnic diversity at first but that immigrant homophily decreases again in the most diverse classes, whereas native homophily increases further. Similar to the effect of diversity, the results show opposite effects of the share of natives for native and immigrant adolescents: native homophily decreases linearly with an increasing share of natives in class ($b_{\text{proportion natives}} = -0.49$, $P < .001$; $b_{\text{proportion natives}^2} = 0.47$, $P = .17$), and immigrant homophily increases nonlinearly ($b_{\text{proportion natives}} = 0.77$, $P < .1$; $b_{\text{proportion natives}^2} = -5.87$, $P < .01$).[20] The effect sizes of ethnic composition are all considerable if we compare them to the range of homophily coefficients (see table 2). The native homophily coefficients range is relatively small, however, and so it is important to keep in mind that native homophily is relatively stable across classes with varying levels of ethnic diversity.

[19] The main effect of ethnic diversity for immigrant homophily is small and insignificant in model 6 because our variables are mean centered. It shows as such the slope of the homophily-diversity relation at the mean of ethnic diversity. Because the curvature of the homophily-diversity relation is so steep, the linear effect is necessarily insignificant (see fig. 6). Without mean centering, the main effect reflects the slope when ethnic diversity would be zero, and in this case, the main effect is positive, large, and significant ($b = 8.83$, $P < .001$; model not shown, but see the left-hand side of the quadratic curve in fig. 6). The main effect of ethnic diversity on native homophily in model 3 without mean centering is small and insignificant ($b = -0.45$, $P = .37$; model not shown, but see the left-hand side of the quadratic curve in fig. 6). We also examined the robustness of the quadratic effects by taking a stricter cutoff point than 5 and −5. When we use a cut-cutoff point of 2.5 and −2.5, the quadratic effects drop in size and significance ($b_{\text{native}} = 0.57$, $P = .15$; $b_{\text{immigrant}} = -0.60$, $P = .72$).

[20] Without mean centering, the main effect of the share of natives on native homophily is somewhat larger ($b = -1.06$, $P < .05$; model not shown, but see the left-hand side of the quadratic curve in fig. 5). The main effect of the share of natives on immigrant homophily is large and significant ($b = 6.42$, $P < .001$; model not shown, but see the left-hand side of the quadratic curve in fig. 7). With stricter cutoff points of 2.5 and −2.5 instead of 5 and −5, the results are robust.

Figure 6 shows the predicted ethnic homophily scores based on the coefficients in models 3 and 6 (table 3) to provide a more intuitive insight in the quadratic effects of ethnic diversity. Figure 7 does the same based on the coefficients in models 4 and 7 (table 3) to visualize the effects of the proportion of natives. Note that the curves for immigrant homophily are considerable, whereas the curves for native homophily are very small or hardly present. The left-hand intersection of native and immigrant homophily in figure 6 shows that classes wherein adolescents have a 20%–30% chance to meet an out-group peer are characterized by the lowest ethnic homophily for both natives and immigrants. The right-hand intersection of native and immigrant homophily in figure 7 shows that classes with 80%–90% native students are characterized by the lowest ethnic homophily for both natives and immigrants.

The results shown in models 5 and 8 are in line with the idea that native homophily increases with ethnic diversity due to feelings of ethnic threat, whereas threat plays a lesser role in the development of immigrant homophily. Model 5 shows that immigrant same-ethnic friendship density has a positive effect on native homophily ($b = 0.39$, $P < .001$), whereas model 8 shows that native same-ethnic friendship density has no significant effect on immigrant homophily ($b = 0.47$, $P = .63$). If the threat mechanism behind the ethnic homophily-diversity relation holds for both groups, both immigrants and natives would become more homophilous when the out-group becomes more unified. As this effect is far from significant for immigrant homophily, our data seem to corroborate our third hypothesis.[21]

We examine the combined effects of immigrant diversity and the share of natives in class in table 4. Note that we switch here from general ethnic diversity (the total variety of ethnic groups in class) to immigrant ethnic diversity (the variety of immigrant groups in class). Models 1 and 3 show the main effects of the share of natives and immigrant diversity for natives and immigrants, respectively. Because we did not find evidence for a quadratic effect of the share of natives on native homophily, we left it out in the models for natives in table 4. Model 1 shows that both concepts of the ethnic composition relate to native homophily while controlling for each other. There is a significant negative effect of the share of natives ($b = -0.55$, $P < .001$), meaning that natives are less homophilous when their in-group is larger. The immigrant diversity coefficient has an independent negative effect on native homophily ($b = -0.21$, $P < .05$), which suggests that multiple immigrant groups are less threatening than one or a few immigrant

[21] It is possible that the coefficient of native same-ethnic friendship density on immigrant homophily is insignificant due to power issues. However, we consider a power problem unlikely because other independent variables are able to reach significance and because even the bivariate correlation between native same-ethnic friendship density and immigrant homophily is small and insignificant ($r = .06$, $P = .34$).

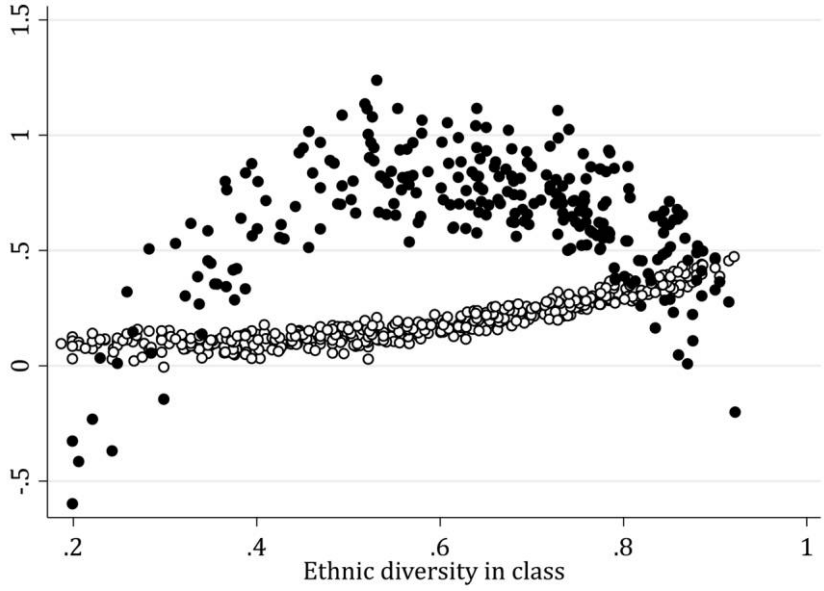

FIG. 6.—Predicted ethnic homophily scores plotted by ethnic diversity in class for native (*open circles*) and immigrant (*filled circles*) adolescents based on model 3 (natives) and model 6 (immigrants) in table 3.

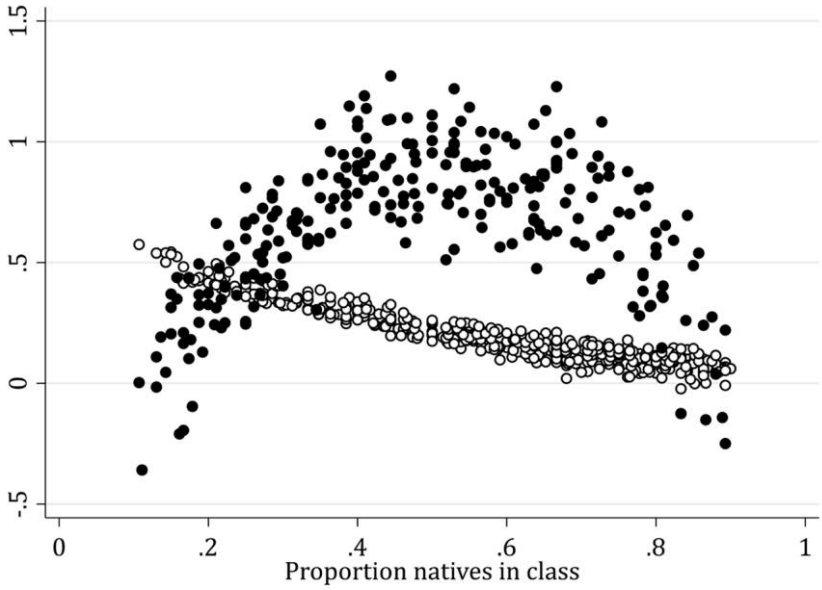

FIG. 7.—Predicted ethnic homophily scores plotted by the proportion of natives in class for native (*open circles*) and immigrant (*filled circles*) adolescents based on model 4 (natives) and model 7 (immigrants) in table 3.

TABLE 4
COMBINED EFFECTS OF ETHNIC DIVERSITY AND PROPORTION OF NATIVES ON ETHNIC HOMOPHILY WITHIN CLASSES

	NATIVE		IMMIGRANT	
	Model 1	Model 2	Model 3	Model 4
Constant	.19***	.19***	1.00***	1.00***
	(.03)	(.03)	(.24)	(.24)
Immigrant ethnic diversity	−.21*	−.21*	.43	.42
	(.10)	(.10)	(.51)	(.53)
Proportion natives	−.55***	−.54***	.82*	.82*
	(.08)	(.08)	(.40)	(.40)
Proportion natives^2			−5.68**	−5.69**
			(1.79)	(1.80)
Immigrant ethnic diversity × proportion natives		.13		−.08
		(.48)		(2.29)
Class size	.00	.00	−.02	−.02
	(.00)	(.00)	(.02)	(.02)
Mean socioeconomic status	−.00	−.00	−.02	−.02
	(.00)	(.00)	(.01)	(.01)
Country (ref. = England):				
Germany	−.04	−.04	−.20	−.20
	(.04)	(.04)	(.25)	(.25)
The Netherlands	.02	.02	−.19	−.19
	(.04)	(.04)	(.30)	(.30)
Sweden	.05	.05	.09	.09
	(.04)	(.04)	(.27)	(.27)
N_{classes}	517	517	262	262
I^2_{res}	.36	.56	100	100
Adjusted R^2	100	100	4.04	3.64

NOTE.—Standard errors in parentheses. Continuous variables are centered around their mean. Data are not weighted for sampling design.

$^+$ $P < .10$.

* $P < .05$.

** $P < .01$.

*** $P < .001$ (two sided).

groups when we hold the share of natives constant. The immigrant diversity effect is twice as small as the proportion of natives effect but is of considerable size nevertheless. For immigrants, model 3 shows a nonlinear effect of the share of natives: immigrant homophily is strongest in classes with a moderate share of natives ($b_{\text{proportion natives}} = 0.82$, $P < .05$; $b_{\text{proportion natives}^2} = -5.68$, $P < .01$). The effect of immigrant diversity is insignificant ($b = 0.43$, $P = .41$), however. Finally, we also tested for an interaction effect between the share of natives and immigrant diversity in models 2 and 4. We find no evidence for it.

Figures 8 and 9 show the predicted homophily scores based on models 1 and 3 (table 4), respectively, in order to facilitate the interpretation of the combined effects of the share of natives and immigrant diversity. Predicted

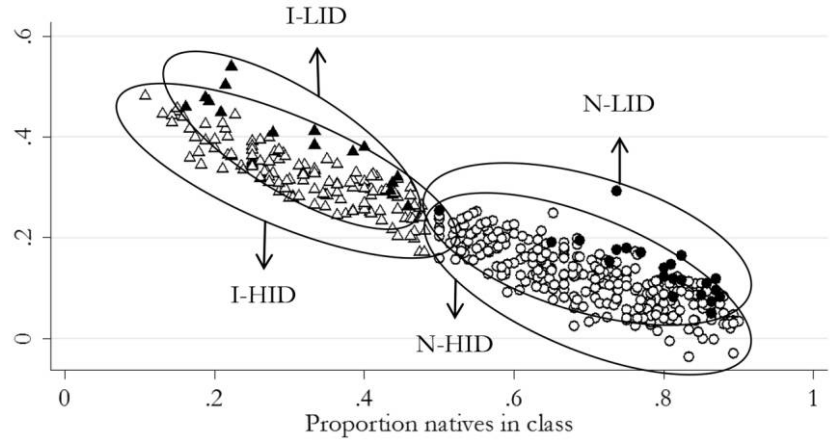

FIG. 8.—Predicted native homophily scores based on model 1 in table 4 (N_{class} in parentheses).

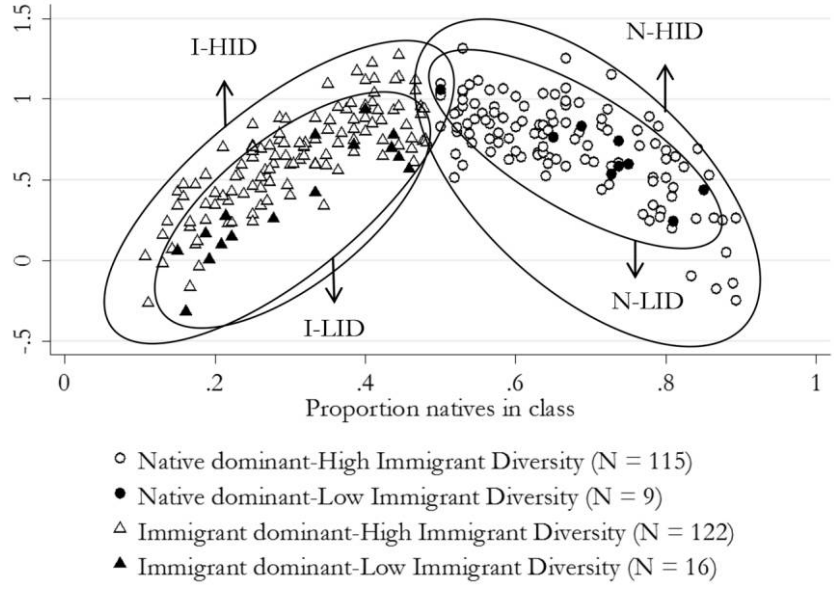

FIG. 9.—Predicted immigrant homophily scores by type of class based on model 3 in table 4 (N_{class} in parentheses).

homophily scores are plotted by the share of natives, and the classes are distinguished according to the typology of figure 1.[22] Figure 8 shows that native homophily is weakest in classes where natives form the numerical majority (shown by circles) and where the immigrant out-group is more diverse (shown by open shapes): in other words, in the N-HID type of class. When natives occupy less than 50% of the class (I-HID and I-LID, shown by triangles) and when the immigrant group becomes less diverse (N-LID and I-LID, shown by solid shapes), native homophily will be stronger as ethnic threat becomes more salient in these classes. Figure 9 shows that the typology seems to work worse for immigrant homophily, as the degree of immigrant homophily does not vary with immigrant diversity as expected. In sum, our data partly support the hypothesis that ethnic homophily decreases with immigrant diversity while controlling for the share of natives (hypothesis 4), as it holds only for natives.

CONCLUSION

In this study, we examined how the ethnic composition of school classes relates to ethnic homophily (i.e., the tendency to choose same-ethnic friends over interethnic friends net of the opportunity structure) of native and immigrant adolescents within 529 high school classes in England, Germany, the Netherlands, and Sweden using the CILS4EU data (Kalter et al. 2014). The use of a unique and large sample of classes enabled us to conduct a meta-analysis in which we model ethnic homophily while distinguishing between multiple ethnic groups instead of grouping different ethnic groups together. Moreover, we distinguished between immigrant diversity and the share of natives in classes, two different aspects of ethnic composition that are rarely studied simultaneously. Moving toward theory and analysis of multiple networks like this study does provides more opportunities to find generalizable mechanisms and understand network variation—a key component to a theory of segregation in social networks.

The study includes school classes in which adolescents have sufficient opportunities to have in-group friends. This means that we were able to analyze 517 of the 529 classes for natives, as they often find same-ethnic peers in class. For immigrants, however, we analyzed only the 262 classes in which the share of natives and the diversity of immigrants are not too high, that is, classes in which most immigrant adolescents will find a same-

[22] The N-HID type contains classes with at least 50% native students and at least a 50% chance that two random immigrant students in class are from a different origin country. The N-LID type contains at least 50% native students but less than a 50% chance that two random immigrant students are from a different origin country. The I-HID and I-LID classes are the same as their native dominant counterparts, except that there are less than 50% native students in class.

ethnic peer in their class. Our study's results about immigrant homophily thus only hold for classes in which immigrant adolescents have sufficient opportunities for same-ethnic friendship.

In line with contact theory (Allport 1954), it is a common belief that ethnically diverse schools facilitate and stimulate positive interethnic relations among their students: when adolescents get in touch with those who have a different ethnic background, their prejudice toward them should decrease and give way to developing interethnic friendships. In line with competition theory, however, most previous U.S. studies find that ethnic homophily is stronger in more ethnically diverse settings (Moody 2001; Mouw and Entwisle 2006; Currarini et al. 2010). In our study, we find that competition theory applies to native homophily but less clearly to immigrant homophily. Immigrant homophily initially increases with ethnic diversity but decreases again in the most ethnically diverse classes. Our results show a striking difference with interethnic attitude research in which it is almost indisputable that out-group contact leads to more positive interethnic attitudes (Pettigrew and Tropp 2006). Our results suggest that interethnic friendship relates differently to ethnic diversity than do interethnic attitudes.

It is unclear why prior research contends interethnic contact leads to positive interethnic attitudes when it does not result in the expected amount of interethnic friendships. One explanation may be that an attitude is less intense than a friendship, and therefore, ethnic boundaries for attitudes are weaker than for friendships. This explanation is in line with several studies that show same-ethnic friendship preferences become increasingly stronger with stronger social relations (e.g., acquaintance vs. strong friendship and dating vs. marriage; Blackwell and Lichter 2004; Windzio and Bicer 2013). In addition, McFarland and colleagues (2014) show that ethnic homophily decreases in more diverse U.S. high school classrooms, whereas we find that native homophily linearly increases with diversity and that immigrant homophily is strongest in moderately diverse classes. The inconsistent effects of ethnic diversity in European classes and U.S. classrooms are in line with the idea that less intense ties benefit from out-group exposure, whereas intense ties do not necessarily. Friendships in European classes might be relatively strong ties, as adolescents necessarily spend every day together in a fixed class setting for at least one year, whereas friendships in U.S. classrooms might be weaker ties, as adolescents spend less time together (about 45 minutes) as they rotate in different class compositions from subject to subject.

Another possibility is that interethnic contact in class is too superficial to improve interethnic relations and that contact theory should be tested with more in-depth measurements of school class culture. Scholars of Allport's (1954) intergroup contact theory generally propose four conditions under which positive intergroup contact is more likely to emerge, namely, when

groups have an equal status, a shared goal, intergroup cooperation, and support of authorities (Pettigrew 1998). On the one hand, it seems unlikely that the school classes under study do not meet these conditions. European classes are small contexts in which adolescents are unlikely able to avoid each other (e.g., joined assignments and physical education require collaboration), and as such, classes are more likely to provide genuine interethnic contact than mere interethnic exposure. In addition, a large meta-analytic study has shown that positive conditions are not necessary for intergroup contact to affect interethnic attitudes positively (Pettigrew and Tropp 2006), and some scholars even find evidence that mere exposure to any object makes people favorable to it (Zajonc 2001).

On the other hand, this study does not rule out that classes will vary in the extent to which Allport's conditions of optimal contact are present and affect ethnic homophily. And, whereas the conditions may not make a difference for interethnic attitudes (Pettigrew and Tropp 2006), they may be of more importance when it comes to interethnic friendship. As ethnic boundaries in friendship seem to be stronger than they are in attitudes, it is plausible that these favorable conditions can give that extra push from positive interethnic attitudes to actual interethnic friendship. Some studies have examined the kinds of context characteristics that reflect these conditions, such as extracurricular activities, high achievement and high school attachment of the student body, or the composition of the teacher body, and have found that favorable conditions do help in stimulating interethnic friendships (Schofield 1979; Epstein 1985; Moody 2001; McFarland et al. 2014). Our study unfortunately could not investigate Allport's conditions of optimal contact due to a lack of suitable measures, but as compensation, our data did include unique variability, as we were able to study a varied population of classes across four countries.

A next aim of this study was to examine whether native and immigrant homophily relate differently to higher levels of ethnic diversity. We argued that natives and immigrants become similarly more homophilous with increasing diversity but for different reasons. To start with, we find that native homophily is stronger in classes with more ethnic diversity. Immigrant homophily also becomes stronger in classes with more ethnic diversity at first, but it becomes weaker in the most diverse classes. Also, the homophily-diversity relation is relatively weak for natives, whereas immigrant homophily is highly sensitive to the ethnic composition of the class. Thus, native and immigrant homophily develop differently with ethnic diversity. How can we explain this?

We suspect that native and immigrant homophily develop differently in ethnically diverse classes because ethnically diverse classes are threatening to natives but not to immigrants. Native adolescents are used to being part of the majority ethnic group in their countries, and as such, becoming part of the numerically ethnic minority in a class challenges their dominant

position. Immigrants, however, are familiar with a minority status, and as such, ethnic threat plays a weaker role in their friendship choice. Instead, their tendency to befriend same-ethnic peers is opportunity based: when their in-group increases in more ethnically diverse classes, they are more likely to find someone they like within the group of same-ethnic peers in class. In the most ethnically diverse classes, however, their in-group size decreases again, and hence, they befriend more often interethnically again.

We have no direct measurement of feelings of ethnic threat, but our study corroborates our line of thought in two ways. First, holding ethnic diversity constant, we find that native homophily is stronger when immigrants mostly befriend within their own ethnic group, whereas we find no evidence that immigrant homophily is stronger when natives befriend mostly natives. This implies that natives feel more threatened by a cohesive out-group, whereas immigrants seem indifferent about the friendship choices of natives. Second, we show that native homophily is weakest in classes in which they are numerically dominant and in which the "leftover" immigrant group is highly diverse. We can interpret this as evidence for the idea that a few large immigrant groups are more threatening to the native dominant position than multiple smaller immigrant groups. We did not find a similar effect for immigrants.

The finding that a more unified immigrant group leads to stronger native homophily signifies the work of classic competition theorists. For example, Simmel (1964) argued that threat requires "centralization" of the in-group in order to compete with the out-group, and Coser (1956) argued that the out-group should be perceived as a "menace" to the in-group in order for threat to affect in-group cohesion. Keeping to their terminology: our work shows that native adolescents take not only the centralization of their own group into account but also that of the out-group. When the out-group is less likely to unify due to different ethnic backgrounds (i.e., the out-group consists of multiple ethnic groups) or when the out-group is not cohesive (i.e., the out-group does not befriend same-ethnic members that much), the out-group is less of a threat to the in-group, which is in line with the relative weak relation between native homophily and the ethnic composition of the class. A unified out-group, however, relates to considerably higher native homophily levels. This study finds less evidence that ethnic threat theories are applicable to immigrant homophily.

Future research can add to our study by including more substantive measures on important concepts that this study lacked. For example, Allport's conditions for optimal contact and feelings of threat can be more directly studied. Additionally, examining country differences was beyond the scope of this study but could be explored in future work. Finally, our study showed that immigrant homophily varies greatly between classes, but we explained little of this variance. It seems as such a fruitful direction of future

research to examine why immigrant homophily is so strong in some classes and much weaker in other classes.

In sum, our study shows that classes with a large share of native students and a diverse immigrant group have the lowest levels of ethnic homophily. Where does that leave schools in their policy toward the ethnic composition of their school classes? Does that mean that schools should avoid ethnically diverse classes? It is important to keep in mind that this study focuses on the tendency to choose same-ethnic friends over interethnic friends net of the availability of same-ethnic friends in class. In other words, we show that the number of interethnic friends is structurally lower than is expected from the possible number of interethnic friends, but there are more interethnic friends in ethnically diverse schools than in ethnically homogeneous schools. Adolescents will not even have the opportunity to make interethnic friendships in the latter case. Limiting ethnic diversity in schools can as such never be beneficial in stimulating ethnic social integration. The important take-home message of this study lies in understanding how ethnic barriers can develop in ethnically diverse classes. For natives, it seems to be feelings of threat when their representation in the class decreases, and for immigrants, it seems to be simply finding a likeable friend among same-ethnic peers.

It is advisable for school policy to understand what may offset feelings of ethnic threat for native students now that this study shows evidence for it. Solutions may relate to the favorable conditions contact theory proposes. For example, Moody (2001) showed that shared extracurricular activities decrease same-ethnic friendship preferences, McFarland and colleagues (2014) showed that achievement and school attachment relates to more interethnic friends, and Stark and Flache (2012) showed that shared opinions and interests can weaken ethnic boundaries under certain conditions. At the same time, this may weaken the tendency of immigrant adolescents to resort to same-ethnic friends when their in-group share enables them to do so. As we also find considerable variance in ethnic homophily between school classes with a similar ethnic composition, this study confirms that there are still ample opportunities for improving our knowledge on why some classes are successful in promoting interethnic friendship to a greater extent than others.

APPENDIX

Here we elaborate on our statistical analysis and provide four sensitivity analyses to compare with our main analysis.

ERGM Convergence and Model Fit

First, we estimate a model with one general homophily parameter. Second, we estimate a model in which the general homophily parameter is split up

into a parameter for native homophily and a parameter for immigrant homophily. Issues common to ERGMs are those of convergence and model fit. With respect to convergence, it is necessary to avoid problems of degeneracy, which means that the simulated networks under the specified model become either completely full or completely empty (Hunter and Handcock 2006).

We check model convergence and degeneracy issues by evaluating the change in the log likelihood between the last iterations of the fitting algorithm. If the change in log likelihood is low (i.e., smaller than five), it indicates that the network estimated is stable instead of heading toward extremes of being empty or full (Hunter, Goodreau, and Handcock 2008). In our sample, only five classes can be considered unstable when we model one general ethnic homophily parameter, and only one class can be considered unstable when we model separate ethnic homophily parameters for natives and immigrants. These classes were discarded from the analysis.

A method to minimize nonconvergence of ERGMs is to constrain parameters if there are sufficient reasons to argue that the model should not consider certain network configurations. We constrain the maximum number of outgoing ties to five, as pupils were only allowed to nominate their five best friends in class. In addition, we allow our models plenty of time to move away from starting values and reach convergence. We started with a model setup of maximum four iterations, a Markov chain Monte Carlo (MCMC) burn in of 100,000, and an MCMC sample size of 50,000. We repeated this analysis 10 times and examined to what extent the coefficients are stable across these runs. General ethnic homophily and native homophily coefficients correlated highly in this case ($r_{\text{average}} = .995$), but immigrant homophily coefficients did not ($r_{\text{average}} = .221$). Therefore, we multiplied the number of iterations, the MCMC burn in, and the MCMC sample size by four. The general, native, and immigrant homophily coefficients correlate at least .95 with each other across runs using this model setup.[23]

Another issue is whether the model fits the data sufficiently. If the model specified does not fit the data well, estimates of ethnic homophily are possibly biased. We identify classes with poor model fit by the magnitude of standard errors of coefficients. We consider standard errors larger than five to indicate that the model produces unreliable estimates (cf. Lubbers 2003). In our sample, one class is problematic when we model homophily in general, 10 classes are problematic when we model native homophily, and 210 classes are problematic when we model immigrant homophily. Again, we exclude these classes from our analyses.

[23] The general and native homophily coefficients show almost a perfect correlation across runs without any restrictions. The immigrant homophily coefficients only correlate this highly if we exclude the classes in which the model does not fit well. This selection is in line with the selection in our main analysis.

A last exclusion is that of outliers. We exclude classes with homophily coefficients lower than −5 and higher than 5 because these estimates are so large that they seem to be an indication of poor model fit rather than a true extreme homophily estimate. The value of ±5 was chosen after an examination of the coefficients' distribution. Figures A1 and A2 show the distribution of homophily coefficients when we model one general homophily parameter and a separate native and immigrant homophily parameter, respectively. Figures A1 and A2 show that coefficients smaller than −5 and larger than 5 are quite extreme. There are no outliers and no extra exclusions of classes for general ethnic homophily, one extra class for native homophily, and another 56 classes for immigrant homophily.

In sum, our selection includes 523 classes when we examine general ethnic homophily (98.87% of the starting sample), 517 classes when we examine native homophily (97.73%), and 262 classes when we examine immigrant homophily (49.53%). We are aware that we exclude a large share of our classes for the immigrant homophily analyses. This is due to the difficulty of modeling homophily coefficients for immigrants who often occupy a small share in a school class. For example, if a class has three immigrant children of which one is Turkish, one is Surinamese, and one is Chinese, there are no same-ethnic immigrant ties possible, and adding a parameter

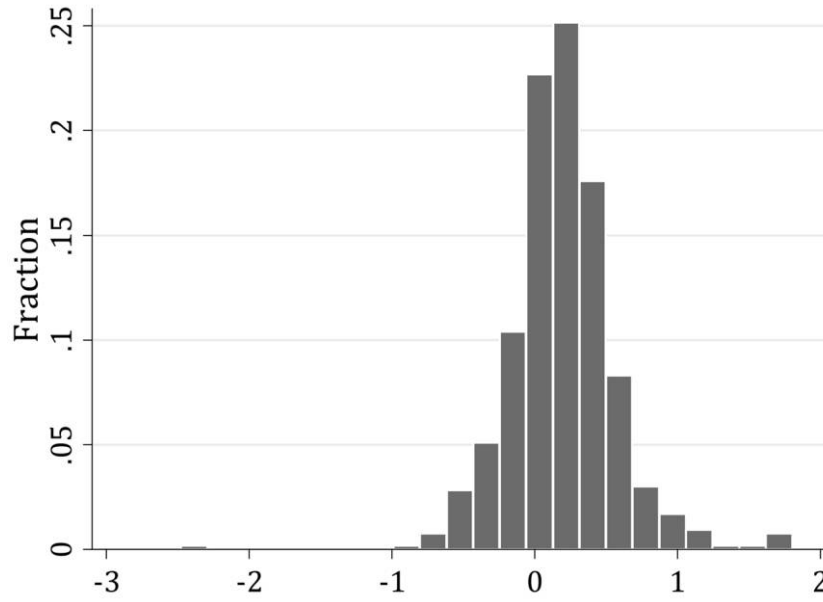

FIG. A1.—Distribution of the general ethnic homophily coefficients estimated by ERGMs.

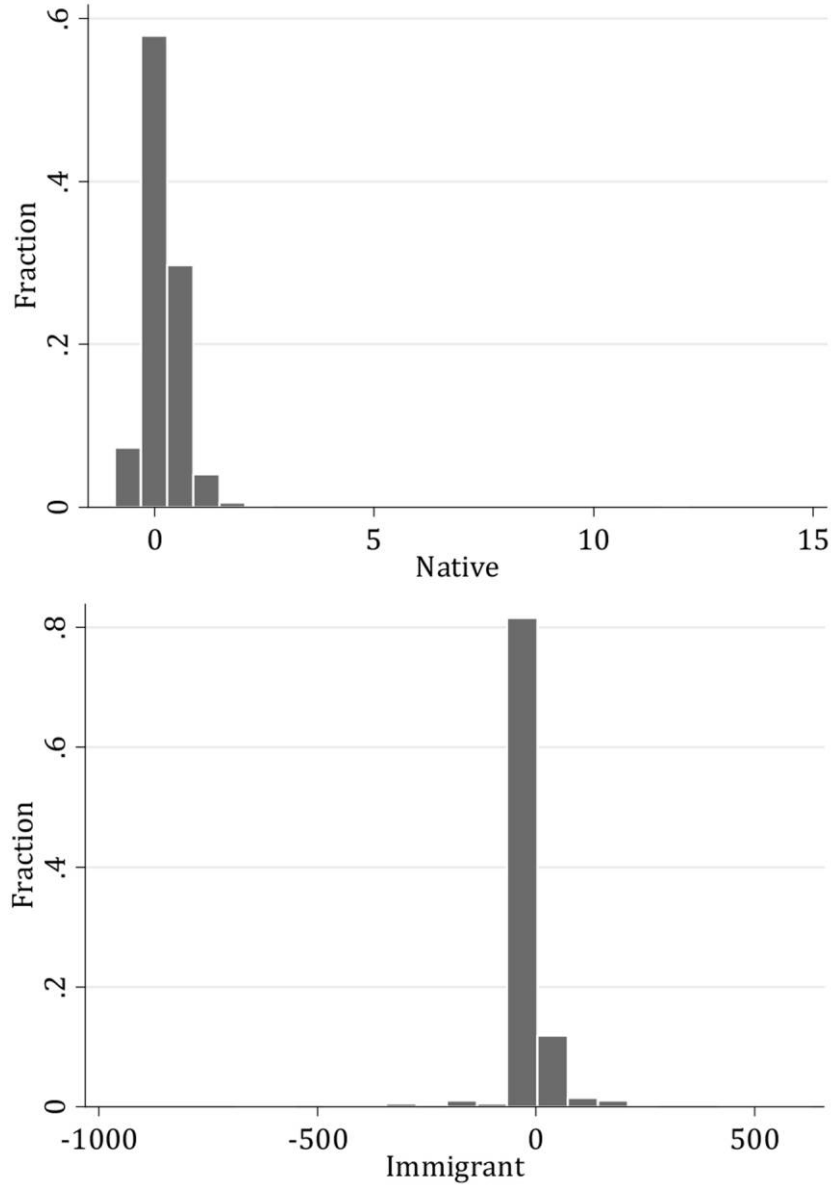

FIG. A2.—Distribution of the native (*top*) and immigrant (*bottom*) homophily coefficients estimated by ERGMs.

for same-ethnic immigrant ties causes estimation problems. The immigrant homophily coefficient will be very large or even infinite as a consequence. A possible solution is to group immigrants into larger panethnic groups or one single group so as to increase the number of possible same-ethnic ties for immigrants (cf. Lubbers 2003; Vermeij et al. 2009).

There are two reasons why we did not follow the same strategy and collapse immigrant groups into broader categories. First, grouping immigrants may have been necessary in previous work because the remaining data did not encompass a sufficient number of classes to run analyses on the class level otherwise. In our case, we have 262 classes left that allow us to distinguish immigrant groups by their national origin. This sample size is sufficient for a class-level analysis. Second, collapsing immigrant groups may obscure effects, as it is less precise: as interethnic ties are considered to be same-ethnic ties, ethnic homophily will be underestimated, and this may also affect the relation between the class's ethnic composition and ethnic homophily. As such, null effects in studies that collapsed immigrant groups may have been due to their somewhat crude measurement of same- and interethnic ties.

Our approach to immigrant same- and interethnic ties is more detailed, but it has the disadvantage that models converge less often, and we end up with a relatively small number of classes when we study immigrant homophily. Therefore, we conduct several sensitivity analyses to examine whether our results for immigrant homophily are caused by sample selection. First, we examine the two samples on their descriptive statistics. Second, we examine whether our results change when we use stricter or looser criteria of inclusion. Third, we examine to what extent the results for natives are robust when we include only the classes in which native and immigrant homophily could be estimated. Fourth, we use a more general definition of ethnicity in which we collapse small immigrant groups into panethnic groups and examine whether our conclusions are driven by our detailed definition of ethnicity. All these sensitivity analyses give insight into the extent to which our results are sensitive to sample selection.

Sensitivity Analysis 1: Comparison of Descriptive Statistics

First, we examine whether the included sample differs from the excluded sample on all the variables in this study. Table A1 corroborates that the classes excluded are classes in which immigrant homophily is difficult to estimate. The excluded sample entails classes with significantly higher shares of natives and lower ethnic diversity (including natives) or higher immigrant diversity. In these kinds of classes, few same-ethnic ties are possible for immigrants, which causes convergence problems during ERGM

TABLE A1
Descriptive Statistics of the Included and Excluded Samples

	Included Sample		Excluded Sample		
	Mean	SD	Mean	SD	t
Pupils:					
Native	.486	.500	.718	.450	−25.747***
Girl	.498	.500	.502	.500	−.465
Popularity	8.582	12.715	9.115	13.910	−2.107*
Socioeconomic status	46.044	15.716	51.028	16.098	−16.511***
Classes:					
Proportion natives in class	.481	.210	.706	.151	−14.141***
Total ethnic diversity	.639	.175	.459	.173	11.938***
Immigrant ethnic diversity	.712	.156	.752	.108	−3.448***
Native same-ethnic density	.195	.081	.183	.056	1.945+
Immigrant same-ethnic density	.193	.081	.092	.140	9.145***
Mean socioeconomic status	45.524	7.318	50.483	7.781	−7.547***
Class size	21.107	4.519	20.903	4.560	.517
N_{class}	262		267		
N_{pupils}	5,530		5,581		

+ $P < .10$.
* $P < .05$.
** $P < .01$.
*** $P < .001$ (two sided).

estimation. This is also reflected by the difference between the samples on immigrant same-ethnic friendship density: it is about twice as small in the excluded sample in comparison with the included sample. Finally, adolescents in the excluded sample generally have a higher socioeconomic status, and their popularity is more centralized.

Sensitivity Analysis 2: Using Stricter and Looser Inclusion Criteria

Second, we examine how the results change when we use either stricter or looser criteria of inclusion. As most classes are excluded on the basis of standard errors and coefficients larger than ±5, we use cutoff points of ±2.5 and ±4 (i.e., stricter) and ±6 and ±10 (i.e., looser) for both standard errors as the coefficients' size of ethnic homophily. Tables A2 and A3 show that the use of stricter or looser criteria leads to a sample difference of around 15 classes and that we mostly exclude a small number of classes with unreasonably large coefficients and standard errors. In addition, the use of different cutoff points leads to differences in effect size and significance, but the direction of effects is in line with the main analyses. The only exception is the effect of immigrant diversity on immigrant homophily (model 8, table A3). Whereas the effect is always positive using a cutoff

TABLE A2

EFFECTS ON IMMIGRANT HOMOPHILY USING STRICTER CRITERIA OF INCLUSION

	CUTOFF POINT = ±2.5				CUTOFF POINT = ±4			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	.496***	.659***	.424*	.677***	.743***	.905***	.664**	.931***
	(.140)	(.149)	(.170)	(.151)	(.199)	(.208)	(.242)	(.211)
Total ethnic diversity	−.151		−.151		−.582		−.589	
	(.394)		(.395)		(.500)		(.501)	
Total ethnic diversity^2	−.599		−.571		−5.715**		−5.680*	
	(1.692)		(1.694)		(2.200)		(2.203)	
Proportion natives		.560*		.512+		.655+		.655+
		(.266)		(.274)		(.353)		(.365)
Proportion natives^2		−2.697*		−2.742*		−5.401		−5.359**
		(1.220)		(1.232)		(1.613)		(1.641)
Native same-ethnic density			.456				.488	
			(.599)				(.848)	
Immigrant diversity				.065				.256
				(.343)				(.474)
Proportion natives × immigrant diversity				−1.420				−1.025
				(1.493)				(2.043)
Class size	.033**	.036***	.035**	.035**	.002	.002	.004	−.000
	(.012)	(.012)	(.012)	(.012)	(.016)	(.016)	(.017)	(.016)
Mean socioeconomic status	−.009	−.015+	−.009	−.014	−.011	−.017	−.011	−.017
	(.009)	(.009)	(.009)	(.009)	(.012)	(.012)	(.012)	(.012)
Country (ref. = England):								
Germany	.014	−.061	−.006	−.071	−.054	−.137	−.073	−.153
	(.158)	(.159)	(.161)	(.159)	(.223)	(.224)	(.226)	(.225)
The Netherlands	.165	.070	.157	.051	.011	−.140	.003	−.167
	(.190)	(.192)	(.191)	(.194)	(.263)	(.265)	(.264)	(.268)
Sweden	.121	.105	.098	.059	.198	.105	.174	.043
	(.170)	(.165)	(.173)	(.173)	(.234)	(.227)	(.238)	(.239)
N_{class}	247	247	247	247	259	259	259	259
I^2_{res}	100	100	100	100	100	100	100	100
Adjusted R^2	4.23	6.33	4.03	6.35	.71	2.99	.47	2.49

NOTE.—Compare to models 6, 7, and 8 in table 3 and model 3 in table 4. Standard errors in parentheses. Continuous variables are mean centered.

+ $P < .10$.

* $P < .05$.

** $P < .01$.

*** $P < .001$ (two sided).

TABLE A3

EFFECTS ON IMMIGRANT HOMOPHILY USING LOOSER CRITERIA OF INCLUSION

	CUTOFF POINT = ±6				CUTOFF POINT = ±10			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	.759**	.910***	.694**	.934***	.550	.756*	.505	.777*
	(.248)	(.259)	(.303)	(.263)	(.336)	(.349)	(.414)	(.353)
Total ethnic diversity	−.807		−.814		−.647		−.654	
	(.591)		(.592)		(.774)		(.776)	
Total ethnic diversity^2	−5.416*		−5.390**		−5.447		−5.436	
	(2.590)		(2.595)		(3.432)		(3.438)	
Proportion natives		.819+		.843+		.778		.712
		(.429)		(.444)		(.575)		(.595)
Proportion natives^2		−4.776*		−4.696*		−6.165*		−6.443*
		(1.942)		(1.985)		(2.608)		(2.672)
Native same-ethnic density			.401				.275	
			(1.062)				(1.465)	
Immigrant diversity				.291				−.055
				(.592)				(.810)
Proportion natives × immigrant diversity				−.552				−2.517
				(2.540)				(3.451)
Class size	−.005	−.006	−.003	−.008	−.029	−.028	−.028	−.029
	(.020)	(.020)	(.020)	(.020)	(.026)	(.026)	(.027)	(.026)
Mean socioeconomic status	−.012	−.019	−.012	−.019	−.010	−.017	−.010	−.016
	(.014)	(.014)	(.014)	(.015)	(.019)	(.019)	(.019)	(.019)
Country (ref. = England):								
Germany	−.058	−.152	−.073	−.170	.238	.135	.228	.127
	(.277)	(.279)	(.281)	(.282)	(.373)	(.374)	(.377)	(.377)
The Netherlands	.006	−.149	−.001	−.176	−.010	−.166	−.014	−.180
	(.323)	(.327)	(.324)	(.331)	(.430)	(.434)	(.432)	(.439)
Sweden	.267	.158	.247	.102	.658+	.570	.645*	.518
	(.290)	(.283)	(.295)	(.298)	(.382)	(.373)	(.388)	(.392)
N_{class}	264	264	264	264	271	271	271	271
I^2_{res}	100	100	100	100	100	100	100	100
Adjusted R^2	−.23	1.20	−.56	.51	1.46	3.02	1.11	2.57

NOTE.—Compare to models 6, 7, and 8 in table 3 and model 3 in table 4. Standard errors in parentheses. Continuous variables are mean centered.

+ $P < .10$.

* $P < .05$.

** $P < .01$.

*** $P < .001$ (two sided).

point of ±2.5–±6, it turns negative when we use a cutoff point of ±10. Note, however, that this effect is not significant in any of the analyses.

Sensitivity Analysis 3: Same Sample Selection for Native Homophily

A third sensitivity analysis was to examine whether our results for native homophily hold when we examine only the classes in which also immigrant homophily could be examined. Note that we examine 251 classes in this analysis instead of 262, because there are also classes in which immigrant homophily could be estimated but where native homophily coefficients did not converge. Table A4 shows that the effects found in the main analyses are even stronger when we exclude all classes in which immigrant homophily could not be studied. In line with sensitivity analysis 2, the immigrant diversity coefficient seems to be an exception: it drops in significance. As the effect is still in the same direction as the main analysis, we conclude that our results for native homophily are robust.

Sensitivity Analysis 4: A Collapsed Definition of Ethnicity

Finally, we examine whether our results are driven by our detailed definition of same-ethnic and interethnic ties. In the main analysis, we consider every national origin group to represent an ethnic group, but it is possible that smaller ethnic groups rely on their panethnicity because they never meet same-ethnic peers in class (e.g., Japanese adolescents may consider themselves Asian). We therefore ran our analyses using a collapsed definition of ethnicity. There are many ways to collapse ethnic categories. For example, one way is to distinguish between natives and immigrants only, whereas another way is to categorize by racial groups (e.g., white, black, Asian, or Hispanic). In our case it makes most sense to collapse smaller immigrant groups into broader categories in order to simplify our analyses, on the one hand, but keep relatively close to the operationalization in the main analysis, on the other hand. By doing so, we can increase the number of classes in which immigrant homophily converges and can make a fair comparison of results using similar accounts of ethnicity.[24]

We distinguish between natives and the four most important immigrant groups within the four countries: Pakistan, India, Jamaica, and Nigeria (England); Turkey, Russia, Poland, and Italy (Germany); Turkey, Morocco,

[24] Using racial groups instead of national origin groups would complicate the comparison, as it not only increases the number of classes included in the analysis but also is another concept of ethnicity. In addition, immigrant groups are the most salient minority groups in many European countries (Castles and Miller 2003), and national origin groups are therefore important groups to study.

TABLE A4
EFFECTS ON NATIVE HOMOPHILY USING THE SAMPLE SELECTION FOR IMMIGRANT HOMOPHILY

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	.353***	.362***	−.340***	.357**	.356***
	(.053)	(.054)	(.089)	(.052)	(.052)
Total ethnic diversity	.069		.105		
	(.561)		(.155)		
Total ethnic diversity^2	−.002		−.683		
	(.004)		(.556)		
Proportion natives	−.003	−.551***		−.579***	−.573***
	(.003)	(.131)		(.109)	(.110)
Proportion natives^2	.069	−.122			
	(.561)	(.495)			
Native same-ethnic density	−.002		3.695***		
	(.004)		(.384)		
Immigrant diversity	−.003			−.035	−.057
	(.003)			(.130)	(.138)
Proportion natives × immigrant diversity	.069				.315
	(.561)				(.645)
Class size	−.002	−.002	.016	−.002	−.002
	(.004)	(.004)	(.005)***	(.004)	(.005)
Mean socioeconomic status	−.003	−.001	−.000	−.001	−.001
	(.003)	(.003)	(.003)	(.003)	(.003)
Country (ref. = England):					
Germany	−.132*	−.116*	−.176**	−.114+	−.112+
	(.059)	(.058)	(.058)	(.059)	(.059)
The Netherlands	−.074	−.053	−.089	−.051	−.048
	(.063)	(.063)	(.062)	(.063)	(.063)
Sweden	−.034	−.011	−.099+	−.007	−.004
	(.060)	(.060)	(.059)	(.061)	(.062)
N_{class}	251	251	251	251	251
I^2_{res}	3.80	1.93	.00	1.92	2.23
Adjusted R^2	100	100	100	100	100

NOTE.—Compare to models 3, 4, and 5 in table 3 and model 3 in table 4. Standard errors in parentheses. Continuous variables are mean centered.

+ $P < .10$.

* $P < .05$.

** $P < .01$.

*** $P < .001$ (two sided).

Surinam, and the Dutch Antilles and Aruba (the Netherlands); and Iraq, Turkey, Bosnia-Herzegovina, and Lebanon (Sweden).[25] All other pupils with an immigrant background are coded to the continent their paren-

[25] We collapsed Antilleans and Arubans into one category as Aruba was part of the Dutch Antilles.

TABLE A5
Effects on Immigrant Homophily Using a Collapsed Definition of Ethnicity

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	.621***	.694***	.647***	.757***	.722***
	(.129)	(.132)	(.131)	(.138)	(.133)
Total ethnic diversity	−.225		−.265		
	(.295)		(.296)		
Total ethnic diversity^2	−1.136		−1.320		
	(1.619)		(1.624)		
Proportion natives		.364		.558*	.533*
		(.223)		(.244)	(.237)
Proportion natives^2		−1.359		−1.060	−1.155
		(1.046)		(1.132)	(1.079)
Native same-ethnic density			.766		
			(.563)		
Immigrant diversity				.551*	.538*
				(.246)	(.238)
Proportion natives × immigrant diversity					−.461
					(1.046)
Class size	−.020*	−.022*	−.016	−.026*	−.026*
	(.010)	(.010)	(.011)	(.011)	(.010)
Mean socioeconomic status	.004	.002	.004	.002	.002
	(.004)	(.004)	(.004)	(.004)	(.004)
Country (ref. = England):					
Germany	−.189	−.219	−.218	−.307*	−.265+
	(.141)	(.141)	(.143)	(.149)	(.142)
The Netherlands	−.063	−.132	−.075	−.226	−.190
	(.171)	(.173)	(.171)	(.181)	(.175)
Sweden	−.068	−.091	−.092	−.148	−.117
	(.143)	(.142)	(.144)	(.149)	(.146)
N_{class}	369	369	369	369	369
I^2_{res}	100	100	100	99.99	99.99
Adjusted R^2	1.46	2.97	1.65	3.56	3.56

Note.—Compare to models 6, 7, and 8 in table 3 and model 3 in table 4. Standard errors in parentheses. Continuous variables are mean centered.

+ $P < .10$.

* $P < .05$.

** $P < .01$.

*** $P < .001$ (two sided).

tal birth countries belong to (Asia, Africa, North America, South America, Europe, and Oceania). In this approach, we are able to study 368 classes (71.73%) compared to 262 classes (49.53%) in the main analysis.

Table A5 shows the meta-analytic results at the class level for immigrant homophily. Most effects are very similar to those in the main analysis, except that some are smaller and drop in significance. The drop in significance and

effect size is to be expected when one uses a more crude measure of ethnic homophily and ethnic diversity. As the effects are in the same direction as our main analysis, we are confident that our conclusions are robust.

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