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The Dynamics of Interethnic Friendships and Negative Ties in Secondary School: The Role of Peer-Perceived Ethnicity

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Abstract

This study examines ethnic integration in secondary school. Social identity theory suggests that perception of relevant individual attributes plays a crucial role in defining ingroups and outgroups, contributing to befriending, and disliking others. Therefore, we analyze the role of peer-perceived ethnicity in social ties. Networks of friendship, dislike, and perceived ethnicity were modeled together using dynamic stochastic actor-oriented models, separating the effect of perceived ethnicity on social ties from that of social ties on perceived ethnicity. Data came from a Hungarian sample of 12 school classes with one minority group: the Roma. Treating friendship and dislike as mutually exclusive and comparing them to neutral relations, we found evidence for the role of perceived ethnicity in dislike—majority students disliked those they perceived as minority peers. However, we saw no direct effect of ethnicity on the friendship network. Implications of the joint modeling of mutually exclusive relationship aspects are discussed.

Keywords

education, intergroup conflict, intergroup relations, interpersonal relationships, race/ethnicity, social identity, social networks

The effectiveness of racial and ethnic integration is of great importance for multiethnic societies. Positive social ties with majority peers are beneficial for minority members because these ties strongly improve their social and cultural capital (Coleman 1988; Stark 2011). Moreover, interethnic relationships are useful for society as a whole because they decrease prejudice between ethnic groups (Brown and Hewstone 2005; Pettigrew et al. 2007).

In an “ideal” interethnic situation, friendships and other positive social ties

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are commonly present between ethnically different individuals. We call this the state of *relational integration*. To achieve this, the first step is to create a formal environment for individuals from different backgrounds to meet. We call such environments the state of *formal integration*. Social policies play a crucial role in reaching this formal stage. These often target the education system, where proportionate mixing of different students can be achieved, providing them with direct meeting opportunities. Furthermore, in school, both the mixing procedure and later group processes can be monitored and controlled. This article investigates the development of relational integration in formally integrated school communities by focusing on the formation and maintenance of interethnic relationships.

Relational integration implies not only the development of friendships between different students but also the decrease of dislike: these are two crucial and distinct aspects of the same process (Brewer 1999). One can argue that even if formal integration results in relatively few interethnic friendships, it can still be advantageous by improving interethnic attitudes. However, ethnic mixing may also lead to enmity (Allport 1954); hence, we argue that formal integration should be studied with respect to emergence of dislike as well as friendship. Nonetheless, so far only few studies have investigated networks of interethnic dislike, mostly cross-sectionally (e.g., Boda and Néray 2015; Kisfalusi, Pál, and Boda 2020; Lőrincz 2016; Tolsma et al. 2013). By analyzing networks of interethnic dislike jointly with friendships, this research also contributes to our understanding of the development of negative interpersonal relationships in ethnically heterogeneous social contexts.

Furthermore, in this article, we consider that someone's ethnic self-identification is not necessarily the same

as that person's ethnicity perceived by others (e.g., Saperstein and Penner 2012; Telles and Lim 1998; for a review, see Roth 2016), and others' perception may be more important for social relationships (Boda and Néray 2015; Kisfalusi et al. 2020). With few exceptions, scholars typically rely on ethnic self-identification or immigration background when examining interethnic relationships. However, social identity theory suggests that individuals sort others into an ingroup or an outgroup based on how they perceive them, not how these others self-identify (Tajfel 1974; Turner 1975). Our approach thus focuses on the effect of peers' categorization of one's ethnicity—also called perceived or observed ethnicity—while controlling for self-identification. Moreover, we take into account that various others' perceptions about the same person are not necessarily in line with each other. To this end, we treat ethnic perception as a *relational* concept (Boda 2018): we conceptualize ethnic perceptions as a network, and this way our analysis can take into account everyone's perception about everyone else in a school community (see Boda 2018, 2019; Boda and Néray 2015; Kisfalusi et al. 2020). This allows us to link observed ethnicity of each person by each peer to other relationships between the same two people and to explain how individuals name others as friends or as disliked persons based on patterns of observed ethnicity.

This article focuses on the process of integration rather than a cross-sectional "snapshot." This is a major advantage of our approach. From previous cross-sectional research on the same data set, we already know that interethnic social ties are segregated based on how students perceive each other (Boda and Néray 2015). At the same time, cross-sectional outcomes may be driven by both ethnic categorizations affecting social ties as

well as social ties affecting ethnic categorizations. In the current analysis, we applied a dynamic approach to separate these processes and thus eliminate this important alternative explanation. A similar longitudinal approach was followed before by Boda (2018, 2019); however, these studies did not model dislike.

We estimated a stochastic actor-oriented model (SAOM) on a sample of 12 Hungarian school classes ($N = 357$). For this purpose, we used the random coefficient multilevel version of SAOMs (see Boda 2018, 2019; Gremmen et al. 2018; Raabe, Boda, and Stadtfeld 2019; Ripley et al. 2020). Analogous to standard random coefficient hierarchical regression techniques, this method allows the estimation of one model for multiple groups, with random differences between the groups. We jointly modeled interdependent changes in friendships, dislike, and ethnic perceptions between students.

THEORY

Homophily, Social Identity Theory, and Interethnic Friendship

The understanding of relational integration often starts with the explanation of how social relations occur. The most well-known process is homophily, that is, the tendency for people to choose friends who are similar to their salient characteristics (e.g., see Lazarsfeld and Merton 1954; McPherson, Smith-Lovin, and Cook 2001). One of the strongest dimensions of homophily in adolescence is ethnicity: individuals of this age group have a strong tendency to choose and maintain same-ethnic friendships (Smith, Maas, and Van Tubergen 2014; Wimmer and Lewis 2010). From a rational choice perspective, the development and maintenance of friendship requires time and effort investment, and these costs are less extensive and benefits more substantial among similar individuals (Block and

Grund 2014; Leszczensky and Pink 2015). Same-ethnic friends are more likely to have similar attitudes and values, which result in more emotional support, better mutual understanding, and shared interest (Lazarsfeld and Merton 1954; Martinovic, Van Tubergen, and Maas 2009). Same-ethnic friends spend more time together (Kao and Joyner 2004) and have more intimate and closer relations (Aboud 2003; Schneider, Dixon, and Udvari 2007), which is imperative in maintaining the relationship.

Although the aforementioned processes arguably contribute to the development of ethnic homophily, this article focuses on the underlying social psychological processes: specifically, on the role of social categorizations. This concept was introduced by the social identity approach (Tajfel 1974; Turner 1975) that argues that the psychological self consists of two different aspects: personal identity and social identity. The latter—collective—aspect expresses that “at certain times the self is defined and experienced as identical, equivalent, or similar to a social class of people in contrast to some other class” (Turner et al. 1994:454). Development and evolution of social identity are based on individuals’ fundamental need for social comparisons, motivated by the underlying need for a positive self-esteem. Social identity rests on comparisons between the perceived ingroup and perceived outgroup. Consequently, the goal of intergroup comparisons is to create and confirm ingroup-favoring evaluative distinctiveness between the ingroup and the outgroup and thus, to improve the individual’s self-esteem (Tajfel and Turner 1979; Turner 1975).

The dimensions relevant enough to serve as bases of intergroup comparisons vary and depend on context. Although minimal group experiments show that even ad hoc group memberships without real content can lead to giving preferential treatments to those signaled as

“ingroup members,” some differences are more meaningful and have more serious consequences than others (Tajfel and Turner 1979). Ethnicity has been found among the most important dimensions of ingroup and outgroup perceptions, explaining ethnic homophily (McPherson et al. 2001; Tajfel and Turner 1979).

Besides ethnicity (with the related social identity process), several other dimensions are also important for homophily, such as gender, popularity, socioeconomic status (SES), or performance (for a comprehensive review, see McPherson et al. 2001). It is vital to consider other relevant factors (e.g., SES) that may spuriously lead to incorrect inferences about ethnic homophily (Moody 2001). Moreover, the study of relational integration should also distinguish the preference for same-ethnic friends from endogenous structural processes, most importantly, triadic closure (e.g., see Davis 1963; Heider 1946), which may lead to further overrepresentation of same-ethnic friendship dyads. Empirical studies of social networks that consider these factors still show friendship segregation between different ethnic groups (e.g., Block and Grund 2014; Leszczensky and Pink 2015, 2019; Smith et al. 2014).

Ethnocentrism and Interethnic Dislike

Ethnocentrism is a phenomenon closely related to social identity theory (Adorno 1950; LeVine and Campbell 1972; Tajfel 1981). It results from two mechanisms: social identification and social contra-identification. As we pointed out earlier, identification is “defined as the selective perception of predominantly positive characteristics of the in-group,” whereas the contra-identification is “defined as the selective perception of predominantly negative characteristics of out-groups” (Billiet, Eisinga, and Scheepers 1996:402). This way, social identification processes

manifest in positive attitudes toward the ingroup as well as negative attitudes toward the outgroup (Eisinga, Felling, and Peters 1990).

In strong relationship with ethnocentrism and social identity theory, ethnic competition theory suggests that processes of social identification and social contra-identification may lead to negative attitudes toward outgroups in case of intergroup competition for scarce resources or perceived ethnic threat (Coenders et al. 2008; Savelkoul et al. 2011; Scheepers, Gijsberts and Coenders 2002). Other studies have found that students tend to exclude (e.g., Hartup 1993) or dislike (e.g., Boda and Néray 2015) others from different ethnic backgrounds. There is also evidence that students often tend to dislike their peers from different social backgrounds, which is often related to ethnicity (Blau 1977). Aggression and negative relations can be used by adolescents to achieve or maintain the status of their ingroup (Faris 2012; Faris and Ennett 2012), which may also be related to ethnic groups in communities.

The Role of Observed Ethnicity

In summary, the literature suggests that segregation along ethnic groups is a general feature of adolescents’ friendship networks. Ethnic groups themselves are, however, not externally given but defined through boundary-making processes (Barth 1968; Brubaker 2009). Vonofaku, Hewston, and Voci (2007) argued that not everyone is always perceived as a “typical” member of his or her ethnic group, and this moderates the effect of friendship on prejudice. Beyond this, a growing body of empirical evidence shows that individuals are sometimes not even perceived as members of their self-identified ethnic group (for a review, see Roth 2016).

Recently, a number of empirical studies analyzed differences between ethnic

self-identification and one's ethnicity as categorized by others (i.e., observed ethnicity), both of which are considered valid aspects of ethnicity (Roth 2016). They found that observed ethnicity is empirically more strongly related to important individual outcomes than self-identification (see Roth 2016 for a review). Given this, the question arises of which aspect matters for relational outcomes: in our case, for creating and maintaining friendships and negative ties. Traditionally, most researchers focus on self-identified race/ethnicity (e.g., Hallinan and Williams 1987; Moody 2001) or country of origin (e.g., Leszczensky and Pink 2015; Smith et al. 2014) when studying interethnic relationships. However, the social processes proposed by the social identity approach actually have a better theoretical fit with observed ethnicity. This is because social identity theory focuses on sociocognitive processes through which individuals create ingroups and outgroups based on their *perception* of characteristics of others rather than based on others' objective or self-identified characteristics (Tajfel and Turner 1979). This implies that the social processes relevant for the formation of social ties happen primarily on the level of perceptions, and self-identification in empirical analyses only captures the effect of observed ethnicity as a proxy.

Hypotheses

According to the social identity approach, individuals are attracted to those whom they perceive as similar to themselves; this attraction should lead to friendships. We therefore hypothesize that

Hypothesis 1: When forming and maintaining friendship ties, students tend to become or remain friends with peers whom they perceive to be of the same ethnicity with a higher probability than peers whom they perceive to be of a different ethnicity.

In line with ethnocentrism, social identity and social categorization processes could additionally lead to individuals disliking those whom they perceive to belong to a different ethnic category from them. Therefore, we also hypothesize that:

Hypothesis 2: When forming and maintaining dislike ties, students tend to start or keep disliking peers whom they perceive to be of the same ethnicity with a lower probability than with peers whom they perceive to be of a different ethnicity.

We assume that observed ethnicity will provide an explanation for the creation and maintenance of social ties even when the effect of self-identified ethnicity is accounted for. We still control for self-identifications because it is possible that these also independently contribute to relationship choices, and therefore, they serve as an alternative explanation. One's self-identification may influence one's values, norms, expectations, and aspirations, with implications for a variety of characteristics (e.g., tastes, habits, academic outcomes). Such characteristics may be more or less attractive for others, independent of how they perceive the given individual's ethnicity. Therefore, besides observed ethnicity, we also include self-identified ethnicity in our models to represent and control for the aforementioned potential processes. This also means that if effects of observed ethnicity are found, these cannot be interpreted potentially as being caused by the fact that observed ethnicity is a proxy for self-identified ethnicity.

CONTEXT, DATA AND MEASURES

Context

We tested our general hypotheses using the case of Roma students in Hungarian secondary schools. The Roma group is

a good example of a disadvantaged minority group because it constitutes one of the biggest and poorest ethnic minorities in Europe (Kertesi and Kézdi 2011). Their situation in Hungary is an illustrative example for the seriously underprivileged status of minorities, given strong prejudice levied toward them, and growing interethnic tensions between the Roma and the general Hungarian population.

The Roma is the only large minority group in Hungary, with many of its members living on the periphery of the society (Goldberg 2006; Janky 2006; Kertesi and Kézdi 2011). Their disadvantaged status can be captured in their educational results both in terms of academic test scores and graduation rates: the vast majority of young Hungarian Roma leave the school system without graduating from secondary school (Kertesi and Kézdi 2011). Recently, the proportion of Roma minorities was estimated to be 5 percent to 6 percent of the total population and 10 percent to 12 percent of the adolescent population (Kertesi and Kézdi 2011).

Although cultural differences between Hungarians and Roma people do exist, these differences are not necessarily easy to recognize. This is because Roma people predominantly live in ethnically diverse neighborhoods, and they all speak fluent Hungarian as their first language (Kemény and Janky 2005). Furthermore, they do not consistently differ from Hungarians in terms of dressing, and although darker skin color and hair color might be a distinctive feature of Roma people, these differences are far from obvious. This makes Roma an ambiguous ethnic category in Hungary. Roma people are sometimes able to “pass” as non-Roma (Simonovits and Kézdi 2014). This is especially interesting given the high level of prejudice against Roma people in the majority society, which may be translated to Roma ethnicity being a stigma in Hungary (Goffman 1963).

Data

We analyzed two waves of a four-wave social network database collected in 2010–2011. The total sample consisted of 1,439 students in seven secondary schools containing 44 school classrooms. In the Hungarian education system, students are sorted into classrooms in which they take most of their subjects together. At the end of the academic year, students have to reach a passing grade for each subject; otherwise, they repeat the whole academic year as part of another class. In schools with lower academic achievement, dropout from the class is relatively common.

Students attended ninth grade (age 15 years) during the first data collection; they were freshly brought together and barely knew each other at that time. Starting the analysis from the first wave makes it possible to examine the development of interethnic attitudes and interpersonal relations from a situation with little prior history.

The questionnaires were filled out in every school at the same time (within a 48-hour interval). Some students did not fill out the questionnaire because either they did not want to participate in the study, or their parents did not give consent. With the help of school principals and teachers, additional efforts were made to collect data from students who did not attend school on the given day, but were willing to participate in the study and had parental consent.

The examined subsample was chosen based on appropriate levels of ethnic heterogeneity within school classes: in each chosen class, there are at least 10 percent of Roma students based on their ethnic self-assessments. This was to ensure that we had enough of each nomination types (non-Roma–non-Roma, non-Roma–Roma, Roma–non-Roma, Roma–Roma) present for the analysis. We also excluded

classrooms with more than 25 percent missings in the social network data, which could make our results unreliable. The final subsample ($N = 357$) includes 12 classrooms. It is heterogeneous in terms of settlement size (three classrooms from the capital, three from a major town, and six from two small towns). However, it overrepresents lower-prestige training programs: vocational schools and secondary technical schools. Our subsample includes only two grammar schools (which have the highest prestige, mainly preparing students for tertiary education) because Roma students are highly underrepresented in that school type.

We analyzed the first two waves of the panel study. The third data wave was collected shortly after the beginning of the second academic year, when a significant proportion of students had left their classes. Due to the high—and potentially biased—composition change, these data cannot be analyzed together with the first two data waves.

Measurements

Friendship and dislike. Interpersonal relationships were measured with a five-point scale in a full network roster. Every student was asked to evaluate their relations with all of his or her classmates one by one on this scale. The relation could be -2 for “I hate him/her, he/she is my enemy”; -1 for “I do not like him/her”; 0 for “He/she is neutral for me”; $+1$ for “I like him/her”; and $+2$ for “He/she is my friend.” This study uses friendship networks ($+2$) instead of all positive relationships—that is, friendship and liking nominations together—because friendships are assumed to have much stronger roles in ethnic integration. For dislike nominations, however, we combined dislike (-1) and hate (-2) relations because even weak negative relationships can be quite influential in a group. Moreover,

“hate” relationships were relatively rare and thus would be difficult to analyze, whereas “like” relationships were very common and thus would dilute the effect of friendships.¹ Nominations coded neither as a friendship nor as dislike served as a reference category in the analysis. For simplicity, we refer to this relationship state as *neutral* in the rest of this article, but here we note that it also includes weak positive ties.

Ethnicity. Perceived ethnicity was measured by a full network roster. Every student was given a list of their classmates and asked to nominate those whom they considered as Roma.

The original measurement for self-identified ethnicity had four categories: Hungarian, Roma, Hungarian and Roma at the same time, and Other. However, in our analysis, we simplified this variable in the following way. We merged Roma with Roma and Hungarian and called this ethnic group Roma; we also combined Hungarian with Other and labeled this group as non-Roma. For simplicity, in the following we sometimes refer to the Roma group as the minority group, and the non-Roma group as the majority group. The categorization of Other students into the non-Roma (majority) category should not affect our results too much given that only four people self-identified with this category.²

METHOD AND MODELS

The Social Network Analysis Approach

Our model defines ethnic perceptions at the dyadic level, that is, whether a given person classifies another person as

¹Figure A1 in online Appendix A shows the frequencies of the five categories and the coding.

²Descriptive statistics on categorizations and self-identifications and justification of our coding of ethnic categories can be found in online Appendix B.

belonging to the minority group will differ between persons. The collection of all ethnic categorizations in each community accordingly is treated as a complete social network. A network on a group of n social actors (individuals) here is defined as a collection of dichotomous tie variables, indicating for each ordered pair of different actors whether there is a tie from the first to the second actor: the variable is 1 if the tie exists, and 0 otherwise. Note that ties are directional, directed from the “sender” of the tie, referred to as *ego*, to the “receiver,” referred to as *alter*. For the ethnic perception network, if *ego* categorizes *alter* as Roma, then the tie is present (tie value = 1); otherwise, it is absent (tie value = 0).

This allowed us to utilize concepts and techniques from the field of social network analysis (SNA; e.g., Robins, 2015). The ethnic perception network was analyzed together with the friendship network and the dislike network. SNA methods recognize that tie variables are strongly dependent on one another: primary dependences are that the ties from *ego* to *alter* depend on the ties from *alter* to *ego* (reciprocity) but also on other ties involving *ego* and other ties involving *alter*. This interdependence precludes the use of standard statistical methods (Snijders 2011). Statistical models used in SNA consider that ties will depend on attributes and perhaps other dyadic variables but that ties also are interdependent; reciprocity, transitivity (“friends of my friends are my friends”), and differential popularity are major kinds of interdependence.

Dependent Networks

The three networks, friendship, dislike, and ethnic perception, were used as three dependent variables. Our analysis used their measurements at two time points, referred to as waves. In the following,

we elaborate how their interdependence is represented. We conceptualized friendship and dislike as two distinct states, mutually exclusive, of the relationship felt by one person for another person. This is in line with the data collection, where friendship and dislike were measured as two ends of the same scale in the questionnaire. By modeling friendship and dislike as two separate but mutually exclusive dependent network variables, we compared the development and maintenance of both friendship and dislike to a neutral relationship state.

Modeling Co-evolution of Networks with Stochastic Actor-Oriented Models

The analysis took the first measurement wave of the networks as the point of departure and examined the dynamics from the first to the second wave. The analysis was based on stochastic actor-oriented models (SAOMs) for the dynamics of multivariate networks (Snijders, Lomi, and Torló 2013). This represents the interdependence within and between the three networks by a simulation model of gradual change, in which ties in the three networks change one by one, and the end result of all changes is the second wave. During this process, the state of the three networks, which is the relational context for everybody in the school class, changes gradually; at each moment, the probabilities of the further changes depend on the current state of this context. The probabilities of the tie changes represent the micro-mechanisms of tie formation and maintenance in the group for the three networks—friendship, dislike, and ethnic perceptions. Tie changes within each network can be explained by the structural position of the actors within the same and within the other two networks, characteristics of actors and pairs of actors, composition effects,

and residual random influences under the constraint that the combination of a friendship from ego to alter and a dislike tie from this ego to the same alter are incompatible (although it is possible that ego mentions a friendship to alter while alter mentions a dislike tie to ego). This model allowed us not only to account for the effect of ethnicity on friendship and dislike while controlling for other important tendencies but also to model the evolution of ethnic perceptions over time, depending on friendship and dislike.

Changes in each network were explained, in part, by the other two networks. For example, the analysis allowed us to estimate whether ego, dependent on certain characteristics, will be more or less likely to start a friendship to alter if this ego also perceives this alter as a minority peer. This allowed us to analyze the relationship between ethnic perceptions and social ties at the micro level, avoiding unnecessary aggregation of data and thus ecological fallacies.

It is important to note that friendship and dislike are linked in the analysis: shifts from friendship to dislike (or the other way around) are possible; however, due to the mutual exclusiveness, a friendship tie first has to dissolve for dislike to form, and vice versa. This way, ethnicity may influence friendship and dislike indirectly through each other. The advantage of this approach to analyzing friendship and dislike separately is that we can take into account the mutually exclusive nature of friendship and dislike that is inherent in the data and consider evolution of social ties through three distinct relationship states (dislike, neutrality, friendship) simultaneously, like moving along an ordinal scale.

In our co-evolution model, we have three dependent variables: friendship, dislike, and ethnic perceptions. The changes in these networks were modeled in such a way that these changes in

each also depend on the state of the other two networks. In this longitudinal setup, it is possible to simultaneously give the networks the roles of dependent variables and of explanatory variables for each other, as explained more in detail in Snijders et al. (2013). Thus, processes related to ethnic perceptions can be used to explain friendships, whereas ethnic perceptions themselves are explained in another part of the same model. It is also possible to respect the constraint that friendship ties and dislike ties cannot cooccur. The SAOM is a simulation-based statistical methodology in which the evolution of the networks is simulated by a process that is governed by parameters expressing a variety of relevant micro-mechanisms including the tested hypotheses. Parameters are estimated and tested based on the correspondence between data and simulations.

Data from 12 classrooms were analyzed as a combined data set with a Bayesian random coefficient multilevel version of the SAOM, as described in Ripley et al. (2020) and applied for instance in Boda (2018, 2019), Gremmen et al. (2018), Raabe et al. (2019), and Lorenz et al. (2020). This is similar to the hierarchical linear model, where at the classroom level the network dynamics follow the SAOM with parameters that are regarded as random effects, that is, drawn from a random distribution. In view of the small number of classrooms, a weakly informative prior was used.

Model Specification

Model specification requires the formulation of distinct models for each of the three dependent networks, friendship, dislike, and perceived ethnicity, where the other two networks can figure among the explanations of the dependent network. The distinction between dependent and independent variables here is that in

the simulation model of the SAOM, the current state of the three networks is at the independent side, determining the tie change probabilities leading to the new state at the dependent side. Because friendship and dislike are mutually exclusive, the direct cross-network effects for these two dependent networks were fixed at -20 (which for the log-probability ratios scale at which the parameters are expressed is practically minus infinity) to represent the impossibility to have a friendship and a dislike tie simultaneously.

In the specifications for the friendship and dislike networks, we included the same ethnicity-related independent variables. To capture the effect of ego, we modeled ego's ethnic self-identification. We also included alter's ethnicity from both alter's and ego's perspective: how alter self-identifies and how ego perceives alter. Given that same-ethnic-group membership should be crucial for relationship formation, we also included interaction effects between ego and alter using both of these ethnicity variables; therefore, we have two interaction effects in both the friendship and dislike parts of the model.

To have an adequate representation of the network dependencies, we included several structural effects that are based on earlier experience with network modeling and on the requirement of obtaining a well-fitting model for this data set (Snijders 2011; Snijders et al. 2013). The latter consideration means that the model selection was based partly on an exploratory process. This is typical in network modeling because of the complexity of network structures and the restricted knowledge available up to now of what constitutes a good network model specification. This is especially true for dislike networks, about which we know much less but that also seem to show fewer regular characteristics than friendships (e.g., Boda and Néray 2015; Huitsing et al. 2012; Pál

et al. 2016), and for ethnic perception networks that have rarely been modeled this way before (e.g., Boda 2018, 2019). All variables that were regarded as theoretically important are in the model, complemented with those that improved convergence of the estimation algorithm and the fit.³ We disregarded that ethnic self-identifications could also change and treated them as fixed (using data from the first wave) because only very few changes happened in our data set between the two observations.

To illustrate the model specification, we present a visualization of three example networks of one classroom: Figure 1 shows friendship, dislike, and minority perceptions between students, respectively. This is purely for the illustration of our model specification. Arrows between nodes show whether ego names alter as a friend, a disliked person, or Roma, respectively. White nodes are self-identified majority, and black nodes are minority students. The arrangement of nodes is fixed across graphs.

Our analysis considered socioeconomic status as a crucial control variable because it is a potential alternative explanation of ethnicity-related preferences.⁴ This variable was created as a principal component from the parents' socioeconomic status and items in the student's home that helped the student prepare for school (Boda and Néray 2015). In addition, we controlled for gender because this is perhaps the most important factor of friendship formation in adolescence.

RESULTS

Descriptive Results

Tables 1 through 4 show the "gross" level of segregation—the likelihood of same-

³The full model specification—also including variables explaining ethnic categorization evolution—is presented in online Appendix C.

⁴See the complete list of included variables in online Appendixes C and F.

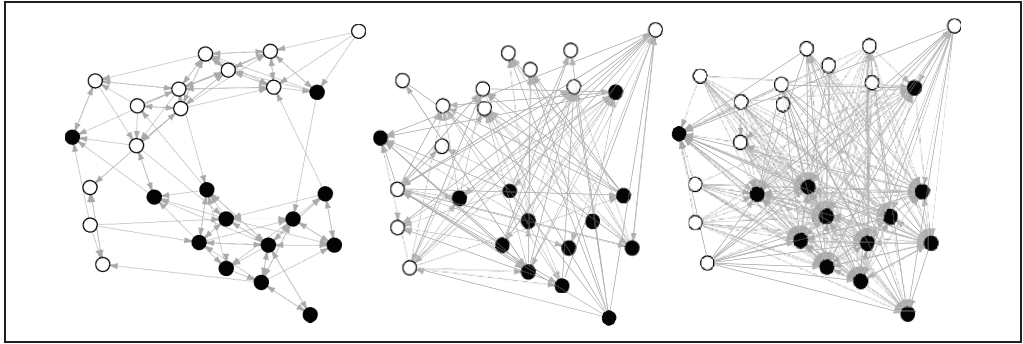


Figure 1. Friendship Network, Negative Network, and Ethnic Perception Network of a School Class
Note: White nodes = self-identified majority students; black nodes = self-identified minority students. Network ties: (left) friendship nomination, (middle) negative nomination, and (right) and minority nomination between the same group of students.

ethnic and interethnic ties—at both time points.⁵ The tables show the proportion of ties sent by a majority- or minority-group individual to peers from each ethnic group. We also show the ratio of these observed proportions to the proportion expected by chance, based on the ethnic composition only, if ethnicity did not matter for tie choices. A value larger than 1 means the nomination type is overrepresented, and a value less than 1 means it is underrepresented compared to chance. The *p* values show whether ties sent by members of the two ethnic groups are significantly different from each other in their composition, according to chi-squared tests (not corrected for network dependencies).

Based on Table 1, majority students almost exclusively named self-identified majority peers as friends in the first wave (87 percent majority peers, 13 percent minority peers), although this is about half for minority students (51 percent majority peers, 49 percent minority peers). Because the self-identified minority proportion is 27 percent, this would be the proportion of minority friends nominated if ethnicity did not play

a role in friendship. Self-identified majority students are 1.19 times as likely to have self-identified majority-group friends and .48 times as likely to have minority-group friends than expected by chance, whereas minority students are .7 times as likely to have self-identified majority-group friends and 1.81 times as likely to have minority-group friends than expected by chance. This changes very little by the second wave. Differences between friendships by the two ethnic groups are significant based on the chi-squared test. This shows strong homophily in both ethnic groups at both times.

When we defined alter's ethnicity based on ego's perception (Table 2), we saw similar homophilous tendencies and, again, little difference between the two waves when we looked at the numbers expressing the prevalence of each tie type compared to what we would expect by chance: majority-group students are 1.1 times as likely to name other majority-group students and .35 times as likely to name minority-group students as friends than expected by chance only, and minority-group students are .74 times as likely to name majority-group friends and 2.57 times as likely to name other minority-group friends than

⁵Basic descriptive statistics of the networks analyzed can be found in online Appendix D.

Table 1. Gross Segregation: Share of Friendship Ties Based on Self-Identified Ethnicity

Share of all friendship ties				
Ego	Wave 1		Wave 2	
	Alter		Alter	
	Majority	Minority	Majority	Minority
Majority	.87 (1.19)	.13 (.48)	.85 (1.16)	.15 (.56)
Minority	.51 (.70)	.49 (1.81)	.51 (.70)	.49 (1.81)
	$p < .001$		$p < .001$	

Note: Based on self-identified ethnicities, minority proportion = .27. In parentheses: number of actual ties compared to number of ties by chance (if ethnicity did not matter).

Table 2. Gross Segregation: Share of Friendship Ties Based on Perceived Ethnicity

Share of all friendship ties				
Ego	Wave 1		Wave 2	
	Alter		Alter	
	Majority	Minority	Majority	Minority
Majority	.95 (1.10)	.05 (.35)	.91 (1.12)	.09 (.47)
Minority	.64 (.74)	.36 (2.57)	.58 (.72)	.42 (2.21)
	$p < .001$		$p < .001$	

Note: Based on ethnicities as perceived by ego, minority nomination density = .14 in Wave 1, .19 in Wave 2. In parentheses: number of actual ties compared to number of ties by chance (if ethnicity did not matter).

expected by chance in the first wave; the second wave showed similar numbers. Differences between the two groups were significant both times. Therefore, descriptive analysis shows homophilous friendship tendencies for both ethnic groups at both time points, but there is no strong evidence that this becomes stronger over time.

Tables 3 and 4 present nominations in the dislike networks and show that patterns of dislike are quite different from those of friendships. Based on Table 3, majority students disliked their self-identified majority peers a bit less and minority peers a bit more than expected by chance already in the first wave

(naming majority peers is .97 times as likely, naming minority peers is 1.07 times as likely compared to chance). This tendency strengthened by the second wave (.95 vs. 1.11 times as likely, respectively). Minority students, however, shifted from same-group preference in the first wave (disliking minority students .85 times less than expected by chance) into same-group rejection (disliking minority students 1.19 times more than expected by chance). Although in the first wave we saw significant differences between dislike nominations sent by minority and majority students, this disappeared by the second wave, with both ethnic groups mostly disliking minority individuals.

Table 3. Gross Segregation: Share of Negative Ties Based on Self-Identified Ethnicity

Share of all negative ties				
Ego	Wave 1		Wave 2	
	Alter		Alter	
	Majority	Minority	Majority	Minority
Majority	.71 (.97)	.29 (1.07)	.70 (.95)	.30 (1.11)
Minority	.77 (1.05)	.23 (.85)	.68 (.93)	.32 (1.19)
	$p = .025$		$p = .682$	

Note: Based on self-identified ethnicities, minority proportion = .27. In parentheses: number of actual ties compared to number of ties by chance (if ethnicity did not matter).

Table 4. Gross Segregation: Share of Negative Ties Based on Perceived Ethnicity

Share of all negative ties				
Ego	Wave 1		Wave 2	
	Alter		Alter	
	Majority	Minority	Majority	Minority
Majority	.85 (.99)	.15 (1.07)	.76 (.94)	.23 (1.21)
Minority	.90 (1.05)	.10 (.71)	.73 (.90)	.26 (1.37)
	$p = .090$		$p = .387$	

Note: Based on ethnicities as perceived by ego, minority nomination density = .14 in Wave 1, .19 in Wave 2. In parentheses: number of actual ties compared to ties by chance (if ethnicity did not matter).

When focusing on perceived ethnicity (Table 4), we saw very similar tendencies: majority students showed a slight tendency to dislike those they perceived as minority students already in Wave 1, and they increased this proportion by Wave 2 (they are 1.07 times as likely than chance to dislike minority peers in Wave 1, which increases to being 1.21 times as likely in Wave 2). Again, minority students shifted from not disliking those they perceived as majority students (.71 times as likely than chance) to mostly disliking their perceived minority peers (1.37 times as likely than chance). These

differences between the two ethnic groups were not significant.

These results may be due to ethnicity-related friendship and dislike preferences. However, they may also be due to their changed perceptions about which peers belong to the minority group. Moreover, endogenous processes may also play a role independent of the peer's ethnicity. These alternative explanations will be taken into account in our SAOM, which controlled for endogenous processes and separated between the effect of social ties on ethnic perception and the effect of perception on social ties over time.

Table 5. SAOM Results Selection Table: Ethnicity Effects on Friendship Ties.

Ego (self-identified)	Alter			
	“Consistent” majority (both ways)	“Consistent” minority (both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
Majority	Reference category	.880	.977	.900
Minority	Reference category	.978	1.264	.773

Note: Reference categories: majority-majority nominations for self-identified majority egos and minority-majority nominations for self-identified minority egos. SAOM = stochastic actor-oriented model.

Table 6. SAOM Results Selection Table: Ethnicity Effects on Negative Ties.

Ego (self-identified)	Alter			
	“Consistent” majority (both ways)	“Consistent” minority (both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
Majority	Reference category	1.510***	.829*	1.822***
Minority	Reference category	.998	.840	1.187

Note: Reference categories: majority-majority nominations for self-identified majority egos and minority-majority nominations for self-identified minority egos. SAOM = stochastic actor-oriented model.

* $p < .05$. *** $p < .001$.

SAOM Results

For our analysis, we use random coefficient multilevel stochastic actor-oriented models (SAOMs; Ripley et al. 2020).⁶ To interpret the parameters, it should be noted that SAOMs represent network dynamics as a series of unobserved tie changes in the three networks by a simulation model where the probabilities for each tie change depend on the unobserved state of the three networks that obtains at that moment. This section first focuses on results directly relevant to our hypotheses. For this, we calculated conditional odds ratios for each of the nomination types based on self-identified and

perceived ethnicity. The parameters are expressed as conditional log probabilities indicating how the probability of ego creating a new friendship/dislike tie to alter (starting from neutrality) or of maintaining such a tie if it already exists depends on ethnicity. Note that those not in a neutral relationship were not allowed to develop new friendship or dislike nominations toward each other during the simulations.

Tables 5 and 6 demonstrate these results. We set a separate reference category for minority-group and majority-group egos given that we aimed at comparing how the same ego categorized different alters. The reference category in each case is ego nominating an alter who “consistently” belongs to the majority category. The parameter sizes were calculated based on the estimated effects

⁶Details of the procedure can be found in Appendix E. The full set of results, including the evolution of friendships, dislike, and ethnic perceptions, is included in online Appendix F.

of ethnicity on friendship and dislike ties.⁷ For friendship networks and dislike networks, these are ego's self-identification, alter's self-identification, ego's perception of alter's ethnicity, and interaction effects between ego's and alter's ethnicity. The cells in Tables 5 and 6 are linear combinations of the parameters for these effects. We applied additional statistical tests to calculate the significance of the deviation between these linear combinations and the reference category.⁸

To interpret our results, we now go back to our hypotheses. Hypothesis 1 predicted that students would tend to become or remain friends with peers whom they perceived to be of the same ethnicity with a higher probability than with peers whom they perceived to be of a different ethnicity. Results on friendship did not confirm this hypothesis. In the friendship models (Table 5), we found that perceived ethnicity did not have an effect on creating or maintaining friendships. This is in line with our descriptive results: although interethnic friendships were less likely than same-ethnic ones at both time points, our groups did not become more (or less) segregated over time. Note that self-identification also did not have an effect on friendship.

Next, we turn to our results on dislike. Hypothesis 2 predicted that students started or kept disliking peers whom they perceived to be of the same ethnicity with a lower probability than peers whom they perceived to be of a different

ethnicity. Based on Table 6, we found that majority students had a higher tendency to dislike peers who they perceived as minority students regardless of whether these students considered themselves as minorities or not (odds ratio = 1.51, $p < .001$, and odds ratio = 1.822, $p < .001$, respectively). These results confirmed Hypothesis 2 among majority students. This is again in line with our descriptive results while also confirming that perceived ethnicity has a crucial role in rejection. Minority students, however, did not distinguish between their majority and minority peers when it came to dislike: therefore, there is no evidence for Hypothesis 2 among minority students. At the same time, majority students rejected those students significantly less often whom they perceived as majority students and who at the same time self-identified as minority students (odds ratio = .829, $p < .05$). This highlights that the combination of self-identified and perceived ethnicity may also be crucial for dislike.

CONCLUSIONS

In this article, we focused on the development of relational integration in school communities: a state when social ties are proportionately present between and within ethnic groups. Based on general theories and empirical evidence, we formed hypotheses about the dynamics of interethnic relationships and tested our predictions using a Hungarian data set including Roma minority and non-Roma majority students. We investigated two types of relationships: friendship and dislike ties, analyzing self-identified and perceived ethnicity at the same time.

Following social identity theory (Tajfel 1974; Turner 1975) and the ethnocentrism literature (Adorno 1950; LeVine and Campbell 1972; Tajfel 1981), we formed two hypotheses about the role of

⁷These are shown in online Appendix F. For friendship networks, ego's self-identification is Effect 12 in Appendix F, alter's self-identification is Effect 13, ego's perception of alter's ethnicity is Effect 14, and interaction effects between ego's and alter's ethnicity are Effects 15 and 16. For dislike networks, these are Effects 33, 34, 35, 36, and 37, respectively.

⁸Details can be found in online Appendix E.

observed ethnicity in the formation and maintenance of friendship and dislike ties. First, we hypothesized that friendships were less likely with those one perceives to belong to a different ethnic group than with others. Second, we expected that dislike would be more likely in these dyads. Fitting a random coefficient multilevel stochastic actor-oriented model, we investigated the dynamics of friendship and dislike based on self-identified ethnic memberships and perceptions about the ethnicity of others.

Although interethnic friendships were descriptively underrepresented in our classrooms compared to same-ethnic ones at both time points (in line with the findings of Boda and Néray 2015, using cross-sectional network models on the same data set), interethnic friendship ties were not significantly less likely to form from neutral ties or to be maintained over time compared to friendships between students from the same ethnic group (controlling for endogenous network processes). In terms of dislike, however, majority students showed a tendency to dislike those they categorized as minority peers: they were more likely to form dislike relations toward minority members they currently felt neutral about and to maintain existing dislike relations toward minority members than toward majority peers. Minority students, at the same time, did not dislike their majority peers significantly more or less than those from their own ethnic group. This asymmetry may imply segregation and hierarchical differences between the two ethnic groups, with majority students rejecting their minority peers. Using our original terminology, we can conclude that formal integration is certainly not enough to develop relational integration—although friendship ties do exist between ethnic groups, which is a positive sign.

For a deeper interpretation of our results, it is important to keep in mind

the special—mutually exclusive and therefore interdependent—conceptualization of friendship and dislike ties. A change from a friendship (dislike) to a dislike (friendship) tie is composed of two steps: first friendship (dislike) to neutral, then neutral to dislike (friendship). Interethnic friendships are equally likely to dissolve into neutral states as same-ethnic ones, but then interethnic neutral ties are more likely to turn into dislike (at least from majority to minority students). Thus, ethnicity plays a role in the eventual formation of dislike between friends, but only once this neutral state is achieved. Similarly, interethnic dislike ties are less likely to turn into neutral ties than same-ethnic ones; thus, the formation of interethnic friendship from dislike ties should be altogether less likely than those of same-ethnic ones.

Results on dislike ties are somewhat surprising given that descriptively we saw that both majority and minority students tended to develop dislike toward minority students. However, we mentioned already when interpreting the descriptive statistics on dislike that there are several alternative explanations beyond just attributing them to ethnicity-related preferences. First, endogenous network mechanisms, such as preferential attachment, may have some role in the evolution of dislike relations. Indeed, we saw a significant positive parameter for this.⁹ Moreover, we took into account that not only (perceived) ethnicity can influence dislike relations but also the other way around. Therefore, it is possible that instead of starting to dislike those they perceive as minority peers, students start to perceive as minority peers those they dislike. We also found evidence for this process in the model.¹⁰

⁹Effect 28 in online Appendix F.

¹⁰Effect 47 in online Appendix F.

An interesting finding is that majority students tend to dislike those peers whom they perceive as majority students but who self-identify as minority students less than “consistent” majority peers. This shows that self-identification is not only a “proxy” for categorizations but has an independent effect on relationships. It seems that self-identified minority students have certain characteristics that lead majority students to not dislike them—as long as they do not perceive them as minority individuals. This may even be the characteristics that made it possible for them to “pass” as non-Roma in the first place—especially given our results that those disliked will be more likely to be perceived as part of the minority group than other students (discussed at the end of the previous paragraph).

Our results about the absence of an effect of ethnicity on friendship may seem to contradict findings of Boda (2019) on the same data set, which suggested that majority students tend to choose other majority peers for friendship. In the current article, we did not find this effect because we considered the co-evolution of not only friendship and ethnic perceptions but also dislike. The absence of friendship is decomposed into a dislike tie and neutral tie; therefore, here we use more details of the data. The effect of ethnicity on friendship found in Boda (2019) here turns out to firstly be an effect on dislike ties, which then translates into an effect on friendship if the distinction between dislike and neutrality is disregarded. This can be spelled out as follows. In the present model, ties can have the value neutral, friendship, or dislike. The probability of transitions between neutral and dislike depends on ethnic perceptions, but not so for the transitions between neutral relations and friendship. The probability of transitioning between dislike and friendship differs from that of transitioning between neutral and

friendship. Therefore, if the neutral and dislike states are amalgamated, the probability of transitions between neutral and dislike and friendship will depend on ethnic perceptions.

This article shows that ethnic classification by others plays an important role in understanding ethnic integration: we found that majority students reject those they perceive as minority peers regardless of these peers’ self-identification. This is in line with the broader literature that suggests that classification determines social outcomes more strongly than self-identifications. The importance of dislike is also emphasized: while friendships did not show significant tendencies toward integration or segregation, dislike networks revealed that majority students tend to develop and maintain dislike toward their minority peers over time. In our model, ethnicity affects friendships through its effect on dislike relationships.

Another relevant contribution of this research is the application of appropriate statistical methodology developed for dynamic social network analysis. This allows us to control for important alternative explanations that we could not do using nonnetwork or nondynamic models. Taking the network structure into account, we control for endogenous mechanisms (e.g., reciprocity, transitivity) that could also result in ethnic segregation. Moreover, our dynamic approach considers that not only ethnicity affects social ties but that social ties also affect ethnic perceptions.

Our study also has limitations. Most importantly, the context of this article is the case of adolescents and the Roma minority in Hungary, which restricts us from generalizing our findings to other contexts. It is very likely that under different circumstances, different strategies will be followed by minority groups. However, this article offers novel theoretical

and methodological tools that can be used to examine these strategies in different settings and compare results in the future. Another limitation is related to the time scale: we examined relationship dynamics within half a year. Clearly, we could get very different results over a longer period of time. Finally, we measured friendship and dislike on one scale, which means that we were not able to take ambivalent, “frenemy”-type relationships into account.

Results of this study nevertheless highlight the role of negative ties in school communities and the importance of focusing on them when analyzing relational integration: without modeling dislike, tendencies of segregation could have stayed hidden. Moreover, our analysis demonstrates that ethnic perceptions have a crucial role in peer rejection: majority students seemed to dislike all peers they perceived as minorities even if these peers did not identify with the minority group themselves. Hence, this article strongly contributes to our understanding of social identity, ethnicity, and ethnic integration in society.

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SUPPLEMENTAL MATERIAL

Supplemental material for this article is available online.

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