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Inter-ethnic friendship and negative ties in secondary school

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ABSTRACT

This paper investigates several different aspects of inter-ethnic relationships. It focuses on friendships and negative ties between secondary school students from different ethnic backgrounds, introducing and measuring two different aspects of ethnicity: self-declared ethnicity, and ethnicity based on peer perception. These are first applied separately and then together on a sample of secondary school students in Hungary consisting of two ethnic groups: Roma and non-Roma Hungarian ($N = 420$). Friendships and negative ties are modelled using cross-sectional exponential random graph models for sixteen classrooms separately, and then individual models are summarized using meta-analysis. Based on the social identity approach, we predict that inter-ethnic friendships are less likely, and negative ties are more likely, than those within ethnic groups; and that majority students reject their minority peers more than the other way around. Moreover, minority students are expected to exclude those whom they perceive as minorities, but who, at the same time, identify with the majority group, since these classmates might seem to them as "traitors" of their "original" ethnic group. Results mostly confirm our hypotheses, emphasizing the role of perceived ethnicity: majority students tend to dislike peers whom they perceive as minorities, regardless of these peers' self-declared ethnicity; on the other hand, minority students are likely to send friendship nominations towards their perceived minority classmates if these also declare themselves as minorities, but, as predicted, negative nominations if these declare themselves as majorities. This supports our general idea that different ethnicity aspects might influence friendships and negative ties in different ways, and inconsistencies in someone's ethnic categorization might play an important role in social rejection.

1. Introduction

In our ethnically diverse world inter-ethnic tension is a serious social issue. Minority groups are often in disadvantaged positions in their host societies which exacerbates this problem (e.g.: Quillian, 2012; Dustmann and Frattini, 2011). The formation of interracial and interethnic social ties might attenuate this tension as they serve as mediators of knowledge and information transfer. Hence, they potentially play a significant role in decreasing prejudice, and increasing the social and human capital of minorities (Coleman, 1988; Stark, 2011). Therefore, it is essential to find effective ways for creating positive, and eliminating negative social ties between members of different ethnic groups. It is often argued that the role of education is crucial in this regard, as it creates a formal opportunity for mixing students from different ethnic backgrounds, and these contact opportunities may lead to the emergence of inter-ethnic positive relations (Allport, 1954; Wright et al., 1997).

However, as Moody (2001) pointed out, formally integrated school classes can remain essentially segregated, if ethnically different students tend not to become friends with each other. Once contact opportunities are given, the magnitude of relational integration can be described by the likelihood of positive inter-ethnic relations. In the last decades, empirical studies have been conducted to explore the formation of students' inter-ethnic friendship networks and the importance of ethnic mixing (see for example Moody, 2001; Stark and Flache, 2012). In these studies, it was found that the formation of inter-ethnic friendship ties tend to be relatively unlikely, and relational integration is not necessarily achieved by the opportunity of ethnic mixing only.

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Our work extends existing research in at least two major ways. First, we emphasize that relational integration should be described not only by the prevalence of positive, but also by the absence of negative inter-ethnic relations. The lack of positive relations does not equal to the existence of negative ones, but interpersonal relations in ethnically fragmented social contexts are often hostile. As positive and negative relationships generally give rise to different structures, one of our main aims is to explore whether they are influenced differently by ethnicity. So far, only a relatively small number of studies have investigated networks of inter-ethnic negative ties (Stark and Flache, 2012), therefore the majority of the previous research in this field has missed an opportunity to capture some important aspects of the relational integration phenomenon. By analysing negative ties separately from positive relations, this paper contributes to our understanding of the nature of negative interpersonal relations in ethnically heterogeneous social contexts.

Second, we introduce two different aspects of ethnicity and apply them simultaneously. The first is self-declared ethnicity, which refers to one's own ethnic identification and is very commonly used in network studies (Munniksma et al., 2013; Stark et al., 2013; Tolsma et al., 2013). The second is peers' perceptions of each others' ethnicity, which captures the way someone is identified by others, which, by our knowledge, has not yet been used in social network models. The idea originates from the phenomenon that ethnicity is a situation-dependent social construction, rather than an objectively defined (and definable) attribute. This constructivist approach is not new. Brubaker (2009) gives a detailed theoretical review, starting with Weber's Economy and Society (1968), and examining several clusters of works that have contributed to developing ways of studying ethnicity without focusing on groups that are conceptually fixed. This allows us to empirically tackle the identification problem, that is, the issue that perceptions about someone's ethnicity may vary (Brubaker, 2004; Hogg and Terry, 2000; Jenkins, 2008), leading to potential inconsistencies between self-declared and perceived ethnicity (Marques et al., 1988; Ogbu, 2008; Saperstein and Penner, 2012). Besides demonstrating the different effects of these aspects of ethnicity, our research provides strong evidence that discrepancy between someone's self-declared and perceived ethnicity has a crucial influence on how much that person is liked or disliked by others.

Our theoretical framework is based on the social identity approach (Tajfel, 1974; Turner, 1975). A main idea of this approach is that individuals strive to maintain positive social identity in order to increase or maintain the level of their self-esteem. Social identity is based on comparisons between the ingroup, that is, one's own social group, and the outgroup. Tajfel and Turner (1979) proposed a number of strategies for dealing with a situation when individuals perceive their ingroup's social identity as negative compared to that of a relevant outgroup's. In this paper, we focus on three of these: (1) engagement in social competition with the higher status group; (2) individual mobility, that is, dissociation from the original group and attempting to join a higher status one; (3) internalization of the inferior social status and attempting to achieve positive self-esteem without positive social identity. Since these strategies influence the emergence of friendships and negative social ties within and between social groups, examining the likelihood of these relationships also gives us indications about which strategies were chosen by the students in a given community.

Our goal is to investigate inter-ethnic segregation in secondary school by analysing relationships between majority and minority students; specifically between non-Roma and Roma students in Hungary. As we are interested in how positive and negative relations are associated with self-declared and perceived ethnicity, we choose a rather descriptive analytic approach to focus on the relative prevalence of same-ethnic and inter-ethnic social ties in a community. That is, we examine the likelihood of different positive and negative same-ethnic and inter-ethnic relationships using cross-sectional network models.

To foreshadow our methodological framework, we estimate exponential random graph models (Lusher et al., 2012) on the sample of 16 Hungarian secondary school classes (average age = 15.9, $N = 420$). After building individual models for each school class, we meta-analyze the results to discover general tendencies. Our results demonstrate that accounting for both positive and negative nominations and capturing the nominators' perceptions provide us with a new perspective about ethnic segregation.

2. Theoretical background

2.1. Integration and segregation

Those who promote integrated education usually argue that contact between minority and majority students should lead to the formation and development of social relations beyond their own ethnic groups, and this, along with the emergence of positive attitudes towards minority ethnic groups, should directly decrease prejudice and increase social cohesion at the societal level (Allport, 1954; Tropp and Pettigrew, 2005; Pettigrew and Tropp, 2008; Munniksma et al., 2013). Proponents also emphasize that peer acceptance gives students a sense of participation in school, and of belonging to a community (Lubbers, 2003). By providing companionship and setting behavioural examples, students can increase each other's motivation and school success as well as lower the probability of dropping out (Hymel et al., 1996; Wigfield et al., 1998). For these reasons, relationships among ethnically different classmates are especially important.

However, it is not yet fully understood how inter-ethnic friendship ties are formed. Based on social identity theory (Tajfel, 1974; Turner, 1975), people have a fundamental need to categorize themselves and others into groups. Social identity is part of the self-concept, and rests on social comparisons between the perceived ingroup and perceived outgroup. These comparisons are motivated by an underlying need for positive self-esteem, therefore their role is to establish and confirm ingroup-favouring evaluative distinctiveness between the ingroup and the outgroup (Turner, 1975; Tajfel and Turner, 1979). Therefore, ingroup-favouritism (Turner and Reynolds, 2001) predicts that people tend to prefer others whom they perceive to belong to the same group as themselves along salient social categories. Following this, in ethnically heterogeneous classes we should see ethnically similar students giving preferential treatment to each other and befriending each other more often than would be expected only based on the proportions in the group as a whole. These predictions are also supported by the strong and general empirical regularity of homophily, suggesting that people indeed tend to choose friends similar to themselves along various dimensions, including race and ethnicity (McPherson et al., 2001; Moody, 2001). In connection with these theoretical considerations and empirical results, we hypothesize that

H1. inter-ethnic positive nominations are less likely than positive nominations within the same ethnic group.

2.2. Positive and negative relationships

So far, previous research has demonstrated that friendships between students from different ethnic backgrounds tend to be relatively unlikely. However, one should not forget that ties between two individuals may also be negative, and the difference between the absence of a positive tie and the presence of a negative tie is very important, yet rarely analyzed in connection with race or ethnicity. From the perspective of ethnic integration, examining negative

ties is essential, because an ethnically heterogeneous class setting, providing contact opportunities, can still be more advantageous than one in which ethnically different students do not even meet each other–as long as it does not result in the disproportionate emergence and strengthening of negative relationships.

Tajfel and Turner (1979) provide a comprehensive explanation of intergroup conflict derived from the social identity approach. They claim that through social categorization, social groups provide their members with group identification in the given social context, and the perception of an ingroup and an outgroup. The fundamental need for evaluative comparisons between the ingroup and the outgroup creates social identity, and defines the individual as better or worse than members of the other group. When individuals perceive the ingroup's social identity as negative compared to that of the outgroup's, they will normally strive to achieve more positive social identity, in order to enhance their self-esteem. Tajfel and Turner (1979) proposed a number of strategies to deal with a situation when the social identity of the own group is perceived as negative. As a first strategy, group members can seek positive distinctiveness by trying to reverse the relative positions of the ingroup and the outgroup, which is an essentially competitive process (Strategy 1). Tajfel and Turner (1979) hypothesized that engaging in social competition will generate conflict and antagonism between the groups to the degree that it challenges the group's position in the established social hierarchy (Tajfel and Turner, 1979).

Even though there are much fewer empirical results about interethnic negative ties than about positive ones, there is support that in certain cases negative relationships evolve under heterogeneous class settings. More specifically, in case of earlier established negative relationships, heterogeneous class settings may cause more negative inter-group attitudes, whereas in case of positive relationships the result may be the emergence of more positive attitudes towards the other ethnic group (Stark and Flache, 2012). Moreover, according to Blau (1977), students often tend to dislike their peers from different social backgrounds, which is often related to ethnicity. Other researchers also showed that children and adolescents tend to exclude those of dissimilar ethnic background, gender, and age (Hartup, 1993). Ethnic and cultural differences may increase the prevalence of bullying among students, where not only minority, but also majority students can be the victims of bullying (Vervoort et al., 2010; Tolsma et al., 2013). Finally, Farris's research provided evidence that aggression and negative relations can be used by adolescents to achieve or maintain the status of their ingroup (Faris, 2012; Faris and Ennett, 2012).

Evidence for heterophobia is less strong than evidence for homophily (Flache and Mäs, 2008; Csaba and Pal, 2010), but based on Tajfel and Turner's theory and the results on negative tie formation between individuals from different ethnic backgrounds we hypothesize that

H2. inter-ethnic negative nominations are more likely than negative nominations within the same ethnic group.

Finding evidence for this hypothesis would imply that indeed, the pursuit of social competition is a valid strategy chosen by at least some individuals in our sample.

2.3. The consequences of the "inconsistent" ethnic categorization

Turner and his colleagues extend social identity theory through the development of self-categorization theory (Turner, 1985; Turner et al., 1987). According to this, social categorization of self and others into an ingroup and an outgroup accentuates the perceived similarity of the target person to the relevant ingroup or outgroup prototype. If, however, the relevant comparison outgroup saliently changes over time, modifications in prototypes and hence in the self-concept can occur (Fiske and Taylor, 1991). This makes social identity and categorizations highly context-dependent and dynamic (Hogg and Terry, 2000).

If categorization is not based on stable, "objectively existing" categories, ethnic group boundaries should also be treated as context-based, fluid, and subjective for each individual. This aligns with the argument of Brubaker (2004), who pointed out that the concept of ethnic identity is too ambiguous, therefore ethnicity should be defined in terms of participants' beliefs, perceptions and understandings. Empirical results also suggest that ethnicity is a situation-dependent social construction rather than a salient, stable personal or group attribute. Shifts in ethnic identification can be observed, and it can be altered by the surrounding social environment (Harris and Sim, 2002; Hitlin et al., 2006; Ladányi and Szelényi, 2006). Hence, in different social contexts different aspects of identity may be emphasized or concealed (Harris and Sim, 2002; Herman, 2004). Whether as a consequence of prejudice or an assimilation process, Roma people in Hungary may suppress their ethnic identity in certain social situations (Ladányi and Szelényi, 2006). Related to its socially constructed nature, ethnicity can also be understood as a social phenomenon with more than one aspect. Saperstein and Penner (2012) proposed a distinction between identification (self-declared ethnicity), and classification (ethnicity judged by others), and – analysing them separately – provided evidence that both are fluid over time.

Examining the two different ethnicity aspects together is advantageous as it makes them and their social implications comparable. Moreover, this way we can analyze situations when individuals are perceived differently from their ethnic self-declarations; these discrepancies, according to the social identity approach, can have serious social consequences. Tajfel and Turner (1979) proposed another strategy to deal with a situation when the ingroup's social identity is perceived as too negative. This is dissociation from the original ingroup; that is, individuals try to leave their group and join a more positively perceived one (Strategy 2). When ethnicity is a relevant aspect of social categorization in the community, choosing a certain ethnic group for self-identification can be understood as a sign about the social status the individual seeks to achieve, and about the strategy for achieving those goals. When individuals who are perceived as members of the lower-status ethnic group identify themselves as members of the higher-status group, this may be seen as choosing Strategy 2 for improving their self-esteem, that is, leaving the original ethnic group and trying to join the higher-status one. Especially when other members of the group try to engage with social competition (Strategy 1), these people can seem to be "traitors" of their original ethnic groups, who, in addition, jeopardize the distinctiveness, prototypical clarity, and integrity of the ingroup, hence introducing the threat of uncertainty (Hogg and Terry, 2000).

Marques and his colleagues introduced the black sheep hypothesis in accordance with the social identity theory as a "sophisticated" form of ingroup-favouritism (Marques et al., 1988). Because individuals seek positive social identities, and therefore try to preserve the overall positivity of their ingroups, their judgements about ingroup members, whether positive or negative, will be more extreme than those about similarly likeable outgroup members (Marques et al., 1988). We already argued that perceived ingroup members, who identify themselves as outgroup members are deviant, and therefore, dislikeable. Therefore, based on the black sheep hypothesis, they are expected to be rejected even more than outgroup members.

Our next two hypotheses are related to this argument, and are as follows. In cases when the social status of the minority group is lower, such as that of the Roma people in the Hungarian society

H3. self-declared minority students are unlikely to name those peers as friends whom they perceive as minorities but who identify with the majority group; and

H4. self-declared minority students tend to dislike these peers.

Finding evidence for these hypotheses would also imply that both mentioned strategies are followed by at least some of the group members.

2.4. Asymmetric inter-group relations

In the previous sections, following Tajfel's and Turner's reasoning we argued that social competition and leaving the social group are two valid strategies for individuals to achieve more positive social identity. However, joining another group is not always perceived as an available option. Social competition requires positive group self-esteem from the subordinate group, and the ability and willingness for questioning or denying its presumed characteristics associated with its low status (Tajfel and Turner, 1979). When social structural differences in the distribution of resources have been institutionalized, legitimized, and justified through a consensually accepted status system, the subordinate group's self-esteem might be not positive enough even to compete with the majority, therefore it is less likely to engage in social competition; instead, it internalizes the wider social evaluation of itself as inferior (Strategy 3) (Gregor and Mcpherson, 1966; Morland, 1969; Milner, 1975). Tajfel and Turner (1979) argued that in this case ethnocentrism among stratified groups is a "one-way street", as minority group members frequently tend to derogate their own ingroup and display positive attitudes towards the dominant group. Although this strategy can undermine the group's positive social identity, it can enhance positive self-esteem, which is the basic underlying psychological need at the individual level (Tajfel and Turner, 1979).

As the social status of the Roma group in Hungary is much lower than the status of the majority group, Strategy 3 might be a valid choice for some of the Roma students. This might influence both positive and negative relations among Roma and non-Roma students. Consequently, in contexts when the minority group has a much lower social status, such as the Roma minority in the Hungarian context, we expect that

H5. minority students are more likely to send positive nominations to their majority peers than the other way around, and

H6. minority students are less likely to send negative nominations to their majority peers than the other way around.

Providing evidence for these hypotheses would suggest that in our case, at least some minorities choose the third strategy of accepting their inferiority.

3. Context, data and measurements

3.1. Context

The situation of Roma people in Hungary is an illustrative example not only for inter-ethnic tension, but also for the seriously underprivileged status of minorities and general prejudice towards them. Traditionally, Roma people constitute the largest minority group in Hungary, and their history has always been characterized by social and economic exclusion (Goldberg, 2006; Kertesi and Kézdi, 2011). Due to high birth rate, their population has continued to grow in the last decades (Janky, 2006). Currently, the proportion of Roma minorities is estimated to be 5–6% of the total population, and 10–12% of the adolescent population (Kertesi and Kézdi, 2011). They have always been living in worse conditions than the rest of the population. After the fall of the communist regime in Hungary, the job market collapsed, resulting in a 23% employment rate among Roma people. By 1994, the gap in employment rates between Roma people and the majority group reached almost 40 percentage points, with an employment rate of 29% for Roma men and 17% for Roma women (Janky, 2006). Since then, the gap has widened even further (Kézdi and Kertesi, 2011).

Not surprisingly, differences in the level of education also grew substantially. The collapse of the labour market, through the phenomenon of permanent poverty, has been partly responsible for the widening ethnic gap in education (Kertesi and Kezdi, 2005). As Kertesi and Kézdi (2005) pointed out, the long-term poverty of the Roma is strongly associated with their high dropout rate after the 8th grade. As a result, the vast majority of young Hungarian Roma leave the schooling system without graduating from secondary school, and only a negligible fraction take part in tertiary education. At the same time, a large proportion of non-Roma Hungarians completes secondary school, and 50% of them continue their studies pursuing a colleges degree (Kertesi and Kézdi, 2005). Regarding academic performance of 8th-grade students, the gap between Roma and non-Roma children is substantial. The gap between test scores for both reading skills and mathematics is approximately one standard deviation, which is similar to what the gap has been between African-American and white students of the same age group in the U.S. in the 1980s (Kézdi and Kertesi, 2011). It was concluded that health conditions, parenting, and schooling explain most of the gap, and ethnic differences in those are almost entirely accounted for by differences in parental education and income (Kézdi and Kertesi, 2011).

3.2. Research project and sample

To test our hypotheses, we used a sample collected in Hungary among secondary school students. The four-wave survey started in 2010 and ended in 2013. It covers 44 classes from 7 schools, including schools in the capital, a major town, and two medium sized towns ($N = 1439$ unique students). This sample contains classes from the three different training programmes of secondary education in Hungary.[2] Our current analysis relies on the second data wave, which was collected in the second half of the fist academic year of secondary school (in 2011), therefore students already had time to get to know each other by then. We restrict our sample to classes with appropriate levels of ethnic heterogeneity. We use a subsample ($N = 420$) which includes 16 classes with at least 10% of Roma students based on their ethnic self-assessments, and with less than 20% of missing data in the relevant network questions (based on the example of Huisman, 2009). As a consequence, our subsample contains mostly vocational and secondary technical school classes, with only one grammar school class included.

3.3. Measurements

3.3.1. Positive and negative ties

In the dataset, friendship and negative relations are measured with one scale; each student was asked to judge all of their classmates along a five-point scale: "−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". For our analysis, we chose friendship networks ("+2") as a measurement for positive nominations as we believe that this network contains the most important and most influential positive

[2] Training programmes: (1) vocational, (2) secondary technical (which provides vocational training programme but also allows students to participate in tertiary education), and (3) secondary grammar (which has the highest prestige and mainly prepares students for tertiary education).

nominations. As everyone judged everyone else in the community along this scale instead of making lists of their best friends, the density of "aggregated positive nominations" – friendship and liking nominations together – is comparatively high (0.52), which confirms that the network constructed based on positive nominations cannot be reflective of very close relationships. For negative nominations, however, we have decided to include both weak ("−1") and strong ("−2") negative ties, as these networks were not dense (0.12 together).

For handling missing values in the network data, we imputed the value of ties using the first and the third waves of data collection as follows. We used the original 5-point scale to impute the strength of missing ties: (1) if data were available only for the first or the third wave, we directly used the value available; (2) if data were available for both the first and the third waves, we calculated the mean of the two rounding it to the number closer to 0 (e.g. $1.5 \rightarrow 1$, $0.5 \rightarrow 0$, $-0.5 \rightarrow 0$, $-1.5 \rightarrow -1$). After the imputation, we inferred friendship and negative ties as described above.

3.3.2. Roma ethnicity

In the questionnaire, both aspects of ethnicity were measured. First, self-declared ethnicity had four different values: "Hungarian", "Roma", "Hungarian and Roma", and "Other". For the analysis, we created two groups: "Roma" (from "Roma" and "Roma and Hungarian"), and "non-Roma" (from "Hungarian" and "Other"). Missing cases were imputed in two steps. In the first step, we considered Roma those students who did not answer the question about ethnicity but gave a valid answer to the question "If you consider yourself a Roma, which Roma subgroup do you belong to?", or considered themselves Roma in the first or third data wave, but never considered themselves non-Roma. As a next step, we imputed the remaining missing values (8.1%) using a multiple logistic regression imputation method suggested by Van Buuren (2011), based on the teachers' judgement whether the student is Roma or not, on the economic status of the students and the education level of the students' fathers (Nagelkerke $R^2 = 0.7$; predictive power: 90.4%). As a result, our restricted subsample consists of 270 non-Roma (64%) and 150 Roma students (36%).

Perceived ethnicity was measured by network rosters, meaning that all students had to nominate classmates whom they considered Roma based on the complete list of their classmates. This resulted in a network of Roma nominations, with an average density of 0.21. For imputing missing values, we used Roma nominations from the first and the third waves, as we did with the friendships and negative ties. In total, 13% of the ties was imputed this way.

3.3.3. Socio-economic status and gender

When analysing inter-ethnic relationships, it is important to control for certain characteristics which are considered to be important for tie formation and/or related to ethnicity. Since Roma ethnicity in Hungary is strongly related to socio-economic status (SES) (Kézdi and Kertesi, 2011), a principal component was created for measuring it, using the variables of the father's education level and cultural assets that are in the students' personal use at home: desk, a place where they can study without being disturbed, a computer that they can use for school work, internet access, a self-owned calculator, classical literature books, and books to help them prepare for school.[3]

Gender was also used as a control variable, as it is found to be the most important source for homophily among children and adolescents (McPherson et al., 2001). In the analyzed sample 46% of the students are male and 54% of them are female, although there are two classes without female students.

4. Methods and model

4.1. Methods

For the analysis, exponential random graph models (ERGMs) were estimated. In ERGMs, the dependent variable of the analysis is a binary tie variable. A tie from actor i to actor j can be present or absent, presence is denoted by $i \rightarrow j$, and the tie variable takes the value 1 or 0 respectively. The network is constituted by the tie variables, represented by an $n \times n$ adjacency matrix, where n stands for the total number of actors, and self-nominations are excluded. This statistical approach estimates the probability that a tie exists and this probability is a function of structural network parameters (e.g. reciprocity) and actor or dyadic attributes (e.g. similarity in ethnicity). For more details and recent developments see Snijders et al. (2006), Robins et al. (2007), and Lusher et al. (2012). We applied a common model specification, discussed below, estimated separately for all classrooms. For the estimation, we used the software MPNet (Wang et al., 2013) with the single-level (or one-mode network) option.[4]

In the first step of analysis, separate ERGMs were estimated for each school class in the sample. For each class, we fit models with the dependent variable of friendship, and models with the dependent variable of negative ties. In the next step, class-based results were analyzed together to study the general tendencies for the two model types.

For the meta-analysis, estimated parameters and standard errors of the separate models per class were used. The underlying assumption of these meta-analyses is that individual networks are a sample from a common population. Using the method proposed by Snijders and Baerveldt (2003), it was estimated whether the values for a given parameter, averaged over the population, differed significantly from 0, i.e., whether the results indicated some general tendency or not. Parameters were estimated jointly for each classroom, and the meta-analysis was conducted for each parameter separately. The mean as well as the variance of the parameters in the population were estimated and tested.

4.2. Model

4.2.1. Roma ethnicity effects

We designed different models using the different ethnicity aspects: only self-declared ethnicity (Model A), only perceived ethnicity (Model B), and both (Model C) for the nominee's ethnic self-identitification, for both positive (+) and negative (−) networks. Consequently, we have six models in total: Model A+, B+ and C+, and Model A−, B− and C−, where different letters refer to the different compositions of ethnicity effects applied, and + or − signs stand for the type the dependent network.

In the first two models (A and B), we tested the same hypotheses (H1–H4) using different measurements for ethnicity concepts (self-declared or perceived). Model C uses these different ethnicity measurements simultaneously, which allows us to examine the results of the discrepancies between self-declaration and sender-perception of ethnicity, in order to test our remaining hypotheses

[3] The variable for the father's level of education is a part of the students' socio economic status index and also serves as a predicting variable in the regression model that we use for imputing Roma ethnicity. However, we imputed ethnicity only in 8.1% of the cases, which did not artificially strengthen the relationship between the two variables (correlation coefficients before and after the imputation are −0.40 and −0.42, respectively).

[4] The software is available at http://sna.unimelb.edu.au/PNet.

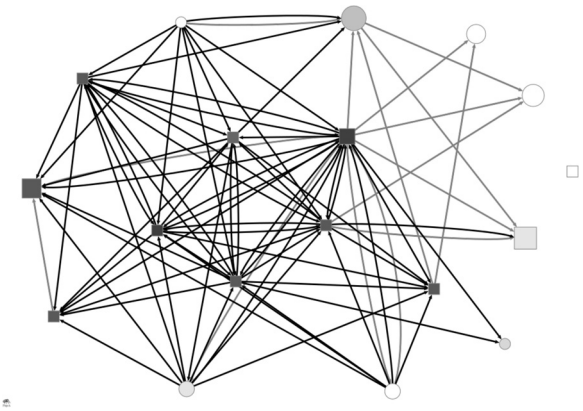


Fig. 1. Negative and Roma perception ties (node size based on out-degrees in negative networks).

(H5 and H6). For this, in each model we used the sender's self-declared ethnicity. In Model A, we also included the receiver's self-declared ethnicity and the interaction between the sender's and the receiver's self-declared ethnicity. Model B differs from Model A in the sense that here we used another measurement for the receiver's ethnicity: the sender's perception about the receiver. In this model we also included the interaction between the sender's self-declared ethnicity and the sender's perception about the receiver's ethnicity. In model C, both measurements of the receiver's ethnicity mentioned above were included, together with the two interaction effects. Self-declared ethnicity was included as a nodal covariate, and perceived ethnicity as a dyadic covariate, therefore the perceived ethnicity of a given receiver does not have only *one* value but can be different in different dyads. Note that the variables are not centred, therefore in every model the value 0 refers to non-Roma, and 1 to Roma students; in case of interactions, the value is 1 if both the sender and the receiver are (self-declared or perceived) Roma.

Figs. 1 and 2 both illustrate the logic of our models, representing the negative and the perceived ethnicity networks in one class from our sample. On both figures, black arrows mean Roma nominations and the grey ones stand for the negative relations. Self-declared Roma students are represented with squares and non-Roma students with circles. The colours of the nodes depend on the number of the incoming perceived ethnic nominations: the higher the indegree of the node, the darker it is. Finally, whereas on Fig. 1 the larger the node, the more incoming negative nominations the student has, on Fig. 2 the node size depends on the outgoing negative nominations (the position of the nodes in the figures is fixed to ease comparison).

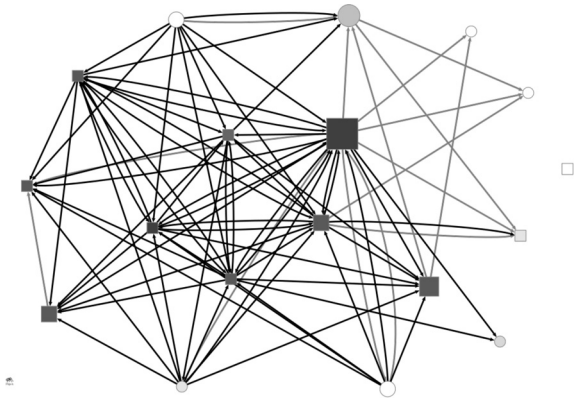


Fig. 2. Negative and Roma perception ties (node size based on out-degrees in negative networks).

4.2.2. Gender and socio-economic status effects

For gender and socio-economic status (SES), effects based on self-declared attribute were used: (1) gender of the sender, (2) gender of the receiver, (3) interaction, (4) SES of the sender, (5) SES of the receiver, and (6) absolute difference in SES. SES and gender effects were included as non-centred node covariate effects in the models, therefore higher values on the SES variable are associated with higher socio-economic status; and 1 refers to boys 0 to girls.

4.2.3. Structural effects

In the models, we also included structural effects to represent the network structure. The applied structural effects were somewhat different for friendship and for negative models. While reciprocity and star-effects seem essential both for friendship and negative ties, in negative networks, triad-based effects are less important than in friendship networks (Robins and Lusher, 2012). Furthermore, networks of negative ties are usually – and in our case as well – more sparse than those of friendship ties, therefore it is advisable to control for isolates or one-sided isolates in negative models. For the model specifications, especially for the rarely analyzed negative networks, examples of Robins and Lusher (2012) and Huitsing et al. (2012) guided our selection. We started with an initial set of effects corresponding to the theoretical ideas explained above, and the examples in these papers. This initial specification was modified if the model did not converge for all school classes. Variables seeming to cause divergence in some cases were excluded, and new structural effects were included which had seemed to be represented poorly before, based on the goodness of fit statistics. We continued with this process to refine the models until we reached a final model specification for both friendship networks and for negative networks that converged for every school class – these are the ones we subsequently present in this paper. Table 1 summarizes which structural effects were used in the friendship and in the negative models.

The model applied to all school classes confirm the structure presented in Table 1, with two exceptions: (1) gender variables were not included in the models of the two all-female classes as there was no variance in gender and (2) effects of isolation (non-senders and non-receivers) were not included in the case of one class as everybody was part of the negative network in this classroom.

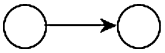
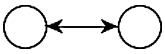
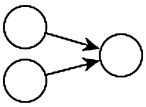
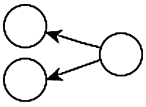
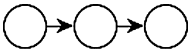
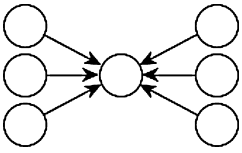
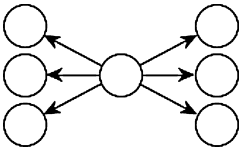
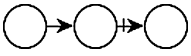
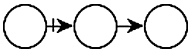
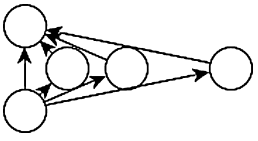
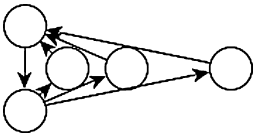
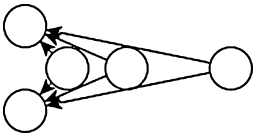
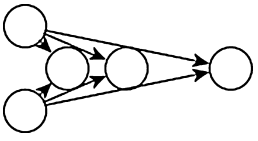
5. Results

5.1. Descriptive results

Before presenting the results of the exponential random graph models, it is important to take a closer look at some descriptive characteristics of our sample. Table 2 shows that 38% of the students were self-declared Roma, with a big variation across classrooms. The average is quite high compared to the proportion of Roma minority in Hungary, but it is the result of our sample selection criteria. It illustrates the highly disadvantaged position of the Roma group in the Hungarian society that classes containing enough Roma students for our analysis (10% or more) showed very disadvantaged social background in general. The fathers' average level of education is low, only half of the fathers graduated from secondary school, and just 7% participated in tertiary education.

In our analysis, we examined whether ethnically different students would be more or less likely to make friends with one another, or dislike one another, than students from the same

Table 1
Structural network parameters included in friendship and negative models.

Name		Description	Illustration	Included in models	
				Friendship	Negative
Arc	*arc*	Occurrence of nominations		×	×
Reciprocity	*reciprocity*	Occurrence of mutual ties		×	×
Two-in-star	*in-2-star*	Occurrence of shared nominations received		×	
Two-out-star	*out-2-star*	Occurrence of shared nominations sent		×	
Simple connectivity	*2-path*	Occurrence of paths connecting three actors		×	×
Popularity spread	*A-in-S*	Dispersion of in-ties distribution		×	×
Activity spread	*A-out-S*	Dispersion of out-ties distribution		×	×
One-sided isolates (non-receivers)	*Sink*	Occurrence of actors with zero in-degree			×
One-sided isolates (non-senders)	*Source*	Occurrence of actors with zero out-degree			×
Path closure	*AT-T*	Closure of two-paths		×	
Cyclic closure	*AT-C*	Cyclic closure of two-paths		×	
Shared in-ties	*A2P-D*	In-ties-based structural equivalence (being nominated by the same actors)			×
Shared out-ties	*A2P-U*	Out-ties-based structural equivalence (nominating the same actors)			×

Unfortunately, difficulties with software implementation made it impossible to use the third A2P-effect, the multiple two-path (A2P-T). Each time it was included, our models diverged.

ethnic background–holding all else equal as described above. For that, it is important to take a look at our networks themselves first. Based on the network descriptive statistics presented, friendship networks were more dense on average than negative networks (19% and 12%, respectively). The density of Roma nomination networks is 21%. This is lower than the proportion of self-declared Roma students in the sample. While the standard deviation of the densities of the friendship and negative networks along classrooms is quite small, suggesting that classrooms tend to be similar to this respect, the densities of Roma perceptions show

Table 2
Descriptive statistics of the sample.

Individual attributes					
Ethnicity (self-declared)					
Roma (*N*)	Roma (%)	SD of classroom averages (%)	Min (%)	Max (%)	Missing
150	38%	19.11%	12%	78%	0
Father's education level					
Primary (*N*)	Secondary (*N*)	Tertiary (*N*)	Sum valid (*N*)	Missing (N)	
132 (33%)	229 (53%)	31 (7%)	392 (93%)	28 (7%)	
Gender					
Boy (*N*)	Girl (*N*)				
189 (46%)	231 (54%)				
Network descriptives					
Density					
	Friendship	Negative relations	Roma		
Mean	0.19	0.12	0.21		
SD	0.05	0.05	0.18		
Number of mutual ties per classroom					
	Friendship	Negative relations	Roma		
Mean	32.9	12.6	20.1		
SD	11.7	10.3	26.1		
Number of triangles per classroom					
	Friendship	Negative relations	Roma		
Mean	117.7	52.0	326.4		
SD	65.2	57.0	377.9		

large between-classroom differences. This is not surprising, since self-declared Roma proportion also varies along classrooms.

As we argued earlier that self-declared ethnicity can differ from how someone is perceived by others, and these differences can have social consequences, we checked the relationship between our two ethnicity measurements (Table 3). This was done by a linear regression model with clustered standard errors, which takes into account that the sample is composed by different subgroups. In the model, the dependent variable was the proportion of classmates who nominated the student as Roma, explained by the student's self declared ethnicity. On average, self-declared non-Roma students were nominated as Roma by 2% of their classmates, while this was 49% for those who declared themselves Roma. Our results show that the relationship is significant ($p < 0.001$).

This suggests that students were nominated as Roma by their classmates much more often when their self-perception was Roma, than when it was non-Roma. Fig. 1 demonstrates the proportion of classmates nominated students as Roma if they declared themselves as non-Roma (first box), or Roma (second box). This gives us some indications that there might be "ambiguous" cases as well, and judgements about others' ethnicity are not necessarily in consensus (Fig. 3).

Table 4 provides us with descriptive statistics about friendships and negative ties, separately for (self-declared) Roma and non-Roma students. In the friendship networks there was little difference between the average incoming nominations of Roma and non-Roma students, although non-Roma students received slightly more ties; however, Roma students nominated more. In negative networks, Roma students both sent and received somewhat more nominations than their non-Roma peers. This suggests that Roma students are more active (nominating more in both networks) but less popular (receiving less friendship, and more negative ties); however, these are really small differences.

Table 4 also presents the shares of different inter-ethnic and same-ethnic nominations of all ties. First, we calculated what proportion of the friendship ties were sent and received by Roma and non-Roma students, and we defined ethnicity based on self-declarations. We found that 60% of the ties were within the same ethnic group, and 40% of them were inter-ethnic. Obviously, these values are highly dependent on the class compositions, therefore they cannot indicate homophily and heterophobia themselves. However, it is interesting that Roma students nominated their non-Roma peers more often than the other way around (25% and 15% of the total nominations, respectively). The same descriptives for the negative ties show that the same class compositions resulted in more cross-ethnic mutual ties in negative networks than in positive ones: 46% of all nominations were inter-ethnic, 54% were within the same ethnic group. Here, we did not find a large difference between the Roma–non-Roma and the non-Roma–Roma nominations (22% and 24%, respectively). When instead of self-declarations, we define both the sender's and the receiver's ethnicity from the sender's perspective, the difference seems even stronger: negative networks show a larger proportion of inter-ethnic nominations (40%) than positive networks (27%). This suggests that ethnicity can indeed have an important effect on tie formation in these communities.

Table 3
Relationship between Roma measurements from the results of linear regression models.

		Average Roma nominations received (%)
Self-declared ethnicity	Roma	1.97
	Non-Roma	49.21
		$R^2 = 0.647$

Due to the clustered nature of our data, our regression model allows for differences in the variance/standard errors due to arbitrary intra-group correlation

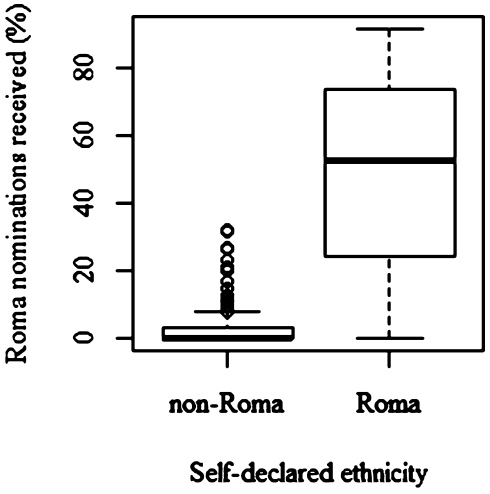


Fig. 3. Relationship between our Roma measurements.

Table 4
Dependent networks by self-declared ethnicity.

Average degrees

Friendship				Negative			
In-degree		Out-degree		In-degree		Out-degree	
Roma	Non-Roma	Roma	Non-Roma	Roma	Non-Roma	Roma	Non-Roma
4.73	4.87	5.21	4.69	3.10	3.24	3.06	3.21

Share of all ties, receiver's ethnicity based on self-declaration (Roma proportion based on self-declaration: 38%)

Friendship

	Receiver	
Sender	Non-Roma	Roma
Non-Roma	53%	15%
Roma	25%	7%

Negative

	Receiver	
Sender	Non-Roma	Roma
Non-Roma	44%	24%
Roma	22%	10%

Share of all ties, receiver's ethnicity based on sender's perception (Roma proportion based on self-declaration: 38%; Roma nomination density: 21%)

Friendship

	Receiver	
Sender	Non-Roma	Roma
Non-Roma	59%	6%
Roma	21%	14%

Negative

	Receiver	
Sender	Non-Roma	Roma
Non-Roma	53%	15%
Roma	25%	7%

5.2. ERGM results

After these descriptive statistics, here we present the results of our exponential random graph models, which also take network dependencies and node-level characteristics into account. At the end of the estimation process, all of our models converged for every parameter based on the *t*-statistics for convergence ($t < 0.1$). Our models also met the requirements for goodness of fit and sample autocorrelation factors suggested by Koskinen and Snijders (2012) and Robins and Lusher (2012). Goodness of fit (GoF) captures whether the observed graph is far from the one that we would predict under the fitted model, by calculating a standardized difference with mean = 0 and SD = 1 (Koskinen and Snijders, 2012). Its value is ideally below 0.1 for variables included in the models and below 2 for non-included variables; however, occasional higher values are tolerable (Robins and Lusher, 2012). In our case, this value was lower than 0.1 for almost all included variables and lower than 0.15 for all of them; and it was below 2 for almost all non-included variables and below 2.2 for all of them. Also, for every model, each value for the sample autocorrelation factor was less than 0.4. With values higher than 0.4, the basic premise of converged estimates would likely be violated (Robins and Lusher, 2012).

In Tables 5 and 6 results for the friendship and negative models are presented (also see Table 1 for the interpretation of the structural effects). In these tables, only the parameter estimates and the standard errors for the cross-classroom means are included; homogeneity tests on the meta-analysis (estimated between-classroom standard deviations, and test-statistics whether there is a difference between parameters among schools) can be found in the Appendices A and B (for friendship ties and negative ties, respectively).

From these results we can conclude that Roma ethnicity played an important role in relationship formation, even after controlling for gender and socio-economic status, and structural factors. Both in the friendship and the negative models, there are several significant ethnicity variables, including main sender and receiver/perception effects, and interactions as well. For a more detailed interpretation, we calculated the conditional odds ratio for each kind of nomination, compared to non-Roma–non-Roma nominations as a reference category. For that, we used the Roma sender effects (when the sender was self-declared Roma), the Roma receiver effects (when the receiver was self-declared Roma), the Roma perception effect (when the sender perceived the receiver as Roma), and the two interactions (when both the sender and the receiver declared themselves as Roma; and when the self-declared Roma sender perceived the receiver as Roma). For each cell, differences from the reference cell were calculated using a Wald-test. Tables 7 and 8 show the conditional odds ratios, together with significance levels, for all kinds of same- and inter-ethnic nominations included in each model, and for the interaction effects the joint significance levels are presented as well. This approach allows us to compare and contrast the real effect sizes of the different kinds of ethnicity measures on tie formation. In case of Model A and Model B, only the non-Roma and the Roma categories were used, which refer to self-declared Roma and perceived Roma ethnicity, respectively. In case of Model C, the category "Consistent" Roma means that someone was both self-declared and perceived Roma, and there are two more categories added for those who were only self-declared (but not perceived by the sender), or only sender-perceived (but not self-declared) Roma.

First, Hypothesis 1 posited that inter-ethnic positive nominations are less likely than positive nominations within the same ethnic group. These differences are modelled by the Roma Sender, the Roma Receiver and/or Roma perception effects (Roma Receiver in Model A, Roma perception in Model B, and both in Model C), and the related Interaction effects. Table 7, Model C+ shows that Roma-Roma nominations are more likely than the reference category, that is, non-Roma–non-Roma nominations (OR = 1.66,

Table 5
Meta-results for friendship ties.

	Model A+		Model B+		Model C+		*N* of groups
	Estimate	(SE)	Estimate	(SE)	Estimate	(SE)	
Structural							
Arc	−1.727	(0.330)*	−1.934	(0.329)*	−1.891	(0.326)*	16
Reciprocity	1.854	(0.161)	1.983	(0.186)*	1.959	(0.181)*	16
Two-in-star	0.092	(0.017)*	0.092	(0.018)*	0.094	(0.017)*	16
Two-out-star	0.116	(0.019)*	0.121	(0.018)*	0.122	(0.018)*	16
Simple connect.	−0.192	(0.035)*	−0.192	(0.037)*	−0.192	(0.038)*	16
Popularity spread	−0.675	(0.200)*	−0.595	(0.194)*	−0.624	(0.193)*	16
Activity spread	−0.229	(0.119)	−0.317	(0.155)*	−0.281	(0.157)	16
Path closure	0.987	(0.111)*	1.004	(0.115)*	0.986	(0.117)*	16
Cyclic closure	−0.080	(0.066)	−0.055	(0.063)	−0.053	(0.063)	16
Roma ethnicity							
Roma Sender	−0.141	(0.109)	−0.056	(0.121)	−0.163	(0.114)	16
Roma Receiver self-declared	−0.143	(0.079)			−0.179	(0.089)*	16
Sender*Receiver	0.643	(0.162)*			0.518	(0.171)*	16
Roma Receiver sender-perceived			0.012	(0.138)	0.093	(0.115)	16
Sender*Receiver			0.808	(0.139)*	0.450	(0.188)*	16
Gender							
Boy Sender	−0.365	(0.066)*	−0.388	(0.066)*	−0.400	(0.069)*	14
Boy Receiver	−0.256	(0.077)*	−0.263	(0.077)*	−0.284	(0.079)*	14
Sender*Receiver	0.770	(0.087)*	0.808	(0.085)*	0.832	(0.088)*	14
Socio-economic status							
SES of Sender	0.035	(0.045)	0.057	(0.042)	0.056	(0.042)	16
SES of Rec.	0.117	(0.051)*	0.131	(0.064)*	0.123	(0.069)	16
Abs. difference	−0.032	(0.038)	−0.007	(0.042)	−0.005	(0.041)	16

* $p < 0.05$.

$p < 0.01$). However, cross-ethnic nominations are not significantly less likely than the reference category (OR = 0.85, for Roma - non-Roma, OR = 0.92, for non-Roma - "consistent" Roma nominations, $p > 0.1$ in both cases). Therefore, Hypothesis 1 is partly confirmed: positive nominations are more likely within the Roma ethnic group, but not significantly more likely within the non-Roma ethnic group than nominations between groups. Moreover, Model C+ shows that the combination of self-declared and perceived ethnicity also matters: Roma students preferred other Roma students only when they had a "consistent Roma identification", that is, they were perceived as Roma by themselves as well as by the sender. Only self-declared, or only sender perceived Roma peers were not more likely to get friendship nominations from other Roma students than the reference category (OR = 1.19, and OR 1.19, respectively, $p > 0.1$ in both cases). This tendency remains hidden when only focusing on the models using only one type of Roma ethnicity (Models A and B).

Second, Hypothesis 2 suggested that inter-ethnic negative nominations are more likely than negative nominations within the same ethnic group. Table 8, Model C- demonstrates that perceived ethnicity has a more important role in this than self-declared

Table 6
Meta-results for negative ties.

	Model A−		Model B−		Model C−		*N* of groups
	Estimate	(SE)	Estimate	(SE)	Estimate	(SE)	
Structural							
Arc	−4.942	(0.169)*	−4.964	(0.161)*	−4.967	(0.179)*	16
Reciprocity	1.303	(0.119)*	1.341	(0.122)*	1.276	(0.138)*	16
Simple connect.	−0.033	(0.013)*	−0.021	(0.010)*	−0.019	(0.010)	16
Non-receivers	0.101	(0.387)	−0.263	(0.406)	0.151	(0.054)*	16
Non-senders	−0.066	(0.436)	0.262	(0.457)	−0.244	(0.063)*	16
Popularity spread	0.389	(0.174)*	0.228	(0.190)	0.450	(0.263)	16
Activity spread	1.222	(0.198)*	1.454	(0.186)*	0.770	(0.257)*	16
Shared in-ties	0.049	(0.070)	0.040	(0.067)	0.193	(0.127)	15
Shared out-ties	0.057	(0.077)	0.133	(0.038)*	0.065	(0.052)	15
Roma ethnicity							
Roma Sender	0.352	(0.195)	0.189	(0.183)	0.365	(0.213)	16
Roma Receiver self-declared			0.333	(0.188)	0.065	(0.109)	16
Sender*Receiver			−1.023	(0.279)*	−0.420	(0.190)*	16
Roma Receiver sender-perceived			0.593	(0.129)*	0.505	(0.124)*	16
Sender*Receiver			−0.572	(0.203)*	−0.194	(0.223)	16
Gender							
Boy Sender	−0.213	(0.087)*	−0.236	(0.160)*	−0.212	(0.089)*	14
Boy Receiver	0.129	(0.084)	0.120	(0.079)	0.059	(0.085)	14
Sender*Receiver	0.211	(0.194)	0.207	(0.193)	0.473	(0.164)	14
Socio-economic status							
SES of Sender	0.007	(0.030)	0.021	(0.036)	0.022	(0.032)	16
SES of Rec.	−0.105	(0.036)*	−0.093	(0.048)	−0.100	(0.038)*	16
Abs. difference	−0.042	(0.042)	−0.026	(0.056)	−0.006	(0.038)	16

* $p < 0.05$.

Table 7
The effect of ethnicity on friendship ties (from Model A+, Model B+, Model C+).

		Receiver's ethnicity	
	Sender's ethnicity (self-declared)	Non-Roma	Roma
Model A+	Non-Roma	1.000	0.866^{+}
	Roma	0.869	1.589**
Model B+	Non-Roma	1.000	1.012
	Roma	0.946	0.641

		Non-Roma	"Consistent" Roma (in both ways)	Self-declared Roma but sender-perceived non-Roma	Sender-perceived Roma but self-declared non-Roma
Model C+	Non-Roma	1.000	0.922	0.836*	1.098
	Roma	0.850	1.656**	1.187	1.191

Odds ratios are presented; non-Roma → non-Roma nominations are the reference category.
$^{+}$ $p < 0.1$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

ethnicity: non-Roma students tend to dislike those whom they perceive as Roma, regardless of these students' self-identifications (OR = 1.75, $p < 0.01$ for Receivers with "consistent" Roma identification, OR = 1.66, $p < 0.001$ for perceived, but not self-declared Roma Receivers). Nominations sent by non-Roma students towards those whom they perceived as non-Roma did not significantly differ based on the receiver's self-declaration (OR = 1.07, $p > 0.1$). Besides, Roma students tended to send more negative nominations to non-Roma students than the reference category, even though this difference is not significant based on the 0.05 significance level (OR = 1.44, $p < 0.1$). At the same time, nominations from Roma senders to those with consistent Roma ethnicity did not differ significantly from non-Roma–non-Roma nominations (OR = 1.20, $p > 0.1$). Therefore, this is evidence for our second hypothesis that inter-ethnic negative nominations are more likely than negative nominations within the same group.

Our Hypotheses 3 and 4, related to the black sheep phenomenon, predicted that Roma students will be less likely to nominate as friends those whom they perceive as Roma, but who, at the same time, declare themselves non-Roma. In the negative networks, we expected a larger likelihood for a tie in these cases. Both of these effects are presented in the friendship and negative tables, by the Roma sender and sender-perceived Roma (but self-declared non-Roma) receiver cells (OR = 1.19, $p > 0.1$; OR = 1.99, $p < 0.01$, respectively). This does not confirm H3, as there is no significant effect in the positive networks. However, it confirms H4, because the conditional odds-ratio for negative ties is significant, which is strong evidence for the black sheep phenomenon. To add more detail to the picture, we could also see that not only Roma, but also non-Roma students were very likely to dislike those whom they perceived as Roma, but who nevertheless did not declare themselves Roma. The combination of these two results suggests that the discrepancy between the declared and the perceived ethnicity plays a crucial role in negative tie formation. This kind of discrepancy had less impact on positive relations; however, we found a similar phenomenon for friendship ties as well. The emergence of positive relations was less likely only in dyads in which the sender declared him/herself as non-Roma and perceived the receiver as non-Roma as well, while the receiver declared him/herself as Roma. This "reversed black sheep effect" also suggests that discrepancies between peer-perception and self-identification may have serious negative effects on social ties in general, not just in case of the lower-status group.

According to Hypothesis 5, Roma students are more likely to send positive nominations to non-Roma students than the other way around. For this, we have to compare the likelihood of a nomination from a Roma sender to a non-Roma receiver, and a nomination from a non-Roma sender to a Roma receiver. This difference is not directly modelled in our analysis, and not included in Tables 7 and 8, either, as in those the reference category is a non-Roma–non-Roma nomination. However, it can be calculated as a comparison of the Roma sender and the Roma receiver/Roma perception effects. Therefore, we ran additional Wald-tests to see if the effects of these variables differ significantly. Our results showed that in the positive models, there were no significant differences between the Roma sender and Roma receiver/perception effects

Table 8
The effect of ethnicity on friendship ties (from Model A−, Model B−, Model C−).

		Receiver's ethnicity	
	Sender's ethnicity (self-declared)	Non-Roma	Roma
Model A−	Non-Roma	1.000	1.395^{+}
	Roma	1.421^{+}	0.811
Model B−	Non-Roma	1.000	1.809***
	Roma	0.946	0.779

		Non-Roma	"Consistent" Roma (in both ways)	Self-declared Roma but sender-perceived non-Roma	Sender-perceived Roma but self-declared non-Roma
Model C−	Non-Roma	1.000	1.754**	1.067	1.656***
	Roma	1.440^{+}	1.197	0.836	1.987**

Odds ratios are presented; non-Roma → non-Roma nominations are the reference category.
$^{+}$ $p < 0.1$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

in any of the models, therefore we could not confirm the fifth hypothesis. Hypothesis 6 formulated similar predictions for the negative networks, that is, Roma students are less likely to send negative nominations towards non-Roma students than the other way around. Wald-test results on Model A- showed that when only taking self-declared ethnicity into account, non-Roma–Roma nominations were not significantly more likely that Roma–non-Roma nominations (OR = 1.02, $p > 0.1$). However, in Model B- the difference was large and significant: non-Roma students seem to be more likely to send negative ties towards those whom they perceive as Roma than vice versa (OR = 1.50, $p < 0.01$). When taking both measurements into account (Model C-), the results suggest than non-Roma students nominate self-declared Roma students less, but perceived Roma students more than the other way around (OR = 1.35, $p < 0.01$; and OR = 0.87, $p < 0.001$, respectively). Therefore, those who declared themselves as Roma but are not perceived as Roma by the non-Roma sender will be more likely to send negative ties towards these non-Roma students; those who are perceived as Roma but declared themselves as non-Roma will be less likely to nominate them in the negative networks. We also compared whether students who have consistent Roma ethnicity will be more or less likely to send negative ties towards their non-Roma peers; the results of the Wald-test show that these Roma students tend to dislike their non-Roma peers less than the other way around (OR = 0.82, $p < 0.05$). This supports Hypothesis 6, and it also highlights the importance of perceived ethnicity, since these asymmetric relationships did not have any indications in the models only using self-declared ethnicity.

Together with the meta-analysis, measures for between-classroom differences were also calculated, and are presented in Appendices A and B. These tables show that when including all the ethnicity effects, parameters for the Roma variables did not differ significantly among classes, except for the sender effect for friendship networks (Appendix A, model C+: $p < 0.05$). Here, our results suggest that although the average sender effect is negative, in a minority of the classrooms it is positive (estimate: $-0.16, \hat{\sigma} = 0.36$). When using only one measurement type for the receiver's ethnicity, significant differences between classrooms occurred more often.

Finally, every friendship model suggests significant gender homophily, but we did not find evidence for gender heterophobia. This means that even though gender and ethnicity are both important factors of friendship formation, they influence negative ties differently. In addition to this, students from better social backgrounds were more likely to receive friendship nominations and less likely to get negative nominations regardless of the nominator's own social background. This also suggests that statistical relationships between social ties and ethnicity cannot be explained by differences in socio-economic status.

6. Discussion

The goal of this study was to explore important characteristics of inter-ethnic friendships and negative relationships in order to see which aspects of relational integration appear in these networks. Furthermore, we focused on two different aspects of ethnicity, that is, self-declaration and peer-perception, for investigating more deeply the different dimensions of ethnic integration, and also for analysing the effect of the possible discrepancies between someone's self-identified and perceived ethnicity. We provided a comprehensive theoretical background to situate the study utilizing the social identity approach. By operationalizing several important social psychological mechanisms based on the original theory and its offshoots we constructed an analytical framework to examine inter-ethnic relationships from a network approach. Our work is an important contribution to social identity theory and social psychology, since both these fields make strong assumptions about social ties and derive substantively important implications of these assumptions for social networks, implying that social network analysis should be a natural tool for them, yet they are rarely interpreted in a social network framework.

Following social identity theory (Tajfel, 1974; Turner, 1975) and ingroup-favouritism (Turner and Reynolds, 2001), we expected that even in heterogeneous classes, the chance of inter-ethnic friendship ties would still be relatively low compared to that of same-ethnic friendship ties. Moreover, Tajfel and Turner (1979) argued that there are multiple sufficient strategies to develop positive social identity and increase or maintain positive self-esteem. The first one is social competition, which must involve conflict between the groups, hence inducing negative intergroup relations. Therefore, we hypothesized that inter-ethnic friendship nominations will be less likely, and negative ties will be more likely that those within ethnic groups. In our analysis, we found evidence for both processes, which is consistent with the theory that students choose this strategy to achieve or maintain positive social identity.

Tajfel and Turner (1979) also suggested that for those in the lower-status social group, a second strategy can be leaving their original ethnic group, in order to try to join to another group with a more positive social identity. As we conceptualized ethnicity as not fixed but fluid and context-dependent, Roma students who are not satisfied with the position of their group but do not want conflict with the majority can choose this strategy, and try to identify themselves as non-Roma. If other students, however, decide to compete with the majority group, these students, if still perceived as Roma by their peers, can seem as "traitors" of their "original" ethnic group. Based on this and the black sheep hypothesis, we expected that Roma students to reject those whom they perceived as Roma, but who, at the same time, perceived themselves as non-Roma. Indeed, while we found our Roma participants to have a higher tendency for homophily, their friendship nominations were more likely to be sent only towards those whom they perceived as Roma and who perceived themselves as Roma as well. Towards those whom they perceived as Roma but who perceived themselves as non-Roma, Roma students had a high chance to send negative nominations instead. This can imply that leaving the low-status group to join another in a better position is also a strategy chosen by certain students in classrooms in secondary schools. Our results also show that the social situation exclusion of these students was exacerbated by being rejected by those non-Roma classmates who also perceived them as Roma. It is important to note, however, that the perception of ethnicity does not necessarily follow the same pattern among Roma and non-Roma students.

Finally, Tajfel and Turner (1979) argued that there is a third strategy for members of the lower-status group, which enhances positive self-esteem without improving social identity. In these cases, the lack of positive group self-esteem and/or internalised inferior position in the status system can bring subordinate group members to display positive attitudes towards the dominant group. Even though this strategy might go against the group's positive social identity, at the same time it can satisfy the need for positive self-esteem on the individual level. Consequently, we argued that members of the lower status group would be more likely to be rejected by their non-Roma peers than vice versa, and Roma students might even have a preference for non-Roma peers in certain situations. We found that indeed, non-Roma students tended to exclude those who they perceived as Roma by sending negative nominations towards them – regardless of their ethnic self-declaration. This rejection, however, was less reciprocated by Roma students. The fact that Roma students showed a more positive behaviour towards non-Roma students than the other way around shows that the third strategy can also be observed in the school context.

In our study, we focused on three major strategies for members of the lower status group to follow in order to achieve more positive self-esteem. This is because these strategies seem to be directly related to within-group and inter-group relationships we focused on. It is worth noting, though, that besides these, other options also exist. Most importantly, individuals can follow the strategy of social creativity, in which case positive distinctiveness is achieved by redefining or altering the elements of the comparison: changing its dimension, modifying the values assigned to certain attributes, or finding another relevant outgroup for the comparison (Tajfel and Turner, 1979). Because the influence of these strategies on relationship structure is not obvious, they are not examined in our analysis, but might still be chosen by students in our sample.

Although in this paper we followed the social identity approach, our results are also in accordance with other important social psychological and sociological theories. Ethnic competition theory (Olzak, 1992; Coenders et al., 2004) predicts that perceived competition induces conflicts between ethnic groups, and based on Moody's (2001) argument, in ethnically heterogeneous classes, the majority might feel their dominant position threatened, suggesting that in heterogeneous school classes, the number of inter-ethnic friendships is relatively low. Indeed, in our (ethnically heterogeneous) classes, we found that inter-ethnic friendships were less frequent than same-ethnic friendships, though unfortunately our sample size does not allow us to compare these classes to each other based on their level of ethnic heterogeneity. Moreover, our findings about the asymmetric inter-group relations are in line with social dominance theory (Sidanius and Pratto, 1999) and system justification theory (Jost and Banaji, 1994), which both predict that in certain situations, the lower-status social group is willing to accept their positions in the status hierarchy, and sometimes even develop outgroup preference. Finally, our results for the black sheep hypotheses (Marques et al., 1988) can also be understood as evidence for an "acting white" phenomenon (Ogbu, 2008). Based on this approach, perceived Roma, but self-declared non-Roma students may seem to other Roma students to somehow disown their "real" ethnic identity, choosing behaviours and attitudes associated with those of the majority group, thereby becoming "traitors" of their own ethnic group.

We argued earlier that even if students have only a relatively small number of friends from the other ethnic group, ethnic mixing may still be advantageous if it does not result in the disproportionate emergence of inter-ethnic negative ties. Even though we found evidence for the higher probability of inter-ethnic than that of same-ethnic negative relationships, one should not draw a conclusion against integrated education for a number of reasons. Some of these reasons refer to certain limitations of our study, while some others are based on earlier studies proposing effective policy solutions to enhance integration, which were not used in our examined schools.

First, our results cannot be generalized to other minorities than the Roma, and even the generalization for the situation of Roma people in Hungary has its limits due to the non-representative nature of our sample. Second, this analysis was cross-sectional, only capturing a snapshot of these communities. As discussed earlier, this cross-sectional step is very important, because it shows the likelihood of the presence of different kinds of inter-ethnic and same-ethnic relationships. However, this also means that while demonstrating the existence of negative relationships, we do not know yet whether the situation improved or deteriorated over time, which would be necessary for deciding about the effectiveness of ethnic mixing on integration. Therefore, in our next study we intend to investigate the factors of relationship changes between ethnically different students for a more detailed picture.

Third, we argued that both ethnic perception and ethnic self-identification depend on the social environment and interpersonal relations. Consequently, not only does ethnicity affect social ties, but also the other way around. Therefore, in a longitudinal analysis we should not only model relationship formation based on ethnicity, but also the evaluation of perceived ethnicity and ethnic self-categorisation based on other variables including relationships.

Finally, there was no additional effort (e.g.: extracurricular activities, proportional tracking, specific pedagogical programmes) made in these schools to strengthen the effects of formal integration. This is important since principles and methods based on which class-decoupling and extracurricular activities are planned and carried out may both maintain segregation or, instead, induce integration by increasing or decreasing opportunities for beneficial cross-race contacts (Moody, 2001; Stark and Flache, 2012). In this sense, results demonstrating the existence of inter-ethnic negative ties call for special interventions supporting integrated education rather than condemning its effectiveness.

Our analysis suggests that examining positive and negative relationships together with different concepts of ethnicity add more detail to the picture of same-ethnic and inter-ethnic relationships. Besides, we provided evidence that positive and negative outgroup attitudes were not directly related, as they were found to appear in different inter-group relationship types. Based on the results, it seems that ethnic segregation in these schools is somehow maintained by both Roma and non-Roma students, even if they contribute to the situation in different ways. Non-Roma students do so by excluding those from different ethnic background, while Roma students by excluding those who they think are willing to "hide" or disown their Roma ethnicity.

The discrepancy observed between someone's self-declared and perceived ethnicity might also be understood and interpreted as a sign for an assimilation effort: students may be reluctant to represent their Roma identity if they would like to be assimilated to the non-Roma students. This behaviour seems to have a price, as Roma classmates tended to punish these students by social rejection. In addition to this, their non-Roma self-declaration was not enough for being accepted by the non-Roma, either: they were also rejected by those non-Roma classmates who still perceived them as Roma. The combination of these two results suggests that students with this kind of ambiguous ethnicity might be in a very difficult situation that may hinder seriously the process of assimilation. One should not forget that actual inter-ethnic relationships are also strongly related to general inter-ethnic attitudes as well (Wright et al., 1997; Stark, 2011), implying that these social ties might have an even broader impact on integration at the societal level.

These very important results would have remained hidden without the observation of negative networks and the application of the concept of perceived ethnicity. Hence, future scientific research in this field should focus more on negative networks, as well as on the discrepancy between ethnic self-identification and perceived ethnicity, in order to design and establish special interventions and pedagogical programmes.

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Appendix A. Meta-results for friendship ties with within-group statistics

	Model A+					Model B+					Model C+					N of groups
	Global		Between-group			Global		Between-group			Global		Between-group			
	Estimate	(SE)	$\hat{\sigma}$	Q	p	Estimate	(SE)	$\hat{\sigma}$	Q	p	Estimate	(SE)	$\hat{\sigma}$	Q	p	
Structural effects																
Arc	−1.727	(0.330)	0.00	33.4	0.004	−1.934	(0.329)	0.00	29.4	0.014	−1.891	(0.326)	0.00	32.0	0.007	16
Reciprocity	1.854	(0.161)	0.40	22.6	0.093	1.983	(0.186)	0.54	27.4	0.026	1.959	(0.181)	0.51	27.1	0.028	16
Two-in-star	0.092	(0.017)	0.00	9.5	0.851	0.092	(0.018)	0.00	10.4	0.796	0.094	(0.017)	0.00	10.3	0.799	16
Two-out-star	0.116	(0.019)	0.06	15.7	0.403	0.121	(0.018)	0.05	16.2	0.370	0.122	(0.018)	0.05	15.8	0.393	16
Simple connect.	−0.192	(0.035)	0.12	62.7	0.000	−0.192	(0.037)	0.13	68.7	0.000	−0.192	(0.038)	0.14	72.0	0.000	16
Popul. Spread	−0.675	(0.200)	0.00	15.7	0.401	−0.595	(0.194)	0.00	15.4	0.425	−0.624	(0.193)	0.00	16.9	0.327	16
Activity spread	−0.229	(0.119)	0.18	15.7	0.400	−0.317	(0.155)	0.41	19.5	0.191	−0.281	(0.157)	0.42	20.7	0.148	16
Path closure	0.987	(0.111)	0.38	67.1	0.000	1.004	(0.115)	0.40	69.8	0.000	0.986	(0.117)	0.41	72.4	0.000	16
Cyclic closure	−0.080	(0.066)	0.20	36.9	0.001	−0.055	(0.063)	0.18	35.9	0.002	−0.053	(0.063)	0.18	37.1	0.001	16
Roma ethnicity																
Roma Sender	−0.141	(0.109)	0.32	36.5	0.002	−0.056	(0.121)	0.41	41.9	0.000	−0.163	(0.114)	0.36	34.6	0.003	16
Roma Receiver self-declared	−0.143	(0.079)	0.00	16.6	0.344						−0.179	(0.089)	0.00	8.0	0.920	16
Sender*Receiver	0.643	(0.162)	0.48	29.3	0.015						0.518	(0.171)	0.45	21.7	0.115	16
Roma Receiver sender-perceived						0.012	(0.138)	0.35	26.4	0.034	0.093	(0.115)	0.00	15.7	0.402	16
Sender*Receiver						0.808	(0.139)	0.08	26.0	0.038	0.450	(0.188)	0.22	18.1	0.255	16
Gender																
Boy Sender	−0.365	(0.066)	0.00	11.3	0.585	−0.388	(0.066)	0.00	11.6	0.558	−0.400	(0.069)	0.00	12.1	0.423	14
Boy Receiver	−0.256	(0.077)	0.00	16.7	0.212	−0.263	(0.077)	0.00	10.3	0.668	−0.284	(0.079)	0.00	11.9	0.539	14
Sender*Receiver	0.770	(0.087)	0.00	19.2	0.116	0.808	(0.085)	0.00	15.3	0.292	0.832	(0.088)	0.00	18.0	0.157	14
Socio-economic status																
SES of Sender	0.035	(0.045)	0.13	18.9	0.127	0.057	(0.042)	0.10	20.3	0.160	0.056	(0.042)	0.10	19.6	0.191	16
SES of Rec.	0.117	(0.051)	0.12	18.8	0.225	0.131	(0.064)	0.19	25.2	0.048	0.123	(0.069)	0.20	24.6	0.056	16
Abs. difference	−0.032	(0.038)	0.06	20.6	0.220	−0.007	(0.042)	0.09	24.7	0.054	−0.005	(0.041)	0.08	24.5	0.057	16

Estimated parameters; estimated standard errors; estimated between-classroom standard deviations; test-statistics and *p*-values testing whether there is a difference between parameters among classrooms.

Appendix B. Meta-results for negative ties with between-group statistics

	Model A-					Model B-					Model C-					N of groups
	Global		Between-group			Global		Between-group			Global		Between-group			
	Estimate	(SE)	$\hat{\sigma}$	Q	p	Estimate	(SE)	$\hat{\sigma}$	Q	p	Estimate	(SE)	$\hat{\sigma}$	Q	p	
Structural effects																
Arc	−4.942	(0.169)	0.00	11.0	0.808	−4.964	(0.161)	0.00	8.6	0.929	−4.967	(0.179)	0.00	23.7	0.096	16
Reciprocity	1.303	(0.119)	0.00	18.0	0.327	1.341	(0.122)	0.00	15.9	0.464	1.276	(0.138)	0.22	22.0	0.142	16
Simple connect.	−0.033	(0.013)	0.03	27.2	0.040	−0.021	(0.010)	0.00	21.6	0.156	−0.019	(0.010)	0.00	23.6	0.098	16
Non-receivers	0.101						(0.406)	0.00	14.7	0.545	0.151	(0.054)	0.00	20.1	0.215	16
Non-senders	−0.066						(0.457)	0.00	13.9	0.605	−0.244	(0.063)	0.00	14.0	0.596	16
Popul. spread	0.389	(0.174)	0.00	17.9	0.332	0.228	(0.190)	0.00	15.0	0.525	0.450	(0.263)	0.56	17.1	0.380	16
Activity spread	1.222	(0.198)	0.30	23.3	0.106	1.454	(0.186)	0.00	20.9	0.183	0.770	(0.257)	0.65	42.9	0.000	16
Shared in-ties	0.049	(0.070)	0.25	69.1	0.000	0.040	(0.067)	0.23	64.7	0.000	0.193	(0.127)	0.49	101.0	0.000	15
Shared out-ties	0.057	(0.077)	0.24	39.6	0.001	0.133	(0.038)	0.08	28.0	0.032	0.065	(0.052)	0.13	23.7	0.096	15
Roma ethnicity																
Roma Sender	0.352	(0.195)	0.65	26.0	0.055	0.189	(0.183)	0.60	31.1	0.013	0.365	(0.213)	0.72	25.1	0.068	16
Roma Receiver self-declared	0.333	(0.188)	0.58	24.4	0.081						0.065	(0.109)	0.00	17.8	0.335	16
Sender*Receiver	−1.023	(0.279)	0.78	27.8	0.034						−0.420	(0.190)	0.00	12.9	0.681	16
Roma Receiver sender-perceived						0.593	(0.129)	0.21	15.7	0.477	0.505	(0.124)	0.00	5.8	0.990	16
Sender*Receiver						−0.572	(0.203)	0.00	35.9	0.003	−0.194	(0.223)	0.00	17.2	0.376	16
Gender																
Boy Sender	−0.213	(0.087)	0.00	24.0	0.091	−0.236	(0.160)	0.46	25.2	0.066	−0.212	(0.089)	0.00	23.7	0.070	14
Boy Receiver	0.129	(0.084)	0.00	16.4	0.426	0.120	(0.079)	0.00	14.8	0.540	0.059	(0.085)	0.00	19.4	0.198	14
Sender*Receiver	0.211	(0.194)	0.00	12.2	0.730	0.207	(0.193)	0.00	13.2	0.658	0.473	(0.164)	0.00	20.2	0.164	14
Socio-economic status																
SES of Sender	0.007	(0.030)	0.00	18.3	0.309	0.021	(0.036)	0.00	14.2	0.585	0.022	(0.032)	0.00	19.6	0.239	16
SES of Rec.	−0.105	(0.036)	0.00	14.7	0.544	−0.093	(0.048)	0.10	19.0	0.269	−0.100	(0.038)	0.00	13.5	0.639	16
Abs. difference	−0.042	(0.042)	0.07	15.3	0.501	−0.026	(0.056)	0.13	15.1	0.516	−0.006	(0.038)	0.00	13.3	0.649	16

Estimated parameters; estimated standard errors; estimated between-classroom standard deviations; test-statistics and *p*-values testing whether there is a difference between parameters among classrooms.

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