

Friendship Based on Race or Race Based on Friendship?

The Co-Evolution of Friendships, Negative Ties
and Ethnic Perceptions in Hungarian School Classes



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This thesis is dedicated to
my parents
for teaching me to think about the world.

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Abstract

This thesis focuses on the dynamic interplay between race and social ties. Even though in sociological studies, race is usually treated as a cause of social segregation, we argue that this is a two-way process. Our approach distinguishes between racial self-identifications and racial perceptions. In the first part of the thesis, we focus on the joint effects of these aspects on the prevalence and emergence of social ties in secondary school communities. The second part investigates social effects on racial perceptions. For the analyses, we take a social networks approach, estimating exponential random graph and stochastic actor-oriented models. First, we take a look at the state of racial segregation in friendships and negative ties within communities, and we investigate the dynamic processes that have led to the described state. We also take endogenous network mechanisms into account. We provide evidence that given an initial state of segregation, reciprocity and clustering can maintain the relative infrequency of cross-race friendships in the group, even without (additional) same-race preference. Further, we find that negative ties describe interracial segregation better than friendships: majority students tend to dislike their minority peers, but no such tendencies were found for friendships. Second, we find that minority students tend to overperceive their friends' similarity to themselves in terms of race. Moreover, there is evidence for social influence: classmates tend to accept each other's, especially their friends', opinions about their peer's race. Altogether, both empirical parts of the thesis suggest a hierarchical relationship between the majority and the minority groups: besides majority students' tendency to exclude their minority peers, those who try befriending majorities – but get rejected by them – are more likely to be perceived as minorities. There are also indications of some minority students showing outgroup preference, while others seem to compete against the majority group. This can contribute to the observed emergence of enmity between minority students.

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Part I

Introduction

Chapter 1

Relevance

The disadvantaged situation of many racial and ethnic minority groups in their host societies has always been an important question for sociology; moreover, race and ethnicity are generally thought of as major factors behind social inequalities in most societies in the world. Minority groups are often found to have relatively low social status, and their members to be excluded from the mainstream society in several ways. This usually comes together with the development of negative attitudes and prejudice, which can lead to, and be reinforced by, various forms of interethnic and interracial conflicts. Throughout history and across continents, such tension has been seen to quite easily flare up; decreasing prejudice via the formation of social ties beyond one's own ethnic group seems to be perhaps the best way to reduce it. Based on these social ties, the social and human capital of minorities can also increase, which should improve their social positions in the mainstream society (Coleman, 1988; Stark, 2011). Thus, investigating race, ethnicity and interpersonal social ties is a research topic of crucial theoretical and practical importance.

1.1 Race as a Social Construct

In the vast majority of the related sociological research, racial and ethnic memberships are treated as given and identifiable individual attributes which lead to differences in economic, social, or political resources and rewards. Even though there is a consensus among sociologists that race is socially constructed (American Sociological Association, 2003), the fact that individuals' race can change even within their lifetime falls outside of the scope of most empirical studies focusing on racial differences (Saperstein and Penner, 2012). Consequently, by ignoring the fact that race and ethnicity are situation-dependent and fluid social constructs rather than objectively defined (and

definable) individual characteristics, most of past research in this field has missed an opportunity to capture some essential aspects of race and ethnicity.

In sociological theory, this constructivist approach already has a long tradition. Brubaker (2009) gives a detailed theoretical review, starting with the Economy and Society (Weber, 1968), and examining several clusters of works that have contributed to developing ways of studying race and ethnicity without focusing on groups that are conceptually fixed. Saperstein and Penner (2012) also argue that race has multiple aspects, such as self-identification and perception. Moreover, they provide empirical evidence that these are not only theoretically but also empirically distinct, following different patterns, and changing differently over time. In terms of mechanisms, it is suggested that racial or ethnic shifts can serve as signals related to individual upward mobility efforts; for instance, minority members in Western societies might try to broaden their opportunities by attempting to “pass as white” (Tajfel and Turner, 1979; Portes and Sensenbrenner, 1993). Since, thus, racial and ethnic shifts are related to upward mobility processes, treating race as only an input – but not an output – of social differences might cause a significant bias in traditional analyses.

1.2 Self-Identification and Perception

It is also crucial to distinguish between racial self-identification and perceptions; not only because this way we can capture social mobility processes, but also because this distinction refers more generally to the complex nature and implications of race. That is, even though we can argue that someone’s racial membership should be defined by the individual him- or herself, still, most of the resources and rewards from the outside society can be reached based on how someone is perceived by others. This is especially true for those which are closely embedded in interpersonal situations and social interactions. Obviously, self-identifications and perceptions are related, and in most cases, they coincide. However, cases when they are actually different can have very important social consequences. Therefore, focusing on self-identifications and perceptions jointly can provide us with a more detailed picture about race and ethnicity.

1.3 Importance of Social Ties in Integration

Due to the crucial importance of relationships in the integration of minority groups, this thesis focuses on the development and maintenance of social ties. The setting we

concentrate on is education; we examine ethnically mixed secondary school classes. We do so since such communities allow students to form ties beyond their racial or ethnic groups. However, providing opportunities does not necessarily suffice in itself: as a second step, students need to be encouraged to befriend each other. Without this, a formally mixed community can remain essentially segregated; moreover, based on students' prior stereotypes, prejudice might become stronger (Allport, 1954; Moody, 2001; Stark et al., 2013). Related to this latter concern, we focus on not only the development of friendships, but also of negative (dislike, hate) relationships between students. Examining friendships and negative ties in formally integrated school communities can help us to understand whether, and under what circumstances, formal integration can result in "essentially integrated" groups at the relationship level.

This thesis examines the effect of race and ethnicity on social ties, while recognizing that a reverse effect may also exist, since race and ethnicity are socially constructed. If race and ethnicity are fluid, changes should be affected by the social ties of individuals. Therefore, this thesis proposes a new approach for understanding interracial and interethnic relationships in communities by considering the fact that race and ethnicity can also change based on social ties in these groups. Moreover, it directly focuses on social tie based processes influencing racial and ethnic perceptions.

The two large empirical parts of the thesis focus on how ethnicity affects social ties, and how social ties affect ethnicity. Our theoretical background mostly relies on the social identity approach (Tajfel, 1974; Turner, 1975), and utilises its perspective about relationships between groups of different social status. Besides, we use methods and techniques developed in the field of social networks analysis. These are especially useful for us, for at least two main reasons. First, for investigating social ties in closed communities, we need to take the network structure into account. There are general patterns of relationship evolution, such as the tendency to reciprocate social ties, or befriending friends of friends, that must be included in models, at least as control factors, when focusing on interethnic tie formation. Otherwise, we could erroneously attribute tendencies that are in fact results of these endogenous network processes to same-ethnic preferences. Moreover, our social network modelling approach allows us to treat relationships on the micro level when examining group-level outcomes. This way, we can avoid the unnecessary aggregation of data and, thus, ecological fallacy.

The thesis uses a Hungarian dataset with two ethnic groups: the Roma minority group, and the non-Roma Hungarian majority group. Even though this is a special context, several groups of results meet our theoretical expectations in the empirical

chapters, which provides evidence for the underlying social and social psychological mechanisms hypothesized.

1.4 Outline of the Thesis

This thesis consists of four parts. The rest of Part I summarizes the most important details about the context, data and methods used in this thesis. Chapter 2 introduces the problem of distinguishing between race and ethnicity, summarizes some of the most important contexts that have been examined in terms of interracial and interethnic relations, and describes the situation of our minority group in focus: the Roma group in Hungary. Chapter 3 introduces the research project and the dataset that is analysed for every empirical chapter of this thesis, describes the variables and provides some basic descriptive statistics. Chapter 4 focuses on the social network modelling approach, and introduces the two main groups of models we use: exponential random graph models, and stochastic actor-oriented models. It also gives a description about additional techniques that are used in the empirical chapters.

Part II investigates interracial and interethnic social ties in school communities. After a theoretical overview of the topic (Chapter 5), Chapter 6 provides us with a cross-sectional picture on the prevalence of same-ethnic and interethnic friendships and negative ties in the class. Chapter 7 starts to build a dynamic model, and, as a first step, examines the effect of network structure on social ties. The chapter presents estimated models including different structural effects and compares their results on inter-ethnic social ties. Chapter 8 continues building the same model, and presents a more complete model specification, based on the co-evolution of friendships, negative ties, and perceptions. This model takes it into account that perceptions are fluid, and models relationship changes together with changes in ethnic perceptions over time. Since there are interesting differences between the cross-sectional and the longitudinal results, in Chapter 8 we aim to synthesise these findings.

In Part III, we focus on the “other side” of the same phenomenon: after examining how race and ethnicity affect social ties, we investigate how social ties affect racial and ethnic perceptions. After a theoretical overview (Chapter 10), we introduce and test two distinct groups of mechanisms. In Chapter 11, we focus on dyadic processes, that is, how we perceive our friends’ race and ethnicity, compared to our non-friends’. Here we have two competing assumptions. First, we could categorize our friends more accurately (that is, more similar to their own self-identifications), since we know these people more and collected more knowledge about them. Alternatively,

our categorisation could be more biased, since we like our friends and therefore can be tempted to see them to be similar to ourselves. Chapter 12 investigates the influence of the broader community, that is, friendship context and social influence processes. This chapter concentrates on whether we tend to classify someone as a minority member if he or she has many minority friends; or whether we tend to accept the classification of our peers, especially our friends, about others.

Finally, Part IV summarizes the whole study and discusses some of the many potential options for future research. Chapter 13 focuses on the main conclusions of the thesis based on the joint interpretation of results from the two empirical parts. It also provides possible further steps based on our research, identifying crucial points of the chapters where future research can help us better understand our results and the phenomena in focus.

Chapter 2

Context

2.1 Race and Ethnicity

This thesis investigates the interplay between social ties, and race or ethnicity. Focusing on social identity processes, our central questions are how racial or ethnic group memberships, being fluid and changeable themselves, affect friendships and negative relationships between individuals in closed, mixed communities; and how, at the same time, these social ties affect changes in racial or ethnic group memberships.

In general, social identity processes are based on similarities along dimensions that are important enough in the given context to become the basis of ingroup and outgroup perceptions and social comparisons (Tajfel and Turner, 1979). Empirical research shows that race and ethnicity are usually amongst the most important sources of social identity creation (McPherson et al., 2001).

So far, in our arguments we did not differentiate between race and ethnicity when describing relevant mechanisms for preferences and perceptions. However, there *are* traditional distinctions between race and ethnicity. Even though many studies handle these two phenomenon jointly nowadays, the literature was long fragmented, and racial and ethnic studies formed two completely different disciplines. As Brubaker (2009, p. 22) puts it, “Ethnicity and ethnopolitics; race, racism, and racial politics; and nationhood and nationalism were largely separate fields of study.” Traditional distinctions between race and ethnicity are based on several dimensions (e.g. involuntary or voluntary; external categorization or internal self-identification; differences of phenotype/nature or differences of culture; rigid or flexible, from processes of exclusion or processes of inclusion; different historical origins). However, some of these assumed differences are found to be completely false, and even for the rest, several exceptions can be found; it is certainly true that none of them allows us to make sharp, clean distinctions between race and ethnicity (see Brubaker, 2009). Race seems to be

much more flexible and less based on nature than previously thought; even definitions of racial categories vary by country and change over time (Davis, 2001; Saperstein and Penner, 2012). Moreover, it is argued to be a general problem with such strict analytical distinctions that they are often based on commonsense understandings referring to particular times in the U.S. (Loveman, 1999; Wacquant, 1997; Brubaker, 2009).

Though there might be other more complex factors that differentiate between race and ethnicity, these do not seem to directly affect the scope of this thesis. In Brubaker's words,

“These multiple dimensions of differentiation do not map neatly onto any conventional distinction between race, ethnicity, and nation. And while some of these dimensions covary, many others do not. As Weber (1968) remarked a century ago, race, ethnicity, nationhood are not precise analytical concepts; they are vague vernacular terms whose meaning varies considerably over place and time. Rather than seek to demarcate precisely their respective spheres, it may be more productive to focus on identifying and explaining patterns of variation on these and other dimensions, without worrying too much about where exactly race stops and ethnicity begins.” (Brubaker, 2009, pp. 27-28)

For the research questions examined in this paper, race and ethnicity are analysed in relation with minority and majority status of individuals and groups, and ingroup and outgroup perceptions. Therefore, the context is much more influenced by factors such as the level of prejudice in the society, or the extent of perceived differences between the majority and the minority group, than whether these differences are based on race or on ethnicity. Therefore, similarly to other studies (e.g. Saperstein and Penner, 2012), we will use the term “race” in a “broader” sense, including ethnicity as well, when talking about these general processes. We choose to use “race” instead of “ethnicity” in order to remind the reader (and ourselves) that the theoretical basis of this thesis originates from general sociological and social psychological theories, and are supported by empirical studies both focusing on race and ethnicity; therefore, our theory could be tested in social contexts including racial or ethnic differences as well. However, our empirical analysis is based on a dataset including two ethnic groups: the Roma minority group and the non-Roma majority group in Hungary. Therefore, in specific cases, such as interpreting particular results based on our data, the term “ethnicity” will be used.

2.2 Previous Findings in Different Contexts

The topic of interracial integration is investigated in many different contexts, including different countries, minority groups, and micro-environments. Since these studies answer similar questions, their results are often “pooled together” when reviewing earlier findings in the field. Seeing these results presented together can be advantageous, since the various contexts provide more information about the general phenomena in focus. However, differences in findings of these studies might be influenced by where and when the study has been conducted, and which groups are compared; therefore, this section makes an attempt to review some of this literature with special focus on their social contexts.

One very important dimension for the possible distinctions between different interracial or interethnic situations is the geographic area (country, city) itself. A lot of the existing research focuses on the U.S., which is not surprising given the country’s long history with minorities. In a meta-analytic study examining the effect of direct intergroup contact on the decrease of prejudice (Pettigrew and Tropp, 2006), 72% of the samples are found to have been carried out in the United States. Pettigrew and Tropp (2006) conduct additional analysis to see whether effects found in the U.S. and other studies differ from each other, and they could not find significant differences. Clearly, this does not mean that geography would not have a role in the prevalence of same-group and intergroup social ties; but it suggests that there might be certain processes behind integration or segregation (such as the effect of direct contact) which are quite similar in different contexts.

Another important factor is whether members of the given minority group arrived in the country relatively recently (migrant groups), or have lived in the area for a long time (non-migrant groups). Migrant groups have different historical backgrounds, they can relate to another culture, and have to face different stereotypes from the majority society. First and second generation migrants usually still have a cultural repertoire from their country of origin, which they can reach back to in order to cope with difficult social situations (Portes and Sensenbrenner, 1993); this is not true for non-migrant minority groups. To see whether there are differences between the interracial situation involving migrant and non-migrant minority groups in general, focusing on the U.S. context is adequate. Here, the situation of the black minority group is particular because of its historical origins; however, there are other big, relatively disadvantaged, mostly Hispanic groups in the country whose situation is also often in focus. As an example, Moody (2001) analyses racial segregation in

racially mixed U.S. schools, focusing on both black and Hispanic minority groups. He finds that on top of the strong same-group preference, whites are more likely to nominate Hispanics than to nominate blacks, while Hispanics are more likely to nominate blacks than to nominate whites (Moody, 2001). This suggests no clear and structured differences between the situation of Hispanic and black students, though it shows preference of white students towards their Hispanic instead of their black peers, which might mean that they are more integrated in the majority society. Other research (Fryer Jr and Torelli, 2010), on the other hand, shows that the “acting white” phenomenon — that is, black students underachieving due to performance lowering pressure from their ingroup in order to avoid accusations of “acting white” — is actually higher for Hispanic than is for black students. That is, both well performing black and Hispanic students are found to be less popular than their peers with moderate performance, but the achievement that comes with the highest level of popularity is lower for Hispanic students. Therefore, it seems that beyond the existing lower social positions of certain migrant and non-migrant minority groups, the relative position of these groups is rather arbitrary, at least in terms of relationships.

The situation of migrant groups can also differ from each other, based on their social situations in their host societies. In case of high prejudice and the impossibility to return to the home country, immigrants often start using cultural items, for example traditional clothes, that they never did at home, and, at the same time, these groups also show a high level of solidarity to each other within the group. However, this solidarity usually comes with a cost that individual success outside of the migrant group is almost impossible, and in many cases it can only happen if the person gets disintegrated from the migrant group (Portes and Sensenbrenner, 1993). Portes and Sensenbrenner (1993) demonstrates the examples of many minority groups in the U.S. and explain the differences between their situations, and the origins and results of these differences. Some of these refer to how closed and how stable the given community is; these are influenced by the migrants’ chances to return their home countries in case of lack of success in their new home, and by the prejudice against them. In case of low chances of leaving the country, and in case of strong prejudice, closed and stable communities might form, with strong within-community ties and with almost no ties outside of the group.

2.3 Roma Minorities in Hungary

The Roma minority group in Hungary, which is the focus of this study, is an ethnic group that has lived in the country for several generations. This makes their situation different from that of migrant groups in other countries (Hungary does not have a big migrant population), and somewhat similar to that of the black population in the U.S; for instance, the vast majority of Roma people in Hungary (including those in our sample) speak Hungarian as a first language for generations. In the Hungarian society, including high school communities, there is strong prejudice against Roma people (Kertesi and Kzdi 2011; Vradi 2014). In spite of this, it is usually not obvious for an external perceiver to decide who is Roma and who is not. Even though stereotypes are often related to visual appearance of Roma people, and there are family names more common amongst Roma families, there are no unambiguous cues to distinguish between Roma and non-Roma individuals. This is, therefore, a big difference from the black minority members in the U.S., who are on average more distinct in their appearance from the white majority group.

Traditionally, the Roma constitute one of the biggest and poorest ethnic minority groups in Europe (Kertesi and Kézdi, 2011). Their situation in Hungary is an illustrative example of the seriously underprivileged status of minorities, the strong prejudice towards them and of growing interethnic tensions. This is the largest (and only large) minority group in Hungary, and they have always been living on the periphery of the society (Goldberg, 2006; Kertesi and Kézdi, 2011).

During the communist era, Roma people were mostly employed, but after the fall of regime, 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 (Kertesi and Kézdi, 2011). Despite their deprived position, their population has continued to grow in the last decades due to a high birth rate (Janky, 2006). Recently, the proportion of Roma minorities has been estimated to be 5-6% of the total population, and 10-12% of the adolescent population (Kertesi and Kézdi, 2011).

The collapse of the labour market resulted in permanent poverty among Roma people, which has been partly responsible for the widening ethnic gap in education (Kertesi and Kézdi, 2011). As Kézdi and Kertesi (2011) pointed out, the long-term poverty of the Roma is strongly associated with their high dropout rate after the

8th grade. The vast majority of young Hungarian Roma leave the education system without graduating from secondary school, and only a negligible fraction takes 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 college degree (Kézdi and Kertesi, 2011). 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 skill gap between black 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 discrepancy, which are almost entirely accounted for by differences in parental education and income.

Chapter 3

Data

3.1 Research Project and Sample

The empirical chapters of this thesis are based on a sample of Hungarian secondary school students. The data were collected by the MTA TK “Lendület” Research Center for Educational and Networks Studies (Budapest, Hungary). The author of this thesis also participated in the research project and the data collection. The four-wave survey started in 2010 and ended in 2013. The leader of the research group and the research project is Dr. Károly Takács.

The aim of the study has been to observe the evolution of students’ networks over time, starting from their first, initial relationships with each other. Since in Hungary, secondary school usually starts in 9th grade, we started the data collection amongst ninth-graders. The first wave of data was collected shortly after the students started school together, where most of them met for the first time. Afterwards, we regularly repeated the measurement to capture changes in social ties. Because these changes are usually much more frequent in the first couple of months after the first relationships are formed and before students know each other well, it is advantageous to have more frequent observations at the beginning than later. Therefore, the second wave of data was collected when the first academic year was still in progress; after that, there was one more data collection in second academic year, and one during the third one. The questionnaires mostly contained the same questions across data waves, though with some variation: there were some questions that were not asked every time.

The sample covers students who were 9th graders in 2010 from 7 Hungarian schools, including two schools in the capital, two schools in a major Hungarian town, and three schools in two medium sized towns. In Hungary, students in the same cohort are sorted into distinct groups of 20-30 students (though sometimes more or less),

with whom they attend most of their classes together. In our 7 schools, there were 44 school classes starting the 9th grade. Our sample includes all of these classes (N = 1439); however, our network questions were mostly focused on within-class social ties, since school classes are the natural units of group formation in Hungarian secondary schools.

The sample contains school classes from the three different training programmes of secondary education in Hungary. These training programmes have different academic criteria and outputs, and have different prestige in society. One school is not necessarily limited to only one programme, some of them (including a few in our sample) offer classes of different training types. *Secondary grammar* programmes are the most academically oriented and mainly prepare students for tertiary education. *Secondary technical* programmes provide students with vocational training, but also allow them to later participate in tertiary education. *Vocational programmes*, though offering some academic subjects, mostly focus on vocational training, and does not prepare students for exams at the end of the secondary studies that are necessary to enter higher education in Hungary.

3.1.1 Cross-Sectional Subsample

Our cross-sectional analysis relies on the second data wave, which was collected in the second half of the first academic year (in 2011). Therefore, by this time the students already had time to get to know each other.

For the analysis, we restrict our sample to classes with appropriate levels of ethnic heterogeneity and missing data. This results in a subsample (N = 420) which includes 16 classes with at least 10%, but not more than 90%, of Roma students based on their ethnic self-assessments, and with less than 20% of missing data in all questions. As a consequence, the subsample contains mostly vocational and secondary technical school classes, with only one grammar school class included.

3.1.2 Longitudinal Subsample

The longitudinal analysis uses the first two data waves of the study; therefore, the results also capture the process which resulted in the state described by the cross-sectional model (which is based on wave 2). The first data collection happened 1-2 months after the students met, therefore most of them did not know very well each other, but they already had some impressions about the other students in their classes. As mentioned earlier, the second observation happened in the second half of the same

academic year. This way, between the first and the second observation the students spent five additional months together, allowing friendships to emerge more.

Unfortunately, we are not able to analyse later data waves of this subsample, since after the end of the first academic year, too many students left the community (mostly because of failing at the end of the year). This means that the communities became too different over time in composition. Moreover, since mostly students with lower academic performance left the sample, the composition change is also too biased. Thus, these data waves cannot be included in our dynamic analysis.

For the analysis, we again restrict our sample based on ethnic heterogeneity and missing data in both data waves. Only students who were parts of the classroom both times enter the subsample. This subsample includes students of 12 classes ($N=357$) with less than 25% of missing cases on each variable used, and at least 10%, but not more than 90%, of self-declared Roma students. Every school class that is included in the longitudinal sample ($N_{class} = 12$) is part of the cross-sectional sample ($N_{class} = 16$) as well. In the longitudinal sample, no grammar school classes are included.

3.2 Measurements

3.2.1 Friendships 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 choose friendship networks (“+2”) as a measurement for positive nominations. For this, we have one theoretical and one empirical reason. First, we argue that this network contains the most important and most influential positive nominations and should matter much more than general liking of someone. As everyone judged everyone else in the community along this scale instead of making lists of their best friends, giving someone a weak positive score (by ticking “+1”) does not seem like a strong positive signal about this person.

From an empirical perspective, we take a look at the network densities. Density is the proportion of potential ties amongst actors, that is, when everyone nominates everyone else, that are actually realized in the network. The number of potential ties is $n \times (n - 1)$. As expected based on the theoretical argument, the density of the “aggregated positive nominations”, namely, friendship and liking nominations pooled together, is quite high, which confirms that the network constructed based

on all positive nominations cannot be reflective of close relationships. Density of friendship networks only, however, seems reasonable (around 18-19% of nominations in classrooms, which means that an average student nominate slightly less than fifth of the classmates as friends; see Section 3.3).

For negative nominations, however, we include both weak (“-1”) and strong (“-2”) negative ties. For this, we also have one theoretical and one empirical reason. First, sending a negative tie towards someone, even a weak one, seems like a much stronger signal of the relationship than a weak positive tie. Therefore, weak negative ties can already have serious social consequences in communities. Moreover, negative networks, in general, are less dense than positive ones, and the combination of these networks still have a relatively low density (around 0.12; see Section 3.3).

3.2.2 Ethnic Self-Identifications

In the questionnaire, both aspects of ethnicity are measured. Self-declared ethnicity has four different values: “Hungarian”, “Roma”, “Hungarian and Roma at the same time”, and “Other”. For the analysis, we create two groups: “Roma” minorities (from “Roma” and “Roma and Hungarian”), and “non-Roma” majorities (from “Hungarian” and “Other”). We do so because handling more than two groups would make the analyses in this thesis impossibly difficult; and it is reasonable to assume that all those students who self-identify as Roma have some kind of a minority status. For more information about the proportion of minority students in the data, see Section 3.3.

3.2.3 Ethnic Perceptions

Perceived ethnicity was measured as a network, using the method of network rosters. This means that every student has to nominate his/her classmates whom he/she considered Roma by putting an “X” at their columns in the roster. This way, we have information about everyone’s ethnic perception about everyone else, and we can organize this information in a network, where we can see all the ethnic classifications between all pairs of actors: who (rows) classified whom (columns) as Roma.

3.2.4 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. Social background is often strongly related to racial and ethnic perceptions

((Saperstein and Penner, 2012; Kézdi and Kertesi, 2011) and this is true for the situation of the Roma minority in Hungary (Kézdi and Kertesi, 2011), Therefore, we include this in the models. For measuring it, a principal component is created, fusing the variables of the fathers 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. This component was created for both subsamples separately. For the cross-sectional subsample, socio-economic status (SES) variables are included in the final models. However, they are neither significant nor change the sizes of other parameter estimates in the dynamic models; therefore in order to reduce the high number of variables, SES is excluded from the final results.

Gender is 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). It is part of the final model specification in both the cross-sectional and the longitudinal models.

3.2.5 Missing Data and Imputation

For the cross-sectional models, exponential random graph models are estimated; for this, we use the software MPnet. This software cannot handle missing data in the analysis; therefore, for this model we need to impute missing cases. SAOM models, however, are able to handle missing data, so in case of the dynamic analysis, we do not do any imputation on the data except in case of ethnic self-declarations which we describe later in this subsection. SES and gender are not imputed for any of the dataset since they do not have any missing data to handle (the SES variable has a valid value for every student; and full gender data have been gained in the classrooms throughout the research project).

For handling missing values in the cross-sectional network data, we impute the value of ties using the first and the third waves of data collection as follows. We use the original 5-point scale to impute the strength of missing ties: (1) if data are available only for the first or the third wave, we directly use the value available; (2) if data are available for both the first and the third waves, we calculate 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 infer friendship and negative ties as described above. For ethnic perceptions, we follow a similar strategy, using the first and the third data

waves for imputing perception ties. Here we round values towards the modus value of the classroom on ethnic perception.

For ethnic self-identifications, missing cases are imputed in two steps in the cross-sectional subsample. In the first step, we consider Roma those students who do 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 consider themselves Roma in the first or third data wave, but never consider themselves non-Roma. As a next step, we impute the remaining missing values (8.1%) using a multiple logistic regression imputation method suggested by van Buuren (2011), based on the teachers judgment 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%).

In theory, we argue that both ethnic self-identifications and perceptions are changeable attributes. In practice, however, our sample does not show a lot of changes in self-identifications between the first two waves (which is not surprising during an interval less than a year). Even existing changes mostly happen between the mixed identity group (Roma and Hungarian at the same time) and the Roma or non-Roma groups; but since we do not distinguish between students who are Roma or Roma and Hungarian at the same time, most of this change falls outside of the scope of this thesis. Therefore, in our empirical chapters ethnic self-identification is included as an independent variable, having its value from the first observation. We decide that in this case, it is reasonable to use the values from the two later waves for imputing the data for those who do not have valid ethnicity information at the first observation but do later, considering the low proportion of changes in the rest of the sample. Therefore, there, too, we follow the first step of ethnic imputation described above for the cross-sectional subsample; however, we do not use the multiple logistic regression imputation in this case.

3.3 Descriptives

In this section, we present some descriptive statistics about our subsamples. In every case when it applies, we present the numbers for the longitudinal and for the cross-sectional data, since the two subsamples are somewhat different. In cases when the attributes or ties are changeable and are measured both times, we present the values for the first and the second wave of the longitudinal sample separately.

	Gender		Father's level of education			
	Female	Male	Primary or less	Secondary	Tertiary	Missing
Longitudinal	223 (62%)	134 (38%)	80 (22%)	232 (65%)	20 (6%)	25 (7%)
Cross-sectional	231 (54%)	189 (46%)	132 (33%)	229 (53%)	31 (7%)	28 (7%)

Table 3.1: Descriptives: Gender and Father's Level of Education

First, we describe our data along some general dimensions. Table 3.1 demonstrates that in both subsamples, more girls are included than boys. This is particularly true in case of the longitudinal subsample: here the proportion of girls is 62%. The difference between the two subsamples is mostly explained by the two only-boy school classes that are part of the cross-sectional study but are not included in the longitudinal one. On the gender variable, we have no missing cases.

In terms of social background, we present the father's higher level of education, since the SES variable that is used for the analysis is a normalized principle component which has, by design, a mean of 0 and standard deviation of 1. In both subsets, only a really small proportion of fathers has a college or university degree (6-7%). However, in the longitudinal sample there are more fathers who finished secondary school (65% vs 53%), and, consequently, less who have only primary education or less (22% vs 33%). This shows that the longitudinal sample might include a slightly larger proportion of students from more advantaged social backgrounds.

Table 3.2 describes the two subsamples in terms of ethnic self-identification. The cross-sectional dataset has more self-declared minority students (39%) than the longitudinal one (27%); this can be related to the social background of that sample expressed by the father's level of education. This means that the four classes that are not included in the longitudinal sample but are part of the cross-sectional analysis have somewhat more ethnic minorities and lower socio-economic status (even though the classes included in the both samples do not necessarily include all the students for both samples). In the longitudinal sample, there is a bit bigger variation among school classes (25% instead of 19%), but in both cases, the class with the least minority students has a proportion of 11%, while the largest minority proportion is 78%. This shows that sample has a big variation in ethnic proportion.

After presenting descriptive statistics about individual attributes, we now give some illustration about our network data, which are the main focus of this thesis. We concentrate on three different networks in our analysis: friendships, negative ties, and ethnic perceptions that are also treated as networks (where a nomination between two

	Total subsample		Classroom-level		
	Minority	Missing	SD of averages	Min	Max
Longitudinal	96 (27%)	7 (2%)	19.1%	11%	74%
Cross-sectional	150 (38%)	0 (0%)	24.9%	11%	74%

Table 3.2: Descriptives: Self-Declared Ethnicity

students is present if the first person perceives, and reports, the second one to be a minority). These results are presented in Table 3.3.

Friendships						
		Density		Jaccard-index		Missing
		Mean	SD	Mean	SD	Proportion
Longitudinal	Wave 1	0.20	0.02	0.34	0.05	0.05
	Wave 2	0.19	0.03			0.14
Cross-sectional	Wave 2	0.19	0.05	-	-	0.00

Negative ties						
		Density		Jaccard-index		Missing
		Mean	SD	Mean	SD	Proportion
Longitudinal	Wave 1	0.10	0.05	0.19	0.06	0.05
	Wave 2	0.13	0.06			0.14
Cross-sectional	Wave 2	0.12	0.05	-	-	0.00

Ethnic perceptions						
		Density		Jaccard-index		Missing
		Mean	SD	Mean	SD	Proportion
Longitudinal	Wave 1	0.15	0.13	0.36	0.14	0.06
	Wave 2	0.21	0.20			0.10
Cross-sectional	Wave 2	0.21	0.18	-	-	0.00

Table 3.3: Network descriptives

In Table 3.3, we can see that the average friendship density is 0.19 for the cross-sectional subsample, while it is 0.2 and 0.19 in the first and second wave for the longitudinal sample, respectively, with little variation between classrooms in all cases. This suggests that the number of friendship ties does not change a lot between the waves, and classes are quite similar in the proportion of friendships. The Jaccard

index measures the stability of ties between data waves (for the longitudinal sample), comparing the number of ties that existed in both data waves to the number of ties existing in at least one of the data waves. Jaccard indices in this data set have an average value of 0.34 (s.d.=0.05). This value is excellent for SAOM analyses; it shows that the friendship ties are somewhat, but not very, stable in the community between the two time points. There are missing cases in both waves, an average 5% in the first wave and 14% in the second wave. However, the valid data show that the sample is quite similar across observations along dimensions important for this study (gender, SES, self-identified ethnicity), so this difference in the missing cases should not mean too much bias.

For the negative networks, the average density is 0.12 in the cross-sectional sample, and 0.1 and 0.13 in the first and second wave of the longitudinal sample, respectively. These are much sparser networks than the friendship ones, and their variation is larger across school classes. Table 3.3 also shows that the proportion of negative ties gets higher over time. The value of the Jaccard index is 0.19, which is a bit low but acceptable for a SAOM analysis. Under 0.2, fitting a SAOM-model might become difficult; in our case, 5 classes have Jaccard indices lower than 0.2, which is another reason for analysing these groups together (see more about this in Chapter 4.4). These low values show that negative networks often change, and a big proportion of the negative ties measured in this study only exist either at the first or the second time of observation. The proportion of missing cases is the same as that of the friendship networks, since these variables are created using the same scale measured originally in the questionnaire. In this case, as well, the valid data show similarity across observations along important dimensions suggesting that we do not have to worry too much about the difference in missings between data waves.

For the ethnic perception networks, the average density is 0.21 in the cross-sectional subsample, while 0.15 in the first wave, and 0.21 in the second wave in the longitudinal subsample. These values mean that in the second wave, students send more minority nominations than in the first wave. The densities for minority perceptions are lower than the proportion of self-declared minority students in the sample (27% in the longitudinal sample and 38% in the cross-sectional one). Moreover, the high values of standard deviations of the densities suggest a big difference between classes in the number of minority nominations. This is an important characteristic of the sample, since standard deviations of the friendship and negative network densities along classrooms are quite small, suggesting that classrooms tend to be similar

in this respect. However, the fact that minority perception networks follow a different pattern is not surprising, since self-declared Roma proportion also varies along classrooms.

In spite of the change in ethnic perceptions over time, ties are still relatively stable, the average Jaccard index is 0.36 (s.d.=0.14), which is good for SAOM-analyses - however, this is not equally true for all the classes, which is shown by the relatively large standard deviation. However, looking at the class-level data, even the lowest jaccard-index is 0.24, which is still well acceptable for SAOM-analyses. The growing number of minority nominations together with the comparatively stable nature of the ties suggests that while the number of minority nominations increase by the second wave, minority perception ties that have already existed by the first wave are unlikely to disappear. The proportion of missing values is an average 5% in the first data wave, and 10% in the second data wave.

While Table 3.2 and 3.3 demonstrate some characteristics of the ethnic self-identification and perception measures, the next box plots illustrate the relationships between them. Figure 3.4 shows the proportion of classmates that nominates a student as a minority if this student declare him- or herself as majority member (first boxes), or as a minority member (second boxes). We have two boxes like this for the cross-sectional subsample, and for both waves of the longitudinal subsample (N of students in classrooms is between 20 and 30). Our results suggest that in all cases, students are nominated as minority peers by their classmates much more often when they also self-identify as minorities than when they do not. Moreover, it gives us some indications that there might be “ambiguous” cases as well, and judgements about others’ race are not necessarily in agreement. The fact that boxplots based on the second wave of the longitudinal sample and the cross-sectional sample look really similar implies that even if there are more self-identified minority students in the cross-sectional study, the relationship between perceptions and self-declarations is not very different.

Finally, Figure 3.5 demonstrates that minority perception indegrees are also related to each other over time: those nominated more at the first observation (axis X) are nominated more later as well (axis Y). A big proportion of students appear at (0,0), therefore, they are not nominated as minority students by anyone at any of the observations. The black line in the picture shows the linear relationship between the ethnic perceptions at the two observations. This figure provides additional evidence that even though there are more minority nominations at the second than at the first observation, they are strongly related.

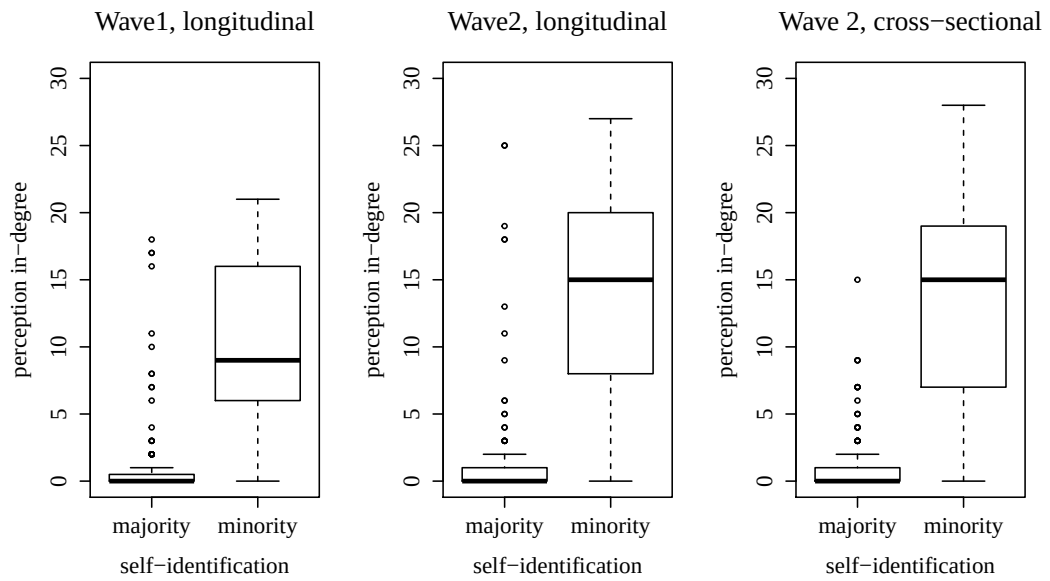


Figure 3.4: The Relationship Between Ethnic Self-Declaration and Perceptions

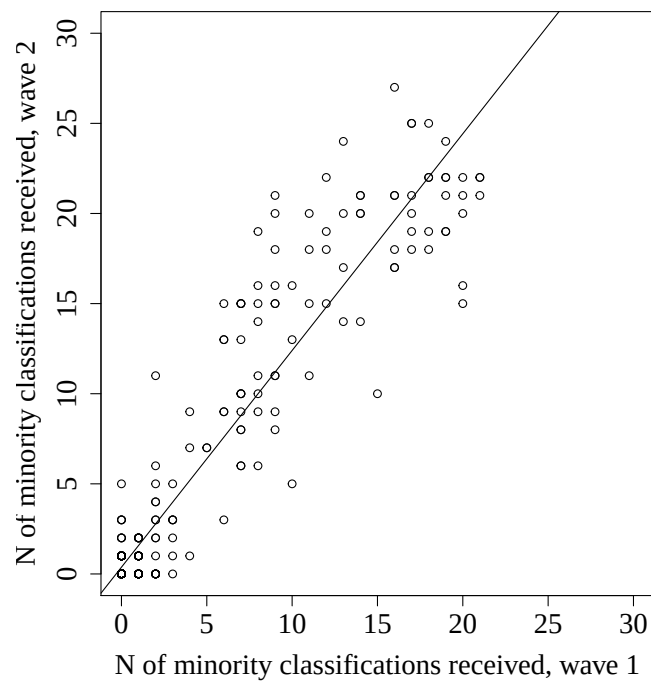


Figure 3.5: The Relationship Between Incoming Classifications in Wave 1 and 2

Chapter 4

Analytic Approach and Methods

4.1 Modelling Social Networks

The chapters of this thesis utilize the most recent methodological developments of cross-sectional and dynamic analysis of small social networks. In this section, we demonstrate the advantages of this approach through some simple examples.

Let us assume that we would like to conduct a quantitative analysis to examine friendships in a secondary school community with male and female students, and two racial groups: a minority group, and a majority group. We would like to know whether students show same-race preferences when they choose their friends.

We have information about the characteristics of the students, and the friendship ties between them. In this community, we observe that two students, *Ego* and *Alter* are friends. There are several potential explanations for this: both of them are males, so it can be a result of gender homophily. Both of them are majority students, so it can be racial homophily as well. Furthermore, *Alter* is a very funny person and everybody likes him – this already makes it more likely that *Ego* will try to make friends with him regardless of *Ego*'s own characteristics.

These explanations might be examined using standard multivariate statistical methods. However, standard methods assume that observations, in our case friendship ties in the community, are independent. If this was true, it would mean that people make friendship choices independently of each other, even independently of others' responses to their efforts. This is not true: people are generally found more likely to reciprocate friendship ties, that is, to name someone as friend who also names them as friend; and to befriend the friends of their friends. The effects of these and other similar processes cannot be explained by other, external mechanisms such as individual preferences – they are endogenous network processes, which only depend on other ties in the network.

To go back to the example, the truth might be that *Alter* has a preference for other majority males when he chooses friends – but *Ego* does not have any preference for (or against) same-race peers, he has simply decided to reciprocate *Alter*’s friendship efforts in the same way as he would reciprocate them if *Alter* was a minority or female student. Alternatively, it is also possible that *Ego* and *Alter* have so many friends in common that eventually they also became friends, even though they would not have chosen each other only based on their individual attributes. Ignoring these possibilities and attributing all same-race friendship dyads to a same-race preference leads us towards overestimating the effect of these preferences in the network.

Therefore, when observing that friendships in a community are racially segregated – that is, similar students are more likely to name each other as friends than we would expect by chance based on the ethnic composition – this could be caused by, for example 1) purely same-race preference; 2) some same-race preference and students’ tendency to reciprocate friendships initiated towards them; 3) some same-race preference, reciprocity, students’ tendency to befriend the friends of their friends (transitivity), who are already likely to be similar to themselves due to the same-race preference; 4) more initial same-race than cross-race friendships simply by accident, reinforced by reciprocity, transitivity, and other potential within-network factors. Therefore, we should consider all these factors if we are interested in the pure effect of racial preferences in a community. Similarly to standard multivariate statistical analysis, social network models used in this thesis are able to conditionally estimate parameters for several independent variables, thus, separate the above described effects from each other. These models do not assume that observations (that is, network ties) are independent: on the contrary, they also model the dependence structure between them and estimate parameters for these dependencies. By modelling social networks, it is possible to estimate parameter values for homophily, reciprocity, transitivity, and other exogenous and endogenous processes. By controlling for these mechanisms, we can better answer our original research question about same-race preferences.

In this paper, two types of methods are used for such analyses: for estimating cross-sectional models, we use exponential random graph models (ERGMs), while for the dynamic models, stochastic actor-oriented models (SAOMs) are estimated. These model types are similar in several aspects; the most important difference between them (besides the cross-sectional - longitudinal distinction) is that ERGMs are tie-based, while SAOMs are actor-based models; therefore, the bases of the statistical analyses are different.

4.1.1 Effects and Parameters

In both ERGMs and SAOMs, it is necessary to specify the exact ways in which network structure or attributes affect tie evolution (Ripley et al., 2015). For instance, race can influence whether a social tie between *Ego* and *Alter* will be present or not in several ways, such as race of *Ego* (modeling whether members of a racial group send more or less friendship ties in general), the race of *Alter* (modeling whether members of a racial group receive more or less friendship ties in general), or whether they have the same race (modeling whether same-race nominations are more likely than cross-race nominations). These configurations are called effects and are treated as explanatory variables in the analysis. They have a similar role as the independent variables in a logistic regression model.

An ERGM or SAOM model specification should be such that a good fit with the observed data can be obtained, and that hypotheses can be represented by parameters in the model. Technically, these models always include effects referring to different relevant network configurations (like actors' tendency to reciprocate friendship ties, or be friends with friends of friends), in order to take network dependencies into account. Usually, attribute-based effects, called covariates, are also included as exogenous independent variables (e.g. race of *Ego*, race of *Alter* and same-race effects). Structural and covariate effects can be interacted with each other.

The parameter interpretation for both models is similar to that of logistic regression models, and parameter values refer to the conditional probabilities of a tie to exist (being created or maintained) as a function of the explanatory variables. Both methods are based on a simulation process; at the end of this, parameters are estimated based on comparing the characteristics of the observed networks to the simulated networks.

4.2 Exponential Random Graph Models

ERGMs are used for estimating cross-sectional models for this thesis (Chapter 6). 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. same race). For more details and recent developments see (Snijders et al., 2006; Robins et al., 2007; Lusher et al., 2012).

For our analysis, we apply two different model specifications, introduced below, estimated separately for all classrooms. For the estimation, we use the software MPNet (Wang et al., 2013) with the single-level (or one-mode network) option.

4.3 Stochastic Actor-Oriented Models

Detailed network studies and discussions have made it clear that in order to obtain a deeper understanding of social action and social structure, it is necessary to study the dynamics of individual attributes, the change in network structure, and how these mutually influence one another (Steglich et al., 2010a). When focusing on interpersonal relations and group phenomena, this approach is especially useful.

Stochastic actor-oriented models (Snijders, 2001, 2005; Snijders et al., 2010), have been developed for modelling network dynamics of panel data and for estimating parameters for the effect of selection and influence processes, depending on, amongst other factors, characteristics of individuals and dyads in the network. In SAOMs, network change is represented as a sequence of many small changes, like in an agent-based simulation model. In each step one randomly selected actor has the chance to create or terminate an outgoing tie. The first wave of data serves as a starting point, and every later data wave is modelled based on the previous network state observed. SAOMs also model the simultaneous co-evolution of two different networks (Snijders et al., 2013), where the two networks change in alternate steps. Change probabilities are flexibly modelled using a set of theoretically assumed effects, weighted by the parameters that can be estimated so as to obtain a good fit with the observed network panel data (Ripley et al., 2015).

Practically, therefore, network evolution modeled with SAOMs can be understood as the result of individual actors' "choices" about their ties towards other actors in the network: they can create new ties, and maintain or terminate existing ones. These decisions are made based on different explanatory variables related to network structure dependencies, characteristics of the decision making actor called *Ego*, and of the actor to whom *Ego* considers creating, maintaining, or terminating a tie, called *Alter*. It is assumed that *Ego* has complete information about the ties in the network.

4.3.1 SAOM Co-evolution

In co-evolution models, two or more different networks, or networks and individual attributes are modelled simultaneously, using separate sets of explanatory variables. In case of network-network coevolution models, model specifications for the dependent networks include variables based on the other network. Therefore, it is possible to estimate cross-network dependencies. In case of this paper, we model the co-evolution of friendship networks, negative (dislike, hate) networks, and minority classification networks. In friendship and negative networks, a tie is present from *Ego* towards *Alter* if *Ego* nominates *Alter* as a friend, or a disliked person. In the minority classification networks, a tie is present if *Ego* classifies *Alter* as a minority member. Estimating a dynamic co-evolution model, minority classification ties and relationships can be modelled together over time, allowing us to distinguish between friendship ties affecting racial perceptions, and racial perceptions affecting friendships. This is part of three empirical chapters of this thesis (Chapter 8, 11, 12).

4.4 Multilevel Modelling

Both model types introduced here concentrate on capturing the structure of relatively small, complete social networks. However, researchers often have the problem that they are interested in the same mechanisms in multiple communities, and wish to estimate parameters based on this larger dataset.

For both ERGMs and SAOMs, the most straightforward way to do this is to first estimate a similar model for each of the individual classrooms, and then conduct a meta-analysis which then estimates global parameters for each variable included in the model (see Chapter 6, 7). However, in certain cases it is not possible to achieve a good model for all of the individual groups, for example, if these are too small and/or the model is over specified for the sample size. For some of our SAOM analyses in this thesis (Chapter 8, 11, 12), we face this problem. In these chapters, we use a new addition to SAOMs, which makes it possible to estimate random coefficient multilevel models and acquire global estimates without first having to analyse each of our groups separately (Koskinen and Snijders, 2015). These models are very much time consuming and computationally demanding at the moment, therefore we only use them in situations where we cannot otherwise achieve results for our models.

4.4.1 Meta-Analysis

For the ERGM and the SAOM meta-analyses, we used two slightly different methods. In general, for both types, estimated parameters and standard errors of the separate models per class are used. The underlying assumption of these meta-analyses is that individual networks are a sample from a common population.

During the process, it is estimated whether the values for a given parameter, averaged over the population, differ significantly from 0, i.e., whether the results indicate some general tendency or not. The meta-analysis is conducted for each parameter separately, using the results of the classroom-level models.

For meta-analysing the ERGM results, we use the method proposed by Snijders and Baerveldt (2003) which follows a random effects approach and presents the Hedges estimator. For the SAOM meta-analysis, we use a somewhat different version provided by the “metafor” R-package, which presents the Hedges and also the maximum likelihood estimator (Viechtbauer, 2010). Based on the comparisons in Viechtbauer (2010), it is somewhat better to use the restricted maximum likelihood estimator, therefore, we also choose this option for meta-analysing our SAOM results (Viechtbauer, 2010; Ripley et al., 2015). A meta-analysis also tests the heterogeneity of each parameters estimated across classrooms. The meta-analysed individual classroom results are acquired using the method of moments estimation method.

4.4.2 Random-Coefficient Multilevel SAOMs

Multi-level SAOM analysis is a very new addition to the method (Koskinen and Snijders, 2015; Ripley et al., 2015). In these models, group-wise and global (combined) parameters are estimated simultaneously, therefore the data provide enough statistical power to achieve meaningful results even with small classrooms, but it is not assumed that all parameters are the same for all groups. This is analogous to the hierarchical linear model of multilevel analysis (Raudenbush and Bryk, 1985; Snijders and Bosker, 1999). In these models, parameters can be set to randomly varying between groups according to a multivariate normal distribution, or to being constant across groups (Koskinen and Snijders, 2015). The analysis is based on a Bayesian estimation method.

4.5 Joint parameter tests

In all empirical chapters of this thesis, we test hypotheses and interpret results that are based on multiple parameters in the models. The simplest example for this is when interpreting interaction effects: the difference from the reference category can be calculated as the sum of the two main effects and the interaction term in the model. To test if this sum is significantly different from the reference category, we need to run additional tests. Since in social network models, we often test the effect of combinations of *Ego* and *Alter* effects (e.g. race of *Ego*, race of *Alter* and the interaction of these), or the influence of structures embedded in each other, this is a common problem. In this case, we use joint parameter tests to see the difference between a case not directly modelled and the reference category: for example, the conditional likelihood of a minority-minority nomination (race of *Ego* = 1), (race of *Alter* = 1), (interaction = 1) compared to the majority-majority reference category.

For the method of moments SAO models (Chapter 7), we calculate Wald tests statistics which estimate linear combinations of parameters based on the means and variances of the estimates, and covariances of each pair of estimates. For the Bayesian models, another test was used; here Mahalanobis distances of the elements of the posterior sample from the posterior mean are calculated for linear combinations of multiple effects, where the p -value is the posterior relative frequency that these are greater than the distance between the tested value and the posterior mean.

Part II

Interracial relationships

Chapter 5

Theory

5.1 Introduction

In our diverse world, interracial tension is a serious social issue. It exacerbates this problem that racial minority groups are often in disadvantaged positions in their host societies (e.g. Quillian, 2012; Dustmann and Frattini, 2011). The formation of interracial social ties might attenuate this tension as they can 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 racial 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 racial backgrounds, which may lead to the emergence of cross-race positive relations (Allport, 1954; Wright et al., 1997). Those who promote integrated education usually argue that this, along with the emergence of positive attitudes towards minority 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). At the same time, formation of cross-race relationships is

This chapter is partly based of a paper co-authored with Bálint Nèray: Boda, Z., and Nèray, B. (2015). Inter-ethnic friendship and negative ties in secondary school. *Social Networks*, 43, 57-72. It also includes unpublished joint work with Bálint Nèray and Tom A.B. Snijders

also beneficial for the society as a whole, since these ties decrease prejudice towards minority groups. This is true even for those who do not maintain such friendships themselves, but have friends who do (Brown and Hewstone, 2005; Pettigrew et al., 2007; Turner et al., 2007; Swart et al., 2010; Stark, 2011). For these reasons, relationships among racially different classmates are especially important.

In an “ideal” interracial situation, positive social ties are commonly present between racially different individuals. We call this the state of relational integration. To achieve this, the first step is to create a formal environment for these different individuals to meet, which we call formal integration. Social policies can play a crucial role in this regard. These often target the education system where the proportionate mixing of racially different students can be achieved, providing direct contact opportunities. Moreover, in this case both the mixing procedure and the consequences can be monitored and controlled by authorities, which is another advantage.

However, as Moody (2001) pointed out, formally integrated school classes can remain essentially segregated if different students tend not to become friends with each other; in our terminology, formal integration does not necessarily create relational integration automatically. Once contact opportunities are given, the magnitude of relational integration can be described by the likelihood of positive cross-race relations (compared to same-race ones). In the last decades, empirical studies have been conducted to explore the formation of students’ interracial friendship networks and the importance of racial mixing (see for example Moody, 2001; Stark and Flache, 2012). In these studies, it was found that the formation of cross-race friendship ties tend to be relatively unlikely in formally integrated communities.

This thesis 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 interracial relations. The lack of positive relations does not equal the existence of negative ones; nevertheless, interpersonal relations in racially fragmented social contexts are often hostile. As positive (friendship, like) and negative (hate, dislike) relationships generally give rise to different structures, one of our main aims is to explore whether they are influenced differently by race. So far, only a relatively small number of studies have investigated networks of interracial negative ties (Stark and Flache, 2012), therefore the bulk of previous research in this field has missed an opportunity to capture some important aspects of relational integration. By analysing negative ties separately from friendships, this paper contributes to our understanding of the nature of negative interpersonal relations in racially heterogeneous social contexts.

Second, we introduce two different aspects of race and apply them simultaneously. The first is racial self-identification, which refers to one's self-declared race and is very commonly used in network studies (e.g. Munniksma et al., 2013; Stark et al., 2013; Tolsma et al., 2013). The second is peers' perceptions of each others' race, which captures the way someone is identified by others, which, to our knowledge, has not yet been used in social network models. This allows us to empirically tackle the identification problem, that is, the issue that perceptions about someone's race may vary (Brubaker, 2004; Hogg and Abrams, 1990; Jenkins, 2008), leading to potential inconsistencies between self-identified and perceived race (Marques et al., 1988; Ogbu and Simons, 1998; Saperstein and Penner, 2012). Besides investigating the separate effects of the two aspects of race, our research also focuses on whether a discrepancy between someone's self-declared and perceived race has an 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). The main idea of this approach is that individuals strive for a 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 perceived outgroup. This way, individuals evaluate their group, and thus themselves, as better or worse than the relevant outgroup, and thus its members.

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 the four main strategies: 1) social creativity, that is, finding new ways of comparing the ingroup to the outgroup so that the outcome is more favourable for the ingroup; 2) engagement in social competition with the higher status group; 3) individual mobility, that is, dissociation from the original group and attempting to join a higher status one; 4) 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 ties within and between social groups, examining the likelihood and evolution of these relationships also gives us indications about which strategies are chosen by the students in a given community.

Referring to the effectiveness of formal integration, two types of questions might arise. The first one is rather descriptive and focuses on the prevalence of different same-race and cross-race relationships in a community at a certain point of time. The second one focuses on the integration/segregation process, that is, the change of relationships over time and the factors explaining these changes. For a detailed

picture about integration, both questions are important. A cross-sectional analysis can provide us with important characteristics of the interracial situation, and with an insight into conditions determining the prevalence of interracial ties. This step helps us to understand the situation before focusing on the direction and extent of changes, and thus is a natural first step of the analysis. Chapter 6 estimates a cross-sectional model to examine the conditional probabilities for different same-race and cross-race relationships.

While results from the cross-sectional model allow us to describe relational integration in static terms, a longitudinal analysis adds to this by “putting it in context”. This step is crucial in order to truly understand relational integration: even if a school class described cross-sectionally seems relatively segregated, it can also be a result of beneficial processes that have started from an even more segregated state. Consequently, Chapters 7 and 8 take a longitudinal approach to examine how interracial ties are formed and maintained over time. We argue that even if a group is racially segregated in the relational sense, the direction of cross-race processes can make a big difference for the interpretation.

As stated earlier, our analysis focuses not only on friendships, but on negative ties as well. This also allows to gain a deeper understanding of the state and process of integration. We argue that even only a few cross-race friendships can be advantageous for the community if they are not accompanied by the disproportionate formation of negative relationships. For example, based on endogenous effects of friendship ties, such as transitivity, a few ties can have a larger impact over time than what seems to be the case in cross-section. Moreover, as we will elaborate it in the next section, even a small number of friendships may lead to reduced prejudice in the community, since attitudes can improve based on indirect cross-race friendships (that is, cross-race friendships of friends) as well. In this case, formal integration should still have an overall positive effect, even if it could be much stronger using additional policies by the school. If, however, the relative lack of friendships appear together with the strong presence, formation, and maintenance of cross-race negative ties, using additional policies is essential in the community.

5.2 The Effect of Direct and Indirect Contact

Contact theory (Allport, 1954) is probably the most important theoretical reference for integrated education. It proposes that racially mixed environments should stimulate the development of positive social ties between individuals from different racial

backgrounds, and decrease intergroup prejudice. Having direct contact opportunities provided, familiarity and friendliness should increase among racially dissimilar students, at least in case of status equality between groups, cooperative interdependence, and explicit support for mixing from authorities (Allport, 1954; Moody, 2001; Brown and Hewstone, 2005). However, while efforts can be – and often are – taken by school managements to meet the second and the third criteria, the first one is usually particularly difficult to achieve, since it depends on status differences in the broader society as well. This is important since theoretically, Allport (1954) suggests that contact can even have negative consequences in situations not fulfilling these requirements.

Empirical studies about the effect of direct contact are numerous, and findings are mixed: a meta-analysis including over 500 empirical studies on the topic shows that there is an average positive effect of direct contact opportunities on intergroup attitudes, that is, the effect of formal integration itself seems to be generally rather positive; even though the effect is much weaker when Allport's conditions are *not* met (Pettigrew and Tropp, 2006). Other results, focusing on social ties, suggest that providing direct contact opportunities is not necessarily sufficient without other policies and practices (mostly related to Allport's criteria) applied (Moody, 2001). Moreover, another study finds that in case of earlier established negative relationships, contact can indeed even make negative stereotypes stronger (Stark et al., 2013).

While contact theory emphasizes the positive effect of direct contact, the extended contact hypothesis (Wright et al., 1997) focuses on the importance of already formed social ties in shaping inter-group attitudes. In accordance with the extended contact hypothesis, even having a friend maintaining inter-group relationships improves someone's attitudes towards that given group (Pettigrew et al., 2007; Turner et al., 2007; Swart et al., 2010; Stark, 2011; Brown and Hewstone, 2005). In this case, friends serve as positive exemplars of their groups, which helps the inclusion of the outgroup members' group memberships in the psychological self (Wright et al., 1997).

To summarise this, while it seems certain that cross-race friendships *would* have crucial roles in different social outcomes, it is not certain that such ties *actually* form as a result of formal integration of students. This is true especially when the formation of such ties is not expressly stimulated by the surrounding system. In this study, we investigate interracial relationships in a context that can be described as only providing formal integration, since no additional efforts – based on Allport's criteria, or on other principles – are made to reach the goal of relational integration.

5.3 The Social Identity Approach

The central idea of the social identity approach (Tajfel, 1974; Turner, 1975) is that the psychological self consists of two different aspects: personal identity, and social identity. The latter one is the collective aspect of the psychological self, which 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, p. 454). Development and evolution of these identity types are based on individuals’ fundamental need for social comparisons. Personal identity rests on evaluative comparisons between the given individual and others, while social identity between the perceived ingroup and perceived outgroup. The motivation for both processes is the individuals’ underlying need for a positive self-esteem. Consequently, the goal of intergroup comparisons is to create and confirm ingroup-favouring evaluative distinctiveness between the ingroup and the outgroup, and thus, to increase the individual’s self-esteem (Turner, 1975; Tajfel and Turner, 1979).

Following these mechanisms, social identity theory gives an explanation why individuals prefer others whom they perceive to belong to the same ingroup along certain dimensions which are relevant enough to serve as bases of categorization. It is crucial to highlight, though, that categorisation is a dynamic and context-dependent process based on the cognitive grouping of environmental stimuli, which therefore works based on individuals’ perceptions about their peers. Consequently, they will prefer others whom they *perceive* as similar to themselves more than based on their *actual* levels of similarity (or, in this case, similarity in self-identifications).

The dimensions relevant enough to serve as bases of intergroup comparisons vary and depend on the context. Although minimal group experiments show that even ad hoc group memberships without real content can lead to giving preferential treatments to those signalled as “ingroup members”, some distinctions are more meaningful and have more serious consequences than others (see Tajfel and Turner, 1979). Research on homophily in the field of social network analysis implies that race and ethnicity are amongst the most important dimensions of ingroup and outgroup perceptions (see McPherson et al., 2001).

Through categorization processes, social groups provide their members with an ingroup identification, and the perception of a relevant outgroup. As a result of these comparisons, social identity is created, and the ingroup is evaluated as better or worse than the outgroup, also defining oneself as better or worse than members of the outgroup. In situations when the ingroup’s social identity is perceived as more

negative than that of the outgroup's, the individual will normally strive to increase his or her social identity, in order to achieve a satisfactory self-esteem. Tajfel and Turner (1979) proposed a number of strategies to deal with these situations. The final purpose of all of them is to improve individual self-esteem, which can be achieved together with the given ingroup, or individually. Therefore these strategies strongly influence cross-race and same-race social ties as well.

5.3.1 Social Creativity

A possible strategy to achieve positive distinctiveness is redefining or altering the elements of the comparative situation. This is a group strategy rather than an individual one, and it does not affect the actual allocation of objective resources, only the subjective interpretation of the social situation (Tajfel and Turner, 1979).

Social creativity includes multiple distinct options to enhance social identity. First, it is possible to change the relevant outgroup of comparison. This can play an important role in interracial situations where multiple racial groups are present; in our study, this option is not available for the minority group, since there are only two groups in the classrooms. Another option is to change the values assigned to each group, therefore the characteristics that have been evaluated as negative for the ingroup will count as positive values. Finally, group members can find new relevant dimensions for comparisons, along which their group can be evaluated as more positive (Tajfel and Turner, 1979). Empirical results show that this last scenario has a crucial importance in educational settings in general: students whose ingroup is (self-)evaluated as worse based on "traditional" dimensions often deal with their lower-status this way. As an example, a study on university students finds Manchester students to evaluate Oxford ones as superior to them on academic dimensions such as "hard-working", "self-assured", "articulate" and "intellectually minded", but at the same time, to rate their ingroups more positively in non-academic dimensions, such as "practically minded", and especially in social dimensions like "easygoing", and "aware of trends in music and fashion" (Spears and Manstead, 1989). In an interracial context, the "acting white phenomenon" can be understood as an example for this: because it is traditionally not acknowledged that black Americans are capable of intellectual achievement, black students begin to doubt and hide their own intellectual ability during their socialization process, and define academic success as white people's privilege (Fordham and Ogbu, 1986). Instead of encouraging academic efforts, black peer communities often emphasize and reward other dimensions they perceive themselves to be better at: sports, (certain types of) music. Research on

black former collegiate athletes suggests that parents also tend to encourage sports as an opportunity for success as opposed to other ways (Beamon, 2009). The following quote from one of the ex-athletes, now a police officer, provides some qualitative insight into this socialization process.

“Even on my job now where I have kids that are bad or whatever and I try to talk to ’em I ask them what are you gone be, its either I’m a play football or basketball or either I’m a be a rapper and so when you try to point out to ’em its okay to get an education and be smart. I don’t think that in the Black community now, I don’t think that it’s really emphasized on education. It’s just more glorified from what we see most Black young people being and that’s a rapper or that’s a sports entertainer of some fashion. Education is not really ya know just not the goal and the focus.”
(Beamon, 2009, p. 14)

If members of the lower-status racial group choose social creativity to improve their social identities, there might be no conflict between the racial groups and interracial negative ties do not necessarily form. However, if this means that minority students do not consider dimensions traditionally important for later success as something they can be good at and they should concentrate on, it can still contribute to the reproduction of social inequalities.

5.3.2 Direct Competition

Another strategy to achieve positive distinctiveness is trying to reverse the relative positions of the ingroup and the outgroup, which is an essentially competitive process. The more it is related to redefining the distribution of scarce resources the more likely that competition will be accompanied by antagonism or conflict between the groups, since it challenges the position of the groups in the established social hierarchy (Tajfel and Turner, 1979). This is also in accordance with the ethnic competition theory (Olzak, 1992), suggesting that social identity processes intensify in case of real or perceived intergroup competition, which induces perceived threat, and therefore causes negative inter-group attitudes (Bobo, 1983; Scheepers et al., 2002; Coenders et al., 2004; Savelkoul et al., 2011). As a qualitative example for this, a black owner of a major business in Miami describes the competition between Cubans and blacks in the following way:

“There is also a growing number of Cuban-owned businesses in Black neighborhoods but they don’t hire Blacks. For example, I was in a drug-store a couple of weeks ago and there was a Cuban lady at one of the cash registers. I went to her and she didn’t even want to talk to me. I thought to myself, ‘Talk to me, if I’m going to leave my money here, you ought to learn how to speak English.’ They come in our areas, they take our jobs, they take our dollars, and don’t even have the decency to learn the language!” (Portes and Stepick, 1993, p. 12)

Violent conflicts between racial groups even emerge during adolescence, as a Puerto Rican drug dealer in New York describes his early teenage years:

“I was chillin’ out most of the time in junior high. But they had like a wild war out there - black against Puerto Ricans - and the Puerto Rican kids used to get beat up real crazy.” (Bourgois, 2003, p. 174)

In educational context, evidence supports that adolescents use aggression to achieve or maintain the status of their ingroup (Faris and Ennett, 2012; Faris, 2012). Research often, but not always, finds evidence for cross-race dislike relationships and negative interracial attitudes in school classes (Hartup, 1993; Stark and Flache, 2012). As a behavioural outcome, the prevalence of bullying might also be higher among racially different students, with both minority and majority students serving as bullies and victims as well (Vervoort et al., 2010; Tolsma et al., 2013). This also demonstrates that interracial conflict arises in some, but not in all, formally mixed communities.

5.3.3 Individual Mobility

Yet another strategy for dealing with negative social identity is dissociation from the original ingroup: that is, individuals might try to leave their group and join a more positively perceived one (Tajfel and Turner, 1979). Generally speaking, the more the idea of the individual mobility represented in a person’s system of beliefs the more likely that he or she will try to dissociate from the group in order to join another one.

When the basis of the social identity processes is race, individual mobility indicates a change in someone’s racial identifications. We described existing evidence earlier that racial group memberships can change over time. In several cases, these changes are consequences of direct assimilation efforts (Tajfel and Turner, 1979; Portes and Sensenbrenner, 1993; Saperstein and Penner, 2012). Moreover, we defined race as a multidimensional concept: individuals are not necessarily perceived in the same way

they self-identify (Saperstein and Penner, 2012). Since the social identity approach proposes that categorization is based more on perceptions than (externally given) attributes of others, the crucial part is someone's race categorized by others. Therefore, for individual mobility the key seems to be whether others, especially from the target ingroup, will accept the new self-identification of those choosing this strategy. At the same time, in communities where race is a relevant dimension of categorization and group perceptions, choosing a certain racial identification also has a signalling function about the social status the individual aims to achieve.

Consequently, the importance and meaning of each identifying characteristics always depends on the context and the relative status each group has, together with the opportunities they can provide for their members. Portes and Sensenbrenner (1993) describe this in the following way:

“In this regard, the use of Spanish in Miami and in the Bronx is instructive. In the Bronx, shifting to English and anglicizing one's name is a sign that the individual aspires to move up by leaving behind his or her ethnic community. In Miami, the same behavior would bring exclusion from the business networks of the enclave and the unique mobility opportunities that they make available. In both instances, public use of Spanish signals membership in the ethnic community, but the socioeconomic consequences are very different.” (Portes and Sensenbrenner, 1993, p. 1343)

The strategy of individual mobility is, therefore, an individualist approach: the position of the person who leaves the group might change, but this will not improve the low status of the original group (Tajfel and Turner, 1979). Moreover, on the longer term it probably even further decreases it, especially if individual mobility is not easy and requires good skills and abilities. In this case, those who can “make it” outside of the group leave the rest in an even worse position than before (Portes and Sensenbrenner, 1993). Consequently, this strategy is destructive for group solidarity in the subordinate group (Tajfel and Turner, 1979). As a result, it can be expected that members of this group will consider those as “traitors” whom they perceive to belong to their ingroup but who, at the same time, identify with the higher-status outgroup. The following quote from a Puerto Rican man illustrates this phenomenon for the above described Bronx-context:

“When you see someone go downtown and get a good job, if they be Puerto Rican, you see them fix up their hair and put some contact lens

in their eyes. Then they fit in. And they do it! I have seen it! Look at all the people in that building, they all turn-overs. They people who want to be white. Man, if you call them in Spanish it wind up a problem. I mean like take the name Pedro - I'm just telling you this as an example - Pedro be saying (imitating a whitened accent) 'My name is Peter.' Where do you get Peter from Pedro?" (Bourgois, 2003, p. 170)

Due to seeking positive self-esteem, individuals generally try to preserve the overall positivity of their ingroups. Therefore, the black sheep hypothesis (Marques et al., 1988), a modifying element of ingroup favouritism, suggests that judgements about ingroup members are more extreme than those about outgroup members, whether positive or negative. Therefore, those choosing the individual mobility strategy can be rejected by their former ingroup members even more than outgroup members are. This process can, therefore, also serve as a basis of certain types of negative relationships and conflict in communities.

5.3.4 Outgroup Preference

Even though there are at least three strategies for members of the lower-status group to improve their social identities with or without their groups, these are not always perceived as "real", available options. In cases when social structural differences in the distribution of resources have been institutionalized, legitimized, and justified through a consensually accepted status system, or through a status system that has no cognitive alternatives for the participants, the result might be the lower-status group internalizing the wider social evaluation of itself as inferior (Gregor and Mcpherson, 1966; Milner, 1975; Tajfel and Turner, 1979). Although this strategy does not change the group's negative social identity, it can enhance the individual's self-esteem, which is the underlying psychological need. In this case, members of the lower-status group tend to show positive attitudes towards the outgroup and, at the same time, to derogate their ingroup. The following quote demonstrates attitudes of those showing outgroup preference towards their ingroup members.

"If anything when you look at me you know I'm Hispanic. When I jog down the neighborhood, people get scared. It's not a problem for me because I have self-confidence. Every once in a while I used to get a crank call in the house, saying 'Hey, spic,' you know 'spic' and other stuff, but I don't worry about that. In a sense, I've learned to be in their shoes. You

see what I mean. Because I've seen what minorities as a group can do to a neighborhood. So I step into their shoes and I understand, I sympathize with them. Cause I've seen great neighborhoods go down." (Portes and Sensenbrenner, 1993, p. 1943)

We can see that this strategy also affects intergroup relations. In this case, attitudes, affections and relationships between the social groups might become (and stay) asymmetric: the higher status group shows ingroup favouritism, while lower-status group develops outgroup preference.

5.4 Conclusions

Based on the research introduced in this chapter, strategies chosen by the lower-status social group members to enhance their self-esteem seem crucial in understanding positive and negative relationships and their dynamics. In the next chapters, we will set up and test hypotheses based on the potential effects of these strategies on social ties in cross-sectional and dynamic models.

Chapter 6 will provide us with a snapshot about same-race and cross-race friendships and negative ties in school classes, also taking the network structure into account. The importance of this was already emphasized in Section 4.1. Then, Chapter 7 and 8 will give us a more detailed insight into the evolution of these relationships. In these chapters, we will build the models step by step, in order to see the effect of different structural features (Chapter 7), and finally, we estimate a model of the co-evolution of friendships, negative ties and racial perceptions (Chapter 8).

Chapter 6

A Snapshot of Relational Integration

6.1 Introduction

As we argued in Chapter 5, it is important to examine racial integration both as a state and as a process. This way, it is possible to see the likelihoods of same-race and cross-race relationships in the community, and to understand how these change in consequence of the racial mixing. As a natural first step, this chapter focuses on the relative prevalence of friendships and negative ties within and between racial groups, defining race in two different ways: based on self-identifications, and based on perceptions of peers. For this, we estimate cross-sectional exponential random graph models (Snijders et al., 2006; Robins et al., 2007; Lusher et al., 2012). This way, we are able to control for endogenous network characteristics of the groups that can also strongly affect the formation of these different relationship types (about the role of structure, see more in Chapters 4.1 and 7).

6.2 Theory and Hypotheses

6.2.1 Ingroup-Favouritism in Friendship Ties

In Chapter 5, we introduced the basics of the social identity approach (Tajfel, 1974; Turner, 1975) and its implications for our research questions. Most importantly, the phenomenon of ingroup-favouritism 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 racially heterogeneous classes we should see students from the same

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race giving preferential treatment to each other and being friends with 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 this chapter, we focus on the relative likelihood of same-race and cross-race relationships. If ingroup-favouritism implies that individuals prefer those similar to themselves, we can expect to see this in the friendship patterns of the groups as well. Minority students should be more likely to be friends with other minorities, while majority students with other majority students, than cross-race friendships. In connection with these theoretical considerations and empirical results, we hypothesize that

H1: cross-race friendship nominations are less likely than those within the same racial group.

6.2.2 Negative Ties

While ingroup-favouritism is a general phenomenon that seems to appear in most intergroup situations (Tajfel, 1974; Turner, 1975), negative ties in communities show much more heterogeneity in their patterns across social contexts (Tajfel and Turner, 1979). Thus, inter-group hostility should not be oversimplified into a parallel phenomenon with ingroup favouritism; in fact, these are conceptually quite distinct (Allport, 1954; Brewer, 1999). In case of perceived inter-group competition for resources or power, intergroup conflict and prejudice are found to be related to ingroup cohesion, but otherwise they seem essentially independent (Brewer, 1999).

Empirical evidence for heterophobia, that is, the rejection of dissimilar others, is also less strong than evidence for homophily (Flache and Mäs, 2008; Csaba and Pal, 2010). According to Blau (1977), students tend to dislike their peers from different social backgrounds, which is often related to race. Besides, children and adolescents tend to exclude those of dissimilar racial background, gender and age (Hartup, 1993).

In Chapter 5, we described various strategies that members of the lower status social group can follow to increase their lower social identity and/or improve their individual self-esteem. Some of these strategies implicate stronger, and different kinds of, conflicts between individuals than others. In the following subsections we will formulate different, and sometimes competing, hypotheses implied by different strategies;

this also means that our results will give us some insight in how members of the lower status social group deal with their situations in our sample.

6.2.3 Social Creativity

The strategy of social creativity is based on redefining or altering the group comparison process (Tajfel and Turner, 1979). This is a group strategy rather than an individualistic one, since the modified evaluation (positively) affects the whole ingroup. Therefore, unlike more individualistic strategies, it is not dangerous for the ingroup cohesion. Moreover, it does not affect the actual allocation of objective resources, therefore it is not likely to create disproportionate amount of negative ties between groups, either. Therefore, if this strategy is popular in our communities, we can expect that

H2: cross-race negative nominations are *not* significantly different in likelihood from same-race negative nominations.

6.2.4 Direct Competition

In case of direct competition, the lower status group makes efforts to reverse the relative positions of the social groups (Tajfel and Turner, 1979). Since perceived competition, by inducing and enhancing perceived threat, is related to negative intergroup attitudes (Bobo, 1983; Scheepers et al., 2002; Coenders et al., 2004; Savelkoul et al., 2011), we expect that in case of direct competition in our sample, intergroup hostility would appear. Therefore, if students in our groups follow this strategy, we hypothesize that

H3: cross-race negative nominations are more likely than same-race ones.

6.2.5 Individual Mobility

Mobility between social groups is a highly individualistic strategy for enhancing social identity. This way, the individual does not contribute to the development of the group's social identity but instead, tries to leave the group and join a more positively perceived one (Tajfel and Turner, 1979). As we describe in Chapter 5, this is destructive of group solidarity, and individuals following this strategy may be perceived as "traitors" by their former ingroup peers. This should be especially true if other group members, at the same time, follow the strategy of direct competition.

Furthermore, the black sheep hypothesis (Marques et al., 1988) suggests that negative judgements about ingroup members are more extreme than those about outgroup members, regardless whether positive or negative; therefore, those choosing the individual mobility strategy are probably strongly rejected by members of their (former) ingroup; or by those minority peers who perceive them as their ingroup members. Consequently, if the strategy of individual mobility is followed by students in our sample, we should see that

H4: self-identified minority students are unlikely to name those peers as friends whom they perceive as minorities but who, at the same time, identify with the majority group; and

H5: self-identified minority students tend to dislike these peers.

6.2.6 Outgroup Preference

Outgroup preference refers to a situation in which members of the lower status group do not try to improve their social identity as a group, instead they internalize the wider social evaluation of their group as inferior (Gregor and Mcpherson, 1966; Milner, 1975; Tajfel and Turner, 1979). This way, they try to enhance their self-esteem without aiming for positive social identity; they show positive outgroup attitudes, while often derogate their ingroups. In this case, ingroup favouritism is only present in the higher status social group, while members of the lower status group might also show preference for their peers from the higher status group.

To translate these to social ties, we can expect that students in the lower status group are likely to prefer outgroup friendships, and even make friendship efforts towards their peers in better positions. Therefore, an expectation could be that they actually nominate more outgroup members as friends than they do ingroup members. However, our data refer to students' *perceptions* of friendships ("He/she is my friend") instead of their friendship *preferences*. In other words, we cannot expect that outgroup preferences can be fully captured by friendship nominations in social networks data - just because an individual wishes to be friends with certain peers, he or she will not name them as friends in the questionnaire without any actual basis for the perception of friendships. Nevertheless, we can still expect that minority students expressing outgroup preference are more open towards outgroup friendships, and are more willing to consider or interpret existing, but maybe weaker positive relationships as friendships, than the other way around. Therefore, if students in our sample follow this strategy, we hypothesize that

H6: minority students are more likely to send positive nominations to their majority peers than the other way around, and

H7: minority students are less likely to send negative nominations to their majority peers than the other way around.

6.3 Model

For the analysis, exponential random graph models (ERGMs) are estimated. The method, which is designed for cross-sectional analysis of social networks, is introduced and in Section 4.2. We analyse a subsample of 16 school classes, which is described in Section 3.1.1. Variables serving as a basis of our analysis are also summarized earlier, in Section 3.2; the exact ways they enter the models will be introduced in the next subsections.

In the first step of analysis, separate ERGMs are estimated for each school class in the sample. For every class, we fit a set of models with the dependent variable of friendship, and another set with the dependent variable of negative ties. In the next step, class-based results are analysed together in a meta-analysis to study the general tendencies for the two model types. The process of the meta-analysis is described in Subsection 4.4.1

6.3.1 Race Effects

For testing our hypotheses, we estimate models for both the friendship (+) and negative (-) networks. In the friendship models, the dependent variable is whether *Ego* nominates *Alter* as a friend, and in the negative ones whether *Ego* nominates *Alter* as a disliked person. Moreover, we design three different types of models based on the two aspects of race: including only self-identified race (Model A), only perceived race (Model B), and both (Model C) for *Alter*'s racial self-identification. 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 race effects applied, and +/- signs stand for the type the dependent network.

In the first two models (A and B), we test the same hypotheses using different aspects of *Alter*'s race (self-identified or perceived by *Ego*). Model C uses these different measurements simultaneously, which allows us to examine the results of the discrepancies between self-declaration and sender-perception of ethnicity, which is necessary for H4 and H5.

In each model, therefore, we include *Ego*'s racial self-identification. In Model A, we also include *Alter*'s racial self-identification and the interaction between *Ego*'s and *Alter*'s self-identifications. Model B differs from Model A in the sense that here we use another measurement for *Alter*'s race: *Ego*'s perception about *Alter*. In this model, we also include the interaction between *Ego*'s racial self-identification and *Ego*'s perception about the *Alter*'s race - therefore, in Model B, everything is modelled from *Ego*'s perspective, both his/her and *Alter*'s race. In model C, both measurements of *Alter*'s race mentioned above are included, together with the two interaction effects. Racial self-identification is included as an individual covariate, and perceived race as a dyadic covariate, therefore the perceived race of a given *Alter* does not have only one value but can be different in different dyads. Note that the variables are not centered, therefore in every model, the value 0 refers to majority, and 1 to minority students; in case of interactions, the value is 1 if both *Ego* and *Alter* are (self-declared or perceived) minority members.

6.3.2 Gender and Socio-Economic Status Effects

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

6.3.3 Structural Effects

In the models, we also include endogenous network effects to represent the group structure. The applied effects are somewhat different for friendship and for negative models. While reciprocity and degree-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 might be advisable to control for isolates or one-sided isolates in negative models. For the model specifications, especially for the rarely analysed negative networks, examples of Robins and Lusher (2012) and Huitsing et al. (2012) guide our selection. We start with an initial set of effects corresponding to the theoretical ideas explained above, and the examples in these papers. This initial specification

is modified if the model did not converge for all school classes. Variables seeming to cause divergence in some cases are excluded, and new structural effects are included which has seemed to be represented poorly before, based on the goodness of fit statistics. We continue with this process to refine the models until we reached a final model specification for both friendship networks and for negative networks that converge for every school class these are the ones we subsequently present in this paper. Appendix A summarizes which structural effects were use in the friendship and in the negative models.

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

6.4 Results

6.4.1 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. Here we present some statistics about friendship, negative ties and ethnicity - some more can be found in 3.3.

Table 6.1 provides us with descriptives about friendships and negative ties, separately for (self-identified) minority and majority students. First, we compare average indegrees, that is, the number of incoming ties, and outgredrees, that is, the number of outgoing ties for these two groups. In the friendship networks there is little difference between the average incoming nominations of minority and majority students, although majority students receive slightly more ties; however, minority students nominate more. In negative networks, minority students both send and receive somewhat more nominations than their majority peers. This suggests that minority 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.

In Table 6.1, we present the shares of different inter-ethnic and same-ethnic nominations of all ties. First, we calculate what proportion of the friendship ties are sent and received by minority and majority students, defining ethnicity based on self-declarations. We find that 60% of the ties are within the same ethnic group, and 40% of them are inter-ethnic. Obviously, these values are highly dependent on

Average degrees							
Friendship				Negative			
In-degree		Out-degree		In-degree		Out-degree	
Minority	Majority	Minority	Majority	Minority	Majority	Minority	Majority
4.73	4.87	5.21	4.69	3.10	3.24	3.06	3.21

Share of all ties, *Alter*'s ethnicity based on self-declaration
(Minority proportion based on self-declaration: 38%)

Friendship		
	<i>Alter</i>	
<i>Ego</i>	Majority	Minority
Majority	53%	15%
Minority	25%	7%
Negative		
	<i>Alter</i>	
<i>Ego</i>	Majority	Minority
Majority	44%	24%
Minority	22%	10%

Share of all ties, *Alter*'s ethnicity based on *Ego*'s perception
(Minority proportion based on self-declaration: 38%; minority nomination density: 21%)

Friendship		
	<i>Alter</i>	
<i>Ego</i>	Majority	Minority
Majority	59%	6%
Minority	21%	14%
Negative		
	<i>Alter</i>	
<i>Ego</i>	Majority	Minority
Majority	53%	15%
Minority	25%	7%

Table 6.1: Dependent Networks by Self-Declared Ethnicity

the class compositions, therefore they cannot indicate homophily and heterophobia themselves. However, it is interesting that minority students nominate their majority 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 are inter-ethnic, and 54% are within the same ethnic group. Here, we do not find a large difference between the minority-majority and the majority-minority nominations (22% and 24%, respectively). When instead of self-declarations, we define both *Ego*'s and *Alter*'s ethnicity from *Ego*'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.

6.4.2 ERGM Results

After these descriptive statistics, here we present the results of our exponential random graph models, which also take network dependencies into account. At the end of the estimation process, all of our models converge for every parameter based on the t-statistics for convergence ($t < 0.1$). Our models also meet 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 s.d. = 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 is lower than 0.1 for almost all included variables and lower than 0.15 for all of them; and it is 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 is 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 Table 6.2 and Table 6.3, results for the friendship and negative models are presented (also see Appendix J 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

	Model A+			Model B+			Model C+			N of groups
	Estimate	(SE)		Estimate	(SE)		Estimate	(SE)		
<i>Structural</i>										
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
<i>Ethnicity</i>										
Ego Minority	-0.141	(0.109)		-0.056	(0.121)		-0.163	(0.114)		16
Alter minority self-declared	-0.143	(0.079)					-0.179	(0.089)	*	16
Ego*Alter	0.643	(0.162)	*				0.518	(0.171)	*	16
Alter minority sender-perceived				0.012	(0.138)		0.093	(0.115)		16
Ego*Alter				0.808	(0.139)	*	0.450	(0.188)	*	16
<i>Gender</i>										
Boy Ego	-0.365	(0.066)	*	-0.388	(0.066)	*	-0.400	(0.069)	*	14
Boy Alter	-0.256	(0.077)	*	-0.263	(0.077)	*	-0.284	(0.079)	*	14
Ego*Alter	0.770	(0.087)	*	0.808	(0.085)	*	0.832	(0.088)	*	14
<i>Socio-economic status</i>										
SES of Ego	0.035	(0.045)		0.057	(0.042)		0.056	(0.042)		16
SES of Alter.	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

Table 6.2: Meta-Results for Friendships

between-classroom standard deviations, and test-statistics whether there is a difference between parameters among schools) can be found in the Appendix 1 and 2 (for friendship ties and negative ties, respectively).

From these results we can conclude that Roma ethnicity plays an important role in relationship formation, even after controlling for gender and socio-economic status. Both in the friendship and the negative models, there are several significant ethnicity variables, including main *Ego* and *Alter* (or perception) effects, and interactions as well. For a more detailed interpretation, we calculate the conditional odds ratio for each kind of nomination, compared to majority-majority nominations as a reference category. For that, we use the *Ego* minority effect (when *Ego* is self-declared Roma), the *Alter* self-identified minority effect (when the *Alter* is self-declared Roma), the minority perception effect (when *Ego* perceives *Alter* as Roma), and the two in-

	Model A–			Model B–			Model C–		N of groups
	Estimate	(SE)		Estimate	(SE)		Estimate	(SE)	
<i>Structural</i>									
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
<i>Ethnicity</i>									
Ego Minority	0.352	(0.195)		0.189	(0.183)		0.365	(0.213)	16
Alter minority self-declared	0.333	(0.188)					0.065	(0.109)	16
Ego*Alter	-1.023	(0.279)	*				-0.420	(0.190)	16
Alter minority sender-perceived				0.593	(0.129)	*	0.505	(0.124)	16
Ego*Alter				-0.572	(0.203)	*	-0.194	(0.223)	16
<i>Gender</i>									
Boy Ego	-0.213	(0.087)	*	-0.236	(0.160)	*	-0.212	(0.089)	14
Boy Alter	0.129	(0.084)		0.120	(0.079)		0.059	(0.085)	14
Ego*Alter	0.211	(0.194)		0.207	(0.193)		0.473	(0.164)	14
<i>Socio-economic status</i>									
SES of Ego	0.007	(0.030)		0.021	(0.036)		0.022	(0.032)	16
SES of Alter.	-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

Table 6.3: Meta-Results for Negative Ties

teractions (when both *Ego* and *Alter* declared themselves as Roma; and when the self-declared Roma *Ego* perceived *Alter* as Roma). For each cell, differences from the reference cell are calculated using a Wald-test (for more information about this test, see Chapter 4.5). Table 6.4 and 6.5 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 minority and majority categories were used, which refer to self-identified and perceived minority (majority) status, respectively. In case of Model C, the category “Consistent” minority means that someone was both self-identified and perceived so, and there are two more categories added for those who were only self-identified (but

		Alter's ethnicity			
		Majority	Minority		
Ego's ethnicity (self-identified)					
Model A+	Majority	1	0.866 ⁺		
	Minority	0.869	1.589 **		
Model B+	Majority	1.000	1.012		
	Minority	0.946	0.641		
		Majority	"Consistent" minority (in both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
Model C+	Majority	1	0.922	0.836*	1.098
	Minority	0.850	1.656**	1.187	1.191

+ $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$
Reference category: majority - majority nomination

Table 6.4: ERGM results: Ethnicity and Friendship Ties Selection Table

not perceived by *Ego*), or only sender-perceived (but not self-identified) minority students.

First, Hypothesis 1 posits that cross-race positive nominations are less likely than positive nominations within the same racial group. These differences are modelled by the minority *Ego*, the minority *Alter* and/or minority perception effects (minority *Alter* in Model A, minority perception in Model B, and both in Model C), and the related Interaction effects. Table 6.4, Model C+ shows that minority-minority nominations are more likely than the reference category, that is, majority-majority nominations (OR = 1.66, $p < 0.01$). However, cross-ethnic nominations are not significantly less likely than the reference category (OR = 0.85, for minority-majority, OR = 0.92, for majority-"consistent" minority nominations, $p < 0.1$ in both cases). Therefore, Hypothesis 1 is partly confirmed: positive nominations are more likely within the minority group, but not significantly more likely within the majority group than nominations between groups. Moreover, Model C+ shows that the combination of self-declared and perceived ethnicity also matters: minority students prefer other minority students only when they have a "consistent minority identification", that is, they are perceived as minorities by themselves as well as by *Ego*. Only self-identified, or only *Ego*-perceived minority peers are 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

		Alter's ethnicity			
		Majority	Minority		
Ego's ethnicity (self-identified)					
Model A–	Majority	1	1.395 ⁺		
	Minority	1.421 ⁺	0.811		
Model B–	Majority	1.000	1.809 ***		
	Minority	0.946	0.779		
		Majority	"Consistent" minority (in both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
Model C–	Majority	1	1.754 **	1.067	1.656 ***
	Minority	1.440 ⁺	1.197	0.836	1.987 **

⁺ $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Reference category: majority - majority nomination

Table 6.5: ERGM results: Ethnicity on Negative Ties Selection Table

focusing on the models using only one type of Roma ethnicity (Model A and Model B).

Second, Hypothesis 2 and 3 formulates competing predictions: according to H2, cross-race negative nominations are *not* more likely, while according to H3, these *are* more likely than negative nominations within the same racial group. Table 6.5, Model C- demonstrates that perceived ethnicity has a more important role in this than self-declared ethnicity: majority students tend to dislike those whom they perceive as minorities, regardless of these students' self-identifications (OR = 1.75, $p < 0.01$ for *Alters* with "consistent" minority identification, OR = 1.66, $p < 0.001$ for perceived, but not self-identified minority Receivers). Nominations sent by majority students towards those whom they perceived as majorities do not significantly differ based on the *Alter's* self-declaration (OR = 1.07, $p > 0.1$). Besides, minority students tend to send more negative nominations to majority 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 minority *Egos* to those with consistent minority status do not differ significantly from majority majority nominations (OR = 1.20, $p > 0.1$). Therefore, this is at least partial evidence for our third hypothesis that inter-ethnic negative nominations are more likely than negative nominations within the same group; it certainly supports it for majority students, however, it is weaker evidence for minority students. This means that at

the same time, we have to, at least partly, reject implications H2, since at least majority students showed strong outgroup rejection.

Our hypotheses 4-5, related to the black sheep phenomenon, predict that minority students are less likely to nominate those as friends whom they perceive as minorities, but who, at the same time, identify with the majority group. In the negative networks, we expect a larger likelihood for a tie in these cases. Both of these effects are presented in the friendship and negative tables, by the minority *Ego* and perceived minority (but self-declared majority) *Alter* cells (OR = 1.19, $p > 0.1$; OR = 1.99, $p < 0.01$, respectively). This does not confirm H4, as there is no significant effect in the positive networks. However, it confirms H5, 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 minority, but also majority students are very likely to send negative ties towards those whom they perceive as minorities, but who nevertheless did not declare themselves so. The combination of these two results suggests that the discrepancy between the declared and the perceived race plays a crucial role in negative tie formation. This kind of discrepancy had less impact on positive relations; however, we find a similar phenomenon for friendship ties as well. The emergence of positive relations is less likely only in dyads in which *Ego* declare him/herself as a majority member and perceived *Alter* as a majority student as well, while *Alter* identified with the minority group. 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 6, minority students are more likely to send friendship nominations to majority students than the other way around. For this, we have to compare the likelihood of a nomination from a minority *Ego* to a majority *Alter*, and a nomination from a majority *Ego* to a minority *Alter*. This difference is not directly modelled in our analysis, and is neither included in Table 6.4 since the selection table is designed with the majority-majority nomination type as reference category. However, it can be calculated as a comparison of the minority *Ego* and the minority *Alter* or minority perception tie effects. Therefore, we run additional Wald-tests to see if the estimated parameters for these variables differ significantly from each other. Our results show that in the positive models, there are no significant differences between the minority *Ego* and minority *Alter* or perception tie effects in any of the models, therefore we cannot confirm the sixth hypothesis. Hypothesis 7 formulates similar predictions for the negative networks, that is, minority students are less likely to send

negative nominations towards their majority classmates than the other way around. Wald-test results on Model A- shows that when only taking ethnic self-identifications into account, majority-minority nominations are not significantly more likely than minority-majority nominations ($OR = 1.02, p > 0.1$). However, in Model B- the difference is large and significant: majority students seem to be more likely to send negative ties toward those whom they perceive as minorities than vice versa ($OR = 1.50, p < 0.01$). When taking both measurements into account (Model C-), the results suggest that majority students nominate self-identified minority students less, but those whom they perceive as minorities 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 minorities but are not perceived so by a majority *Ego* are more likely to send negative ties towards this *Ego* than the other way around, which is understandable since *Ego* perceives this dyad as a same-group one, while *Alter* perceives it as a cross-group one. At the same time, those who are perceived as minority students but declared themselves as majorities are less likely to nominate *Ego* in the negative networks than vice versa; this can be also explained based on the same logic. We also compare whether students who have consistent minority status are more or less likely to send negative ties towards their majority peers; the results of the Wald-test show that they tend to dislike their majority peers less than the other way around ($OR = 0.82, p < 0.05$). Therefore, when both students perceive their dyad as a cross-ethnic one, the majority one will reject the minority classmate more than vice versa. This supports Hypothesis 7, and it also highlights the importance of racial perceptions, since these asymmetric relationships did not have any indications in the models only using ethnic self-identifications.

Together with the meta-analysis, measures for between-classroom differences are also calculated, and are presented in Appendix B. These tables show that when including all the ethnicity effects, parameters for the minority variables do not differ significantly among classes, except for the *Ego* effect for friendship networks (Appendix B, model C+: $p < 0.05$). Here, our results suggest that although the average *Ego* 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 occur more often.

Finally, every friendship model suggests significant gender homophily, but we do not find evidence for gender heterophobia. This means that even though gender and ethnicity are both important factors of friendship formation in these classrooms, they influence negative ties differently. In addition to this, *Alters* from better social

backgrounds are more likely to receive friendship nominations and less likely to get negative nominations from *Ego* regardless of *Ego*'s own social background. This also suggests that statistical relationships between social ties and ethnicity cannot be explained by differences in socio-economic status.

6.5 Conclusions

The goal of this chapter was to explore important characteristics of cross-race friendships and negative relationships in order to see which aspects of relational integration appear cross-sectionally in these networks. Furthermore, we focused on two different aspects of race, that is, self-identification and peer-perception, for investigating more deeply the different dimensions of racial integration, and also for analysing the effect of the possible discrepancies between someone's self-identified and perceived race.

Following social identity theory (Tajfel, 1974; Turner, 1975), 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. We found evidence than indeed, friendships are more likely within than between groups. Moreover, Tajfel and Turner (1979) argue that there are multiple sufficient strategies to develop positive social identity and increase or maintain positive self-esteem. The first one is social creativity, which should not induce negative interethnic relationships, since it only cognitively redefines certain elements of the social comparison process. Therefore, we hypothesized that in case of social creativity, inter-ethnic negative ties would not be significantly more likely than those within ethnic groups. The second one is social competition, which is likely to involve conflict between the groups, hence inducing negative intergroup relations. Therefore, if our students choose this strategy, we can expect negative ties to be more likely between than within groups. In our analysis, we found evidence that majority students tend to exclude their minority peers, partially confirming H2 and rejecting H1. Minority students also showed some outgroup rejection; however, in their case the parameter was only marginally significant ($p < 0.1$), thus, we must be cautious with the interpretation. Since this does not seem enough evidence to confirm or reject either H1 or H2 for minority *Egos*, this question will require further analysis in the future.

Tajfel and Turner (1979) also suggest that for those in the lower-status social group, a third 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, minority 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 with the majority group. Other minority students might, therefore, see them as “traitors” of their “original” ethnic group; especially if they themselves have decided to compete with the majority group. Based on this and the black sheep hypothesis, we expected minority students to reject those whom they perceived minorities, but who, at the same time, perceived themselves as majorities. Indeed, while we found our minority participants to have a higher tendency for homophily, their friendship nominations were more likely to be sent only towards those whom they perceived as minorities and who perceived themselves as minorities as well. Towards those whom they perceived as minorities but who perceived themselves as majorities, minority 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 indeed a strategy chosen by certain students in classrooms in secondary schools. Our results also show that the social exclusion of these students was exacerbated by being rejected by those majority classmates who also perceived them as minorities. It is important to note, however, that the perception of ethnicity does not necessarily follow the same pattern among minority and majority students (and varies even within these categories). Also, due to the cross-sectional nature of the study, we cannot exclude some alternative explanations for this. Though here we interpreted our results that minority students who turn to majority students get rejected by their same-race class-mates, but it is, in theory, equally possible that they are rejected by their minority peers first and therefore seek friendships with majority students. This in the end would also lead to attempts for individual mobility.

Finally, Tajfel and Turner (1979) argued that there is a fourth strategy for members of the lower-status group to enhance self-esteem, but without improving social identity. In these cases, the lack of positive group self-esteem and/or internalized inferior position in the status system can bring subordinate group members to display positive attitudes toward 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 argue that members of the low status minority group would be more likely to be rejected by their majority peers than vice versa, and minority students might even have a preference for majority peers in certain situations. We found that indeed, majority students tended to exclude those who they perceived minorities by sending negative nominations towards them regardless of their ethnic self-declaration. This rejection, however, was

less reciprocated by minority students. The fact that minority students showed a more positive behaviour towards majority students than the other way around shows that the third strategy, that is, outgroup preference can also be observed in the school context.

We argued earlier that even if students have only a relatively small number of friends from the other racial group, racial 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 just yet, for a number of reasons. Of these, the most important factor to mention at this stage of the thesis is the cross-sectional study design, which only captures a snapshot of these communities. As discussed earlier, such cross-sectional steps are very important, because they show the likelihood of the presence of different kinds of interracial and same-race 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 chapters (Chapter 7, 8) we investigate the factors of relationship changes between ethnically different students for a more detailed picture. Moreover, we argue that both racial perception and racial self-identification depend on the social environment and interpersonal relations. Consequently, not only does race affect social ties, but also the other way around. Therefore, in a longitudinal analysis we should not only model relationship formation based on race, but also the evaluation of perceived race and racial self-identification based on other variables including relationships. This problem, however, will be also addressed in Chapter 8.

Besides this, there are a number of other reasons suggesting that integrated education can still be a good tool to achieve relation integration. Our argument about these, together with limitations of our analyses will be discussed in Chapter 9. This chapter, however, already shows us that examining positive and negative relationships together with different concepts of race add more detail to the picture of same-race and interracial relationships. Besides, we provided evidence that positive and negative outgroup attitudes are 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 minority and majority students, even if they contribute to the situation in different ways. Majority students do so by excluding those from different ethnic background, while minority students

do so by either leaving their ethnic group memberships behind, which is destructive of group solidarity, or by excluding those whom they think are willing to “hide”, or disown, their Roma ethnicity.

The discrepancy observed between someone’s self-identified and perceived ethnicity might also be understood and interpreted as a sign for an assimilation effort: students may be reluctant to represent their minority identity if they would like to be assimilated to the majority students. This behaviour seems to have a price, as minority classmates tend to punish these students by social rejection. In addition to this, their majority self-declaration was not enough for being accepted by the majority group, either: they were also rejected by those majority classmates who still perceived them as minorities (of course, they might not perceive these students as minorities any more). The combination of these two results suggests that students with this kind of ambiguous race might be in a very difficult situation that may hinder seriously the process of assimilation. One should not forget that actual interracial relationships are also strongly related to general interracial 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.

Chapter 7

Homophily and Network Constraints

7.1 Introduction

In Chapter 6, we tested hypotheses about the prevalence of interracial friendships and negative ties in school communities. This way, we have gained some knowledge on the likelihoods of such ties, and we found that social networks of these classes are, as expected, ethnically segregated. However, it is also important to see how this situation evolved from the beginning when the students first met; relationships might have got more or less influenced by ethnicity, which would give the cross-sectional results quite a different interpretation. In this chapter and the next one (Chapter 8), therefore, we focus on analysing such changes in social networks. For this, we build various longitudinal stochastic actor oriented models in order to investigate how same- and interethnic friendships and negative ties are created or maintained over time.

We already argued in the previous chapters that for analysing social ties in groups, it is essential to take the network structure into account. This is because endogenous network processes strongly influence tie formations, moreover, they can be partly responsible for tendencies we otherwise could attribute to racial preferences. In our cross-sectional model (Chapter 6), we controlled for structural features, and thus could see that they indeed have significant effects on tie formations. However, we could not see if these effects were independent of ethnicity effects or instead, were partly responsible for interethnic tendencies. For the longitudinal analysis, therefore, we first build simple models step by step in order to see how adding groups of structural effects provides us with different empirical results on friendship evolution. The goal of the current chapter is to show that even in case of very simple model specifications, that is, modelling the effect of self-declared race on friendship ties, including

endogenous network processes makes a difference in the results. Therefore, the chapter first introduces and describes the most important structural configurations used in SAOM analyses, then estimates SAOMs with four different model specifications. We first present results for a model that includes no endogenous network variables, only attribute effects on *Ego*'s and *Alter*'s ethnicity; and then step by step, more and more structural effects enter the model. This way, it is possible to see how each group of variables modifies the estimated ethnicity effects.

7.2 Network Effects

In general, similarly to ERGMs, the collection of structural effects included in a network model always depends on the theoretical considerations relating to the substantive content of the dependent network. In general, for friendship networks it is usually assumed that reciprocity and effects related to transitivity or clustering play a major role in tie evolution. Furthermore, it is also crucial to capture the degree distributions of the network, since degree-related processes can explain a lot of the tie formation and can be related to race as well. In this section, we introduce, illustrate and describe these main groups of structural effects.

7.2.1 Reciprocity

When modelling friendship networks, it is intuitively reasonable to assume that there is a tendency for reciprocity in the network, that is, individuals tend to reciprocate their incoming friendship ties (see Figure 7.1). Reciprocity is probably the single most important structural feature of friendship networks. To explain people's tendency to form and maintain reciprocated friendships, we can follow at least two different lines of argument. First, most of the individual characteristics that increase the probability of friendships between two people, such as similarities along certain dimensions, apply to dyads instead of just one individual; therefore, it is likely that *both* actors are affected by the same matching characteristics (Block, 2015). Similarly, time spent together is also a factor that, in itself, increases the likelihood of a friendship; and this, by definition, also affects the two individuals jointly (Homans, 2013; Block, 2015).

Second, based on social exchange theory (Emerson, 1976; Rusbult and Buunk, 1993), reciprocity is not only a by-product of other processes behind friendship formation, but individuals also actively *look for* reciprocated friendships instead of non-reciprocated ones. The theory interprets friendships as investments: people aim to get

rewards for the time, energy or sometimes even material goods they invest in the relationship. These rewards can have different substantive contents in different contexts. Individuals consider and evaluate the costs and returns of the relationships, including potential alternatives, and if both partners are satisfied with their investments, the friendship tie is maintained; otherwise, it gets broken. In most situations, investing in unreciprocated friendship ties is unlikely to come with satisfactory rewards; therefore, such configurations are unlikely to be stable.

SAOMs are actor-oriented models, in which relationship changes (and stability) are understood as the central actor's, *Ego*'s decisions. Thus, in these models reciprocity is modelled as *Ego*'s tendency to form ties, and maintain them if they already exist, towards those *Alters* who already name *Ego* as a friend. Figure 7.1 illustrates the reciprocity SAOM effect.

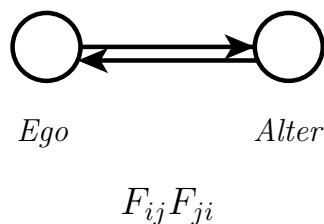


Figure 7.1: Reciprocity

7.2.2 Triadic Closure

In most friendship networks, we can observe some kind of a clustering among the actors. This phenomenon is related to the transitive closure mechanism, which can be intuitively interpreted as the so-called “open triads” getting closed, that is, friends of friends becoming friends. It is usually added to this that ties embedded in such closed triads are usually more stable as well. In general, triadic closure is another important process behind friendship evolution.

The most relevant theoretical basis for modelling transitive closure in networks is balance theory (Heider, 1946; Newcomb, 1961). According to this theory, people generally seek balanced relationship structures in their lives instead of imbalanced ones in order to avoid psychological distress. Balance is usually defined as a characteristic of signed non-directed graphs: structures where every pair of nodes is tied by an edge, which can be positive or negative. Balance is mostly understood as a characteristic of triads: all triadic configurations are either balanced or not. A triad is balanced if the number of positive ties between actors is odd: either all individuals are tied together

(which means the presence of three positive ties), or there is only one positive tie in the triad. If there are exactly two positive ties, that is, for example, someone has two friends who do not like each other, the situation is imbalanced. This is because it causes psychological distress for the participants in the situation; therefore, as a solution either the two friends also befriend each other, or their common friend breaks up the relationship with one of them.

Since transitive closure is expected to have a crucial role in network evolution, it is very important to take it into consideration when analysing interracial segregation in communities. This is because even in case of some minor initial level of segregation in the group, that is, individuals, on average, have somewhat more same-race than cross-race ties, balance processes will also push individuals towards same-race others instead of cross-race peers (since they are initially more likely to be friends with same-race others, who also have more same-race than cross-race friends). Through reinforcing existing, sometimes even small initial tendencies, balance processes can result in much stronger group-wise segregation through clustering than just preferences would indicate. If not controlling for these triadic processes, we can, therefore, overestimate same-race preferences in the community.

As we mentioned earlier, the idea of balance is defined for signed non-directed graphs (in which all pairs are tied); however, it can also be transferred to digraphs, where ties have a directionality and not all ordered dyads are tied. In SAOMs, transitivity and clustering are usually captured by the transitive triplets effect, which models *Ego*'s likelihood to close an open triad, or maintain a closed one. Figure 7.2 illustrates this effect.

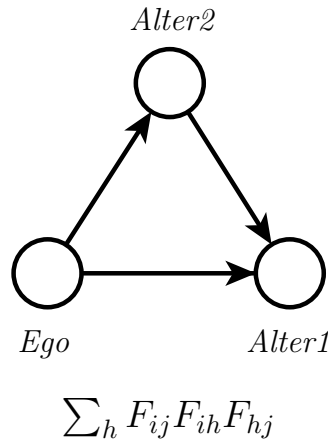


Figure 7.2: Transitive Triplets

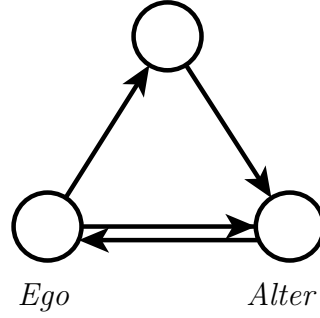
In basic SAOMs, network processes are modelled based on the resulting configurations, that is, how likely *Ego* is to contribute to the formation or maintenance of

these configurations (Ripley et al., 2015). Note that the substructure illustrated by Figure 7.2 can be created as a result of two somewhat different processes, that is, by two possible actions taken by *Ego*: (1) *Ego* nominates friends of his or her friends (in Figure 7.2, a tie towards *Alter1*); or (2) *Ego* nominates those with whom they both name a third person as a friend (in Figure 7.2, tie towards *Alter2*). Therefore, these two micro-mechanisms are modelled in SAOMs jointly, and can be interpreted as a more general process capturing clustering in the group. If *Ego* and *Alter* are embedded in more than one transitive triad, the SAOM effect takes into account the contribution of the given tie between them to all of these triads.

7.2.3 Reciprocity within Triads

So far, we mentioned reciprocity and transitivity as two major mechanisms behind the formation and maintenance of social ties. However, Block (2015) proposes that these processes are not independent of each other: reciprocity has a stronger role in friendships outside of transitive triads than when embedded in these structures. The argument is based on the situational understanding of friendships, which emphasizes that forming and maintaining friendship ties require time spent together (Fischer, 1982). This can happen in dyadic situations, which usually requires the friendship to be mutual, since both actors need to make active efforts in order to meet for joint activities. However, time can also be spent together in social groups, which allows the formation and maintenance of one-sided friendship ties as well, since the time spent together is guaranteed by the group activities. In this case, no extra effort is required to meet this person.

Since social groups are based on network clusters, their effects on a single dyad can be mostly captured by the transitive triplets effect. Therefore, the interaction of the reciprocity and the transitive triplets effects expresses the effect of reciprocity when the dyad is also embedded in a group. As reciprocity should be stronger when the two actors are not embedded in triadic structures and weaker when they are so, we can expect a negative interaction effect between reciprocity and transitivity (Block, 2015). This interaction is modelled by the transitive reciprocated triplets effect in SAOMs, where the reciprocated tie is the tie $i \leftrightarrow j$ that closes the two-path $i \rightarrow h \rightarrow j$. The effect is illustrated by Figure 7.3.



$$\sum_h F_{ij} F_{ji} F_{ih} F_{hj}$$

Figure 7.3: Transitive Reciprocated Triplets

7.2.4 Degree effects

Degree effects capture systematic processes behind changes in degrees of individuals in the networks. That is, these effects model how indegrees (the number of in-coming ties) and outdegrees (the number of out-going ties) at a given point of time affect ties sent and received at a later point of time.

The four basic types of degree effects are *Alter*' popularity, *Ego*'s popularity, *Alter*'s activity, and *Ego*'s activity (see Figure 7.4). Popularity of actors is represented by their indegrees, and activity by their outdegrees. Here, too, network configurations are modelled based on the resulting configurations, that is, *Ego* might be able to contribute to these configurations in more than one ways. In this case, the popularity of *Alter* and the activity of *Ego* effects can be contributed to by *Ego* in only one way: *Ego* is more likely to form or maintain a tie towards *Alter* if *Alter* is already more popular; and *Ego* is more likely to form or maintain a tie towards *Alter* if *Ego* already sends more ties towards others, respectively (see the first and the last figures in Figure 7.4). However, the indegree *Ego* and the out-degree *Alter* effects cannot be distinguished from each other this way, as they both result in the same chain-like configuration at the micro level (Actor $\rightarrow$ Actor $\rightarrow$ Actor; in case of the Popularity of *Ego* effect, this is third person $\rightarrow$ *Ego* $\rightarrow$ *Alter*, while for the Activity of *Alter* effect, *Ego* $\rightarrow$ *Alter* $\rightarrow$ third person) contributing to the network level count of these effects. Therefore, only one of these two effects can be included in a model at once.

Of mechanisms captured by the degree-related effects, the most theoretically important one is the tendency of actors who are already popular to gain even more popularity. This is called the Matthew effect, or preferential attachment, and was first described by Merton (e.g. Merton, 1968). This is explicitly expressed by the

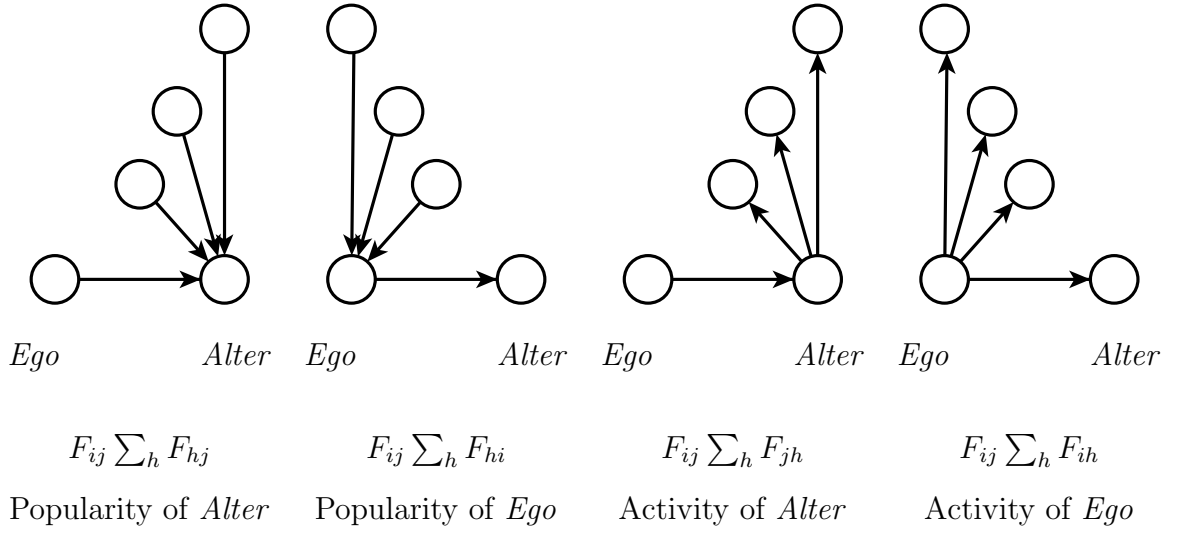


Figure 7.4: Degree Effects

popularity of *Alter* SAOM effect which estimates whether those who are already nominated by many will be more likely to be nominated by *Ego* as well (that is, whether *Ego* will be more likely to maintain and form a friendship towards them). Besides this effect, another important process to include in the model is whether actors who already nominate a lot will maintain their nominations and will create more ties, or not (activity of *Ego* effect). Finally, the popularity of *Ego* and activity of *Alter* effects relate the indegree and out-degree distributions to each other, therefore, usually it is also beneficial to include one of them in the model.

7.2.5 Joint interpretation of SAOM effects

Generally, SAOMs differ from general regression type models in at least one major way that is very important for model specification and for parameter interpretation. That is, these models always include effects that are not only statistically correlated (like most regression models), but also embedded in each other. This is because the micro-structures included in the model are of different complexity, and the more complex structures always contain less complex structures. One example for this is the transitive triplets effect (see Figure 7.2), within which three subconfigurations can be identified (Figure 7.5). These subconfigurations, as demonstrated by Figure 7.5 refer to the degree effects mentioned above.

One consequence of not including these degree effects in the analysis when modelling transitive triplets is that it makes us unable to distinguish between these more embedded degree processes and the actually modelled transitivity when interpreting

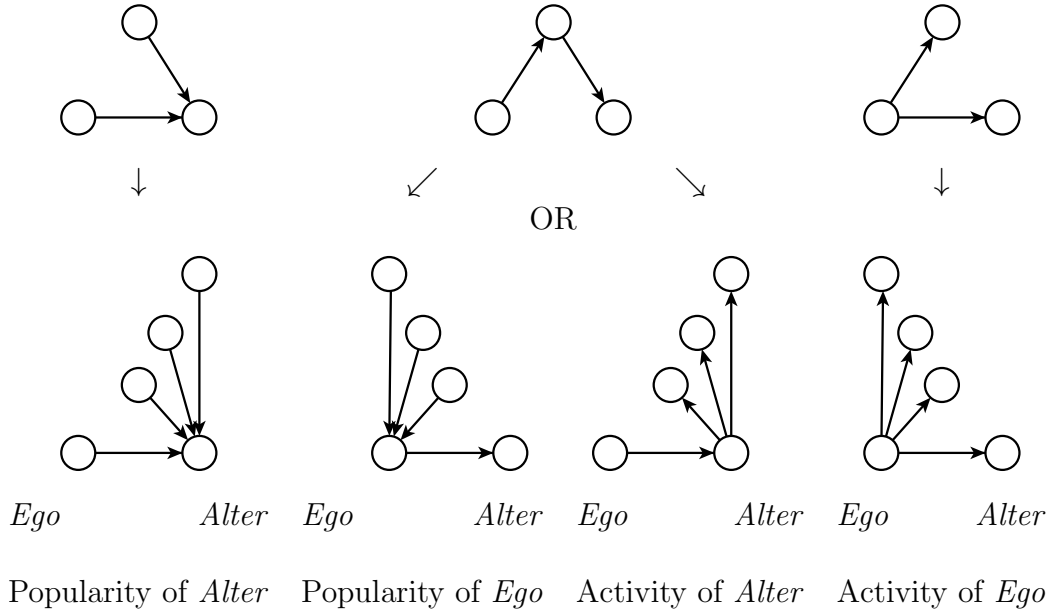


Figure 7.5: Effects Embedded in the Transitive Triplets effect

the estimated parameter. This is because in this situation, this can be the a result of not only closure processes; it is also possible that one of the substructures is over-represented in the data, and therefore it results in more triangles than expected by chance; even if the other ties contributing to the triangles are not more common than would be by chance. Since the underlying subprocess is not controlled for, the transitive triplets variable “absorbs” its effect, making us falsely interpret it as tendency for transitive closure.

This problem is related to the more general one of interpretation of effects embedded in each other. If three degree effects and the transitivity effect are all included in the model, transitivity should be interpreted as the *extra* effect that these substructures are present in the form of a transitive triad, and not as non-connected degree effects, since when interpreting the transitive triplets effect, the degree-based mechanisms themselves are “controlled for”. At the same time, degree effects in this case only refer to configurations “outside of” transitive structures, since from the perspective of *their* interpretation, *transitivity* is “controlled for.” For instance, we mentioned earlier that the activity of *Ego* variable models whether actors who already nominate a lot will maintain or form more friendships than others. However, if this effect is used together with the transitive triplets effects, it only refers to the formation and maintenance of “open” triangles (since the “closed” ones are already captured by the transitive triplets effect), and it models whether individuals are likely to create or

maintain open triadic structures.

7.3 Model

In order to see how structural effects modify the results on racial segregation in our groups, we design and estimate four different models. In the first model (Model A), there are no structural effects included, only the minority *Ego* and *Alter* effects, and the interaction between them, expressing that both are minorities. (Even though effects in SAO models are centred by default, that is, the parameters are estimated compared to the group mean on the given variables, in our model we use the non-centred version in order to help interpretation of results.)

In Model B, we add the reciprocity effect; in Model C, the transitive triplets effect, and in Model D, three degree effects (popularity of *Alter*, activity of *Ego*, activity of *Alter*) enter the model. After estimating individual parameters for each model on each classroom dataset, we meta-analyse the results using the method that is introduced in Chapter 4.4.1. Our models are based on the subsample described in Chapter 3.1.2.

7.4 Results

7.4.1 Parameter Estimates

In this section, we present our results from the four models. For every parameter, we provide the estimated value, the standard error and the related p-value. The results can be found in Table 7.6. For more detailed results, also presenting within-group statistics, see Appendix C.

Based on Table 7.6, the first and the second model find a significant and negative minority *Alter* effect, while other ethnicity effects are not significant in any of the four models. This gives us indications about minority-majority and majority-minority nominations compared to the majority-majority reference category; however, minority-minority nominations are not modelled directly in this analysis. This parameter can be calculated and tested based on the three ethnicity effects estimated in the model. Therefore, to see all four possible nomination types together, we create

The relationship between effects embedded in each other can be more complicated than this, since additional ties contributing to different effects are not necessarily counted in the same way. In some cases, there is an option to set the effect of every extra tie to count with decreasing marginal returns, which sometimes results in better fit. However, when the focus of the analysis relies on the joint interpretation of SAOM parameters, it is probably useful to set these effects in the same way to each other

	Model A		Model B		Model C		Model D	
Effect name	Est	(S.E.)	Est	(S.E.)	Est	(S.E.)	Est	(S.E.)
Outdegree	-0.864	(0.088) ***	-1.318	(0.041) ***	-2.038	(0.088) ***	-1.446	(0.152) ***
<i>Ethnicity effects</i>								
Alter is minority	-0.285	(0.123) *	-0.270	(0.118) *	-0.186	(0.122)	-0.070	(0.111)
Ego is minority	-0.079	(0.144)	0.069	(0.130)	0.072	(0.109)	0.107	(0.116)
Both minorities	-0.179	(1.033)	0.026	(0.601)	-0.153	(0.773)	-0.113	(0.603)
<i>Structural effects</i>								
Reciprocity			1.444	(0.109) ***	1.931	(0.143) ***	2.218	(0.136) ***
Transitive triplets					0.403	(0.030) ***	0.429	(0.035) ***
Trans. reciprocated triplets					-0.422	(0.057) ***	-0.242	(0.057) ***
Alter's popularity							0.009	(0.021)
Alter's activity							-0.169	(0.020) ***
Ego's activity							-0.005	(0.006)

Table 7.6: Results for Interracial Relationships by Controlling for Structural Effects

a new table only for results on the ethnicity effects. Table 7.7 presents the calculated conditional odds ratios for the four same- and cross-ethnic nomination types for the four models. The reference category is the majority-majority nomination, which, therefore, has a conditional odds ratio of 1 in every case.

		Model A		Model B		Model C		Model D	
		Alter		Alter		Alter		Alter	
		Majority	Minority	Majority	Minority	Majority	Minority	Majority	Minority
Ego	Majority	1	0.76 *	1	0.76 *	1	0.83	1	0.93
	Minority	0.92	0.50	1.07	0.72	1.07	1.00	1.11	0.79

Reference category: majority-majority nominations

Table 7.7: Conditional Odds Ratios

Based on Table 7.7, results of Model A provide evidence that indeed, majority students tend to nominate minority students less often than they do other majority students, while other nomination types do not differ significantly from the reference category.

In Model B, reciprocity enters the analysis. In this step, we also estimate whether some of the effects shown by Model A, that is in our case, the tendency of majority students to nominate their majority instead of their minority peers, is the result of their tendency to reciprocate incoming ties. In this case, the significant “*Alter* is minority” parameter would disappear. We can expect such a tendency, since we find a strong, positive and significant reciprocity parameter (see Table 7.6). However, we find that this is not the case: the parameter estimate is still significant (see Table 7.7).

Even though the parameter size seems mostly unaffected, it is still possible that reciprocity explains some of this ethnicity effect. This is because adding a variable to the logistic regression type model (and provided that this has an effect) can increase the parameters for all other estimates in the same model (Mood, 2010). Therefore, the fact that the estimates for the minority *Alter* effect are similar in size in the two models may in fact mean that some of the original effect was due to reciprocity, but the reciprocity effect – which is quite strong – raises all parameter estimates in the whole model.

In Model C, effects related to transitivity are also included in the analysis. With this model specification, we cannot find significant ethnicity effects any more: none of the conditional odds ratios are different from the reference category (see Table 7.7). It seems, thus, that the structural effects added to the model at this step might have been responsible for what we could have interpreted as same-ethnic preferences before. Indeed, results in Table 7.6 show that all the three structural effects are significant in the model. Reciprocity still shows a large and positive parameter as expected. The effect of the transitive triplets is also positive, suggesting that clustering is present in the networks. The estimated parameter for the transitive reciprocated triplets effect meets our expectations as well: it is negative, therefore, reciprocity is indeed less important when embedded in clusters than otherwise for forming or maintaining friendships. Since the ethnicity effects are not significant in this model any more, this implies that clustering processes might co-vary with ethnicity. The ethnic segregation in the initial network, together with the tendencies toward reciprocation and most importantly transitive closure, are responsible for what seems a tendency of the majority students to systematically select other majority students as friends more than minority students.

In Model D, we can observe the same tendencies. None of the estimated ethnicity parameters are significant (see Table 7.6), and none of the nomination types differ significantly from the reference category (see Table 7.7). Moreover, the three structural effects from Model C are significant again. Of the degree effects added to the model at this step, the outgoing ties of *Alter* effect seems to have a significant influence on friendship evolution, which is negative. This means that those nominating a lot of their peers as friends will become (or stay) less popular in the community. This might seem surprising at first; but it is important to note that we get this result while controlling for other structural effects, such as reciprocity or transitive closure. Therefore, now we refer back to our argument about the interpretation of effects when modelled together (see Section 7.2.5). First, this effect should be understood on top

of the tendency to reciprocate incoming ties. Since the effect of reciprocity is positive and much larger, ties sent are still likely to be reciprocated; but those who nominate a lot of peers might be less likely, on average, to receive friendship nominations by *others*. Second, transitivity is also included in this model, capturing friends of friends also being friends with each other; therefore, this effect only refers to nominating those as friends with whom *Ego* does *not* belong to the same cluster.

The findings described here are results of a meta-analysis, which summarizes parameters and standard errors estimated in separate models for each classroom. During this process, homogeneity of the results is also tested. The full results including heterogeneity tests are presented in Appendix C. In case of Model A, every parameter is heterogeneous across groups; in Model B, every parameter except the outdegree effect. In Model C, only the minority *Alter* and the minority interaction effects are found to be significantly heterogeneous. In Model D, the same two effects, and the Outgoing ties of *Alter* effects are found to be heterogeneous. Therefore, the second two models specifications are able to describe the separate classrooms in a more homogeneous way than the first two ones.

7.4.2 Goodness of Fit

In the previous subsection, we presented four different model specifications with different structural effects to estimate conditional odds ratios for different same-ethnic and inter-ethnic relationships. Our conclusion so far is that taking the structure into account matters a lot; controlling for triadic and degree effects revealed that what we could interpret as same-ethnic preference might be just a result of endogenous network processes in the group. In terms of this, we could not find a big difference between Model C and Model D.

In this subsection, we test the statistical fit of these models. This technique examines whether a given model is a good representation of the data, even for important features that are not explicitly modelled during the estimation, such as the degree distributions and the triad census. For SAOMs, a goodness of fit (GoF) estimation is done by calculating auxiliary statistics for given characteristics of the data (Lospinoso, 2012). The tested null hypothesis is that the observed network was generated by the assumed model; therefore, finding significant differences in the GoF study is a sign that our model is not a good representation.

In this section, we test the goodness of fit of our three models in terms of indegree distribution, out-degree distribution and triad census. Triad census is a collection of the frequencies of each possible triadic configuration in networks, where between

each pairs of actors there can be no tie, a one-sided tie, or a mutual tie. If the p-values given by the GoF are significant, this means that our estimated network cannot capture the certain aspect of the observed network well.

Since we originally estimated our models on twelve school classes, we conduct the goodness of fit analysis for every classroom level model separately. These p-values are presented in Table 7.8 for the indegree distribution, in Table 7.9 for the out-degree distribution, and in Table 7.10 for the triad census. Our individual models that have to be rejected ($p < 0.05$) are highlighted with bold numbers. However, it is also important to take into account that our SAOM analysis tests the same model specification on twelve different datasets, therefore it can be considered as testing one hypothesis on multiple datasets. Therefore, we should be able to make conclusions about the model as a whole as well, not only about individual groups. The Bonferroni correction for multiple testing of one hypothesis suggests that our set of models should be rejected if one of the p-values is smaller than 0.05 (by convection) divided by the number of groups. In our case, this value is 0.004; therefore, if one of the values in a column include a smaller number than this, the whole model represented by the column has to be rejected. In these cases, the whole column is presented in italic.

Class No.	Model A	Model B	Model C	Model D
1	0.993	0.980	0.947	0.990
2	0.390	0.427	0.836	0.901
3	0.720	0.798	0.734	0.920
4	0.005	0.008	0.565	0.649
5	0.329	0.276	0.318	0.388
6	0.159	0.127	0.947	0.162
7	0.469	0.570	0.836	0.601
8	0.808	0.775	0.734	0.702
9	0.934	0.912	0.565	0.836
10	0.056	0.016	0.318	0.258
11	0.728	0.745	0.947	0.681
12	0.894	0.988	0.836	0.979

Table 7.8: Goodness of Fit p -values for the 12 Classrooms - Indegree Distribution

Table 7.8 demonstrates the GoF p-values for the indegree distribution of our networks. Here, most of the p-values in every model are quite far from being significant;

in Model A, we can find one classroom, while in Model B two classrooms showing significant difference between the indegree distributions of the observed and the modelled networks with poor fit. In Model C and Model D, none of the classrooms shows poor fit. As whole models, we do not have to reject either one of the four model specifications, since none of the p-values are lower than 0.004. Therefore, in terms of indegree distribution, all of our models fit reasonably well; though Model C and D has a substantially better fit than models with less (or none) structural effects modelled.

Class No.	<i>Model A</i>	<i>Model B</i>	Model C	Model D
1	0.017	0.013	0.185	0.325
2	<i>0.247</i>	<i>0.231</i>	0.500	0.666
3	0.001	0.000	0.536	0.755
4	0.006	0.001	0.201	0.273
5	<i>0.217</i>	<i>0.190</i>	0.339	0.056
6	0.000	0.001	0.185	0.117
7	0.008	0.004	0.500	0.739
8	<i>0.513</i>	<i>0.477</i>	0.536	0.431
9	<i>0.455</i>	<i>0.297</i>	0.201	0.715
10	0.008	0.000	0.339	0.780
11	<i>0.170</i>	<i>0.069</i>	0.185	0.306
12	<i>0.735</i>	<i>0.746</i>	0.500	0.768

Table 7.9: Goodness of Fit p -values for the 12 Classrooms - Outdegree Distribution

Based on Table 7.9, the fit of the out-degree distribution is worse than that of the indegree distribution for the models including no structural effects (Model A), or only reciprocity (Model B). Here, in half of the classrooms the estimated networks have significantly different out-degree distributions from those of the the observed networks (these are the same classrooms in Model A and Model B). Moreover, we also find groups where the p-value is smaller than 0.004, therefore, Model A and Model B both should be rejected. In Model C and Model D, all the p-values are substantially larger than 0.05. This means a reasonably good fit for Models C and D.

Table 7.10 demonstrates that the fit of the triad census is more problematic for our analysis than those of the degree distributions. Here, we get very low p-values for both Model A and Model B; for these models, the p of every classroom is below not only the 0.05, but also the 0.004 limit. Therefore, these models show a very poor

Class No.	<i>Model A</i>	<i>Model B</i>	Model C	Model D
1	0.000	0.002	0.056	0.182
2	0.000	0.000	0.051	0.219
3	0.000	0.000	0.025	0.557
4	0.000	0.000	0.011	0.776
5	0.000	0.001	0.096	0.800
6	0.000	0.000	0.056	0.764
7	0.000	0.000	0.051	0.722
8	0.000	0.000	0.025	0.013
9	0.000	0.000	0.011	0.175
10	0.000	0.000	0.096	0.331
11	0.000	0.000	0.056	0.783
12	0.000	0.000	0.051	0.272

Table 7.10: Goodness of Fit p -values for the 12 Classrooms - Triad Census

fit with the observed data. In Model C, results improve; thus, not surprisingly, the triad census is much better captured when triadic effects are directly modelled in the analysis. Here, only four classes have p -values lower than 0.05, and none of them is lower than 0.004. Therefore, the model should be rejected in only four individual classrooms, and Model C as a whole should not be rejected. Model D shows an even much better fit: for this model, only one classroom has a p -value lower than 0.05, but this is also higher than 0.004. Therefore, it seems that Model D, including degree effects as well, is our best specification for capturing triad census.

Based on these findings, Model A and B seem to produce results that fit the observed data quite poorly: while they still seem reasonable for capturing the indegree distribution, they are very problematic in case of the out-degree distribution, and especially of the triad census. Model C and D, however, show good overall fit; but Model D seems to have a much better fit to the triad census than Model C.

7.5 Conclusions

This chapter focused on the role of group structure in relationships in school classes, and how this can contribute to the racial segregation. We introduced some of the most important SAOM effects that are used to capture characteristics of the friendship

structure in closed groups and estimated four sets of models on individual classroom data of 12 communities using four different model specifications. Of these models, Model A does not include any structural effects, while in Model B, C and D reciprocity, transitivity, and degree effects enter the analysis step by step. Results of Model A and B show significant same-ethnic preferences in case of majority students; however, when we control for clustering (Model C) and degree (Model D) processes, this effect becomes non-significant. At the same time, most of the structural features show significant influence on friendship evolution. This is an important finding: it means that it is indeed crucial to control for endogenous network processes when analysing interracial friendships, since they might explain effects which we could otherwise interpret as same-race preferences.

To test how our models fit the observed data, we also estimated goodness of fit statistics, and found that models without structural effects, or only including reciprocity provide a much worse fit than models with also including effects related to clustering or degree processes. Model D, which contains the most effects capturing network structure, has quite good fit to the data.

We argued earlier that observing racial segregation in communities can be a mixture of same-race preferences and endogenous network processes. Moreover, these endogenous processes can really easily “conserve”, or even strengthen initial states of segregation without any (further) racial preferences. Since our longitudinal analysis starts from the first wave assuming this initial network as given, a predominance of same-ethnic friendships might be already present at the first observation and then persist merely because of reciprocity and transitivity effects. In this case, no tendencies favouring same-ethnic friendships would be found in the longitudinal analysis, while they would continue to exist cross-sectionally. This can be, therefore, a possible explanation for the fact that while our cross-sectional analysis found ethnic segregation in our communities, the longitudinal model show non-significant ethnicity effects.

However, it is important to highlight that even though this chapter did not find significant ethnicity effects, processes enhancing segregation can still exist. First of all, this model was limited to friendship ties, and only used ethnic self-identifications of the students. This is because our aim was to show that including structural variables can already have a crucial effect on our results even in this simple case. However, as we argued earlier, a good understanding of ethnic segregation or integration cannot rely on the analysis of friendships and on self-identified race only, since these only capture a part of the relevant social processes. Our cross-sectional results (Chapter 6) already provide evidence that certain aspects of cross-ethnic rejection can only be seen

when analysing negative networks as well; moreover, including ethnic perceptions in the models also revealed tendencies that were hidden otherwise. Therefore, building on what we have learnt from these rather simple SAOM results, in the next chapter we estimate more complex models which can capture more aspects of relational integration as a process.

Chapter 8

The Dynamics of Relational Integration

8.1 Introduction

Part II of this thesis focuses on how racial self-identifications and perceptions influence friendships and negative ties. In Chapter 6, we analysed ethnic integration cross-sectionally, taking into consideration that endogenous network processes also have an important role in shaping social ties. We found that majority students reject those they perceived as minorities, while minority students are more likely to be friends with those they perceive as minorities if they also identify so. However, it was also shown that minority students are likely to exclude those whom they perceive as minorities, but who, at the same time, identify with the majority group. This is true after controlling for endogenous network factors. Therefore, these results provide evidence that race indeed plays an important role in the formation of friendships and negative ties. Moreover, as we expected, we found several significant structural variables in the model, highlighting the importance of endogenous network processes in the formation of interracial social ties.

While Chapter 6 provided us with a detailed, but static picture about ethnic integration, it does not tell us about the dynamic processes pushing the community towards more integrated or more segregated states. For that, longitudinal models can give us some indications. Therefore, in Chapter 7 we started to build a dynamic model examining interethnic relationships as a process, based on tie changes and tie stability of ethnically similar and different student dyads. However, since our cross-sectional chapter confirmed the importance of the structure itself, in Chapter 7 we took a step back, and started with very simple friendship models based on ethnic

This chapter includes joint unpublished work with Bálint Néráay and Tom A. B. Snijders.

self-identifications, adding more and more structural effects to the analysis. That chapter showed evidence that “gross” segregation, that is, the tendency to form or maintain friendship towards those similar to oneself, can be actually result of structural processes instead of ethnic preferences, when combined with an earlier existing state where ethnic preferences were at work.

Based on these findings, this chapter builds a more complex model. For this, again, we focus on the social identity approach, and concentrate on the intergroup social comparison processes and their effects on social relationships. For this, we revisit the strategies introduced in Chapter 5 and 6, from which members of lower-status social groups can choose in a comparative intergroup situation in order to enhance their self-esteem. Therefore, we will set similar hypotheses to the ones in the cross-sectional chapter, but these are focused on the process-related aspects of integration rather than integration as a state. Similarly to Chapter 6, we will model both friendships and negative ties, and some hypotheses will differentiate between self-identified and perceived ethnicity as well. Moreover, by also modelling ethnic perceptions instead of only using them as a dependent variable, we can take into account related and simultaneous other processes, such as the fact not only ethnicity affects social ties, but social ties affect ethnic perceptions as well.

8.2 Theory and Hypotheses

In Chapter 5 we introduced the social identity approach, which gives detailed explanations for ingroup preference, and for different patterns of ingroup and outgroup relationships. We focused on four major strategies that can be followed by members of the lower-status social group in order to enhance their self-esteem. In Chapter 6, we drew conclusions from these strategies and predicted how they affect interethnic friendships and negative ties.

However, strategies are, by definition, dynamic rather than static. Though a cross-sectional analysis can test hypotheses based on the expected *results* of these processes, which then implies the existence of the processes themselves, a longitudinal analysis following behaviours step by step is probably an better approach. Especially because while we might expect that certain relationships will be more or less likely than others in the group as results of a strategy, these processes might have not reached their “turning points” yet if they started from certain states. A longitudinal analysis can also find, for example, that interracial differences slowly decrease over time, even if they do not disappear, therefore, we could not observe this tendency

cross-sectionally. Therefore, in this section revisit the same strategies examined in Chapter 6 again, and make predictions about the longitudinal process of tie change and maintenance implied by these strategies.

8.2.1 Social Creativity

Social creativity is the strategy that enhances individuals' self-esteem by modifying elements of the comparative situation; among these, the most relevant for our study is finding new, more advantageous dimensions to compare the ingroup and outgroup along. According to Tajfel and Turner (1979), social creativity is one of the efficient strategies to avoid intergroup conflict between groups, since it is related to the (conscious or unconscious) avoidance of direct competition between groups.

In Chapter 6, we did not find strong evidence that minority students have hostile feelings about the majority group; however, they seem to be rejected by their majority peers at the same time. This does not give us a definite answer whether social creativity is followed as a strategy in our classrooms; we need further analysis to be able to decide about this. Moreover, we highlighted earlier that just focusing on cross-sectional results might not reveal overall tendencies in the classrooms. Thus, longitudinal analysis might help us to better understand if social creativity is chosen as a strategy in these classrooms. In this case, we could expect that even if students have more same-group than intergroup friends cross-sectionally, this ratio does not further increase over time. Similarly, we would not expect a growing number of negative ties, either. Therefore, our first hypothesis is that

H1: Students do *not* create and maintain interracial friendships less than same-race friendships; and they do *not* create and maintain interracial negative ties more than same-race negative ties.

In other words, this means that if minority students follow the strategy of social creativity, the given community should not get more segregated over time even if the initial level of segregation would not disappear. Note that this is a null hypothesis rather than a research hypothesis in a statistical sense since it proposes the *lack* of effect; therefore, we cannot find direct evidence for this hypothesis. If we do not find support for the rest of the hypotheses, this can be understood as an indicator (but not evidence) that this strategy might be found in our sample.

8.2.2 Direct Competition

Direct competition is another strategy that members of lower-position groups can follow; by engaging in competition, they aim to reverse the relative positions of the ingroup and the outgroup. Therefore, this is potentially related to intergroup conflicts and negative intergroup relationships.

In the cross-sectional analysis, we did not find clear evidence that the minority group would compete against the majority group; even though minority students seemed to send more negative ties towards majorities, this parameter was only marginally significant. However, it does not mean that the dynamic processes cannot lead towards this direction; especially since majority students, at the same time, seem to exclude their minority classmates. Over time, we expect that this strategy would induce a growing level of enmity between racially different students, therefore, the network would get more segregated over time both in terms of positive and negative ties. Since in this case new relationships are formed and old ones are maintained based on both ingroup preference and outgroup rejection, we hypothesize that in case of students following the strategy of direct competition,

H2: Students *do* create and maintain interracial friendships less than same-race friendships; and they *do* create and maintain interracial negative ties more than same-race negative ties.

Note that this hypothesis is the opposite of H1, which explicitly hypothesized that such differences between same-race and interracial ties do not exist.

8.2.3 Individual Mobility

Individual mobility between groups is an individualistic strategy and means that a person leaves his or her original, lower-status group behind and tries to join a more positively perceived one instead. This is likely to induce conflict between this given person and other members of the original group, since it makes the social position and chances of the group as a whole worse (see Chapter 5). In Chapter 6, we found strong evidence for this strategy and for its negative interpersonal consequences: minorities seemed to strongly reject those whom they perceive to belong to the minority group like themselves, but who, at the same time, self-identify with the majority group. In this chapter, we expect to see similar dynamic tendencies. Therefore, if students in our sample choose the strategy of individual mobility, we predict that

H3: self-identified minority students form and maintain friendships less, and negative ties more, towards those whom they perceive as minorities but who, at the same time, identify with the majority group than towards others.

8.2.4 Outgroup Preference

Outgroup preference is the last strategy for improving individual self-esteem of those belong to lower-status social groups, in this case without achieving positive social identity during the process. This is because students choosing this strategy tend to derogate their own racial group and to show positive attitudes towards the majority group. In our cross-sectional study (Chapter 6), we already showed some signs that members of the lower-status group might develop outgroup preference, since in general, minority students seemed to be much more open towards majorities than vice versa. If individuals in our sample also choose and maintain this strategy over time for dealing with their negative self-esteem, we expect to see both majority and minority students to develop an increasing preference for majority students over time. Therefore, if this strategy is followed in our sample, we hypothesize that

H4: both majority and minority students form and maintain friendships more, and negatively ties less, towards majority than minority peers.

8.3 Models

For our analysis, stochastic actor-oriented models (SAOMs) are estimated. In this chapter, we build one large co-evolution model, that is, friendships, negative ties, and ethnic perceptions are modelled together and partly based on each other, which helps us to capture cross-network dependencies; moreover, all classrooms are modelled together estimating a random coefficient multilevel SAOM. More information about the co-evolution process can be found in Chapter 4.3.1, and about multilevel SAOMs in Chapter 4.4.

In our co-evolution models, we have three different dependent variables: friendships, negative ties, and ethnic perceptions. To estimate these, we have three separate sets of independent variables of which each explains one dependent variable. These

sets include effects based on the other dependent variables as well, therefore, processes related to ethnic perceptions can be used to explain friendships, while ethnic perceptions themselves are explained in another part of the same model.

Similarly to our cross-sectional model (see Chapter 6), this chapter substantively focuses on friendships and negative ties. For estimating these networks, we design a model specification similar to the cross-sectional ones. However, now negative and friendship networks are not estimated in different models, but as two parts of the same model. Moreover, perceived ethnicity is also modelled together with the relationships, since this way we can take into consideration changes in the perception networks over time, and the fact that they can be partially caused by relationships themselves.

In the friendship and negative model parts, we include the same ethnicity-related independent variables. To capture the effect of *Ego*, we model *Ego*'s ethnic self-identification. We also include *Alter*'s self-identification in two different ways: how *Alter* self-identifies, and how each *Ego* perceives *Alter*. This second measurement for *Alter*'s ethnicity is, again, based on a network, which includes everyone's perception about each *Alter* in the community. We also include the interaction between *Ego*'s and *Alter*'s ethnicity, using both *Alter* variables; therefore, we have two interaction effects in both the friendship and the negative parts of the model. In this step, we do not find it important to build models with only self-identifications and only perceptions like we did in the cross-sectional chapter, since that analysis has already revealed the importance of modelling these together. Therefore, we only present results of the full model specification.

Since we have highlighted several times in this thesis the importance of considering endogenous network processes in such an analysis, we also include several structural effects in our model. Similarly to the ERGM model, our choice of a model specification is theoretically driven, however it is partly a result of experiments with different sets of variables to capture the network structure the best way possible. This way, all variables that are thought as theoretically important are in the model, complemented with those that made the convergence easier and the fit better. The full model specification can be found in Appendix D.

To control for the fact that friendships and negative ties can also affect how someone's ethnicity is perceived, which is one of the major reasons for this co-evolution analysis, we also include structural, friendship and negative tie effects on the evolution of the ethnic perception network. This part of the model is not the main focus of this chapter; however, these effects are also summarised in Appendix D. As we describe in Chapter 3, we now disregard that ethnic self-identifications can also change, and treat

them empirically as fixed, which is reasonable since not too many changes happen in our dataset between the two observation used.

8.4 Results

The full set of results, including the evolution of friendships, negative ties, and ethnic perceptions, is included in Appendix E. It also provides a more detailed description of the results presented here, with estimates, standard errors, and between-classroom differences. Since this is an overwhelming amount of data, this section only focuses on results directly relevant to our hypotheses. For this, similarly to our cross-sectional results, we calculate conditional odds ratios for each of the nomination types based on self-identified and perceived ethnicity. Table 8.1 and 8.2 demonstrate these results.

		<i>Alter's ethnicity</i>			
		Majority	"Consistent" minority (in both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
<i>Ego's ethnicity</i> (self-identified)	Majority	1	1.000	0.986	1.014
	Minority	1.045	0.946	1.221 ⁺	0.811

$+p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001$
Reference category: majority - majority nomination

Table 8.1: SAOM results: Ethnicity on Friendship Ties Selection Table

		<i>Alter's ethnicity</i>			
		Majority	"Consistent" minority (in both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
<i>Ego's ethnicity</i> (self-identified)	Majority	1	1.743 ***	0.726 **	2.401 ***
	Minority	0.899	4.726 ***	0.778 *	1.293

$+p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001$
Reference category: majority - majority nomination

Table 8.2: SAOM results: Ethnicity on Negative Ties Selection Table

For the interpretation of these results, we now go back to our four hypothesis to which ones of them are supported and which ones are rejected by our models. First, we concentrate on the first, second and fourth hypotheses, since these have predictions about interracial friendships and negative ties in general; afterwards, we focus on the third hypothesis, which also refers to the effect of discrepancies between self-identified and perceive race.

The first hypothesis suggests that students do *not* create and maintain interracial friendships less than same-race ones; and they do *not* create and maintain interracial negative ties more than same-race ones. At the same time, the second hypothesis predicted the opposite, expecting students to form and maintain interracial friendships less and negative ties more than same-race ones. Finally, the fourth hypothesis expects that both majority and minority students form and maintain friendships more, and negatively ties less, towards majority than minority peers.

When focusing on friendship ties, the predictions of H1 seem to be confirmed instead of those of H2 or H4: we cannot find significant differences between the majority-majority nominations and other tie types. In fact, in the friendship models no nominations are significantly different from the reference category based on the conventional, 0.05 significance level. There is one parameter that is marginally significant ($p < 0.1$), expressing that minority students nominate those more whom they perceive as majorities, but who, at the same time, identify with the minority group ($OR = 1.22$, $p < 0.1$). This finding, however, does not reflect directly either H1, H2, or H4. Therefore, based on friendship ties only, the first hypothesis seems to be supported while the second and the fourth hypotheses do not.

For negative ties, though, results paint a completely different picture. Here we see (similarly to our cross-sectional results) that majority students tend to exclude those whom they perceive as minority peers, regardless whether these consider themselves as minorities or not ($OR = 1.74$, $p < 0.001$, and $OR = 2.40$, $p < 0.001$, respectively). This explicitly rejects H1 but can be partial support for either H2 or H4, which both predict same-group preference for majority students. Therefore, to decide which one is the underlying mechanism for tie formation and maintenance, we need to focus on the relationship choices of minorities as well. There, it seems that minority students tend to strongly dislike other, “consistent” minorities compared to the reference category ($OR = 4.726$, $p < 0.001$); moreover, this parameter is much higher than any other odds ratios in the table. This suggests that out of H2 and H4, the latter is supported, since it predicted outgroup preference amongst minority students, and our results indeed show very strong outgroup preference (and, even more, ingroup rejection).

Finally, the third hypothesis predicts that self-identified minority students form and maintain less friendships, and more negative ties, towards those whom they perceive as minorities but who, at the same time, identify with the majority group than towards others. We cannot find support for this hypothesis: even though the parameter sizes and directions are in line with our expectations, neither of them is significant ($OR = 0.811$ in the friendship networks and $OR = 1.293$ in the negative

networks, in both cases $p > 0.1$). However, we find another interesting phenomena: both minority and majority students tend to dislike those peers less whom they perceive as majorities, but who, at the same time, self-identify as minorities. This is an interesting finding which is not related to any of our hypotheses; however, it matches the other unexpected piece of result in the positive networks, that is, minority students liked those more whom they perceived as majorities, but who identified with the minority group. Therefore, some other mechanisms should operate behind this result which are not captured by the social processes the theoretical sections of this thesis have focused on.

8.5 Conclusions

In this chapter, we formed theoretically based hypotheses about the dynamics of interracial relationships, and tested our predictions using our Hungarian dataset on Roma and non-Roma Hungarian students. We did so to examine the processes that had created the tie probabilities observed in our cross-sectional model (see Chapter 6). For this, similarly to Chapter 6, we focused on not only friendships but also negative ties, and included self-identified and perceived ethnicity in the models at the same time. We also built on the information provided by Chapter 7 about the role of the network structure when modelling and understanding segregation; therefore, we controlled for endogenous network processes in this chapter.

Following social identity theory (Tajfel, 1974; Turner, 1975) and our previous results (see Chapter 6), we formed different, mostly competing, hypotheses about interracial friendship and negative ties based on the various possible strategies members of a lower-status group can follow in order to improve their self-esteem. We expected that the strategy of social creativity would not induce further interracial segregation in the group, since it does not affect the objective positions of the two groups. However, social competition should lead to, and confirm, racial segregation. At the same time, in consequence of individual mobility processes minority students were expected to exclude those whom they perceive as minorities, but who, at the same time, identify with the majority group. This is because these peers can seem to them to be traitors of their “original” ethnic group. Finally, minority groups can develop outgroup preference as well, in which case we predicted them to tend to prefer their majority instead of their minority peers.

Our results showed that indeed, friendship ties do not become significantly more (or less) segregated over time, controlling for structural mechanisms. This seems to

imply that our groups do not follow a path of segregation over time, that is, the case of social creativity is the most important strategy in these communities. However, when we take a look at our results on the negative ties as well, this interpretation seems to be false. Even though we did not find ingroup preference in the classrooms, we did see evidence for outgroup rejection from the side of majority students. Moreover, minority students showed significant same-group rejection. This suggests that instead of integration, our groups follow a path towards a state where majority students exclude minority students, who, at the same time, also develop a rejection towards their own group. This implies strong hierarchical differences between the two groups.

These results, again, highlight the role of negative ties in school communities, and the importance of examining them when analysing racial integration. Without modelling negative ties, tendencies of segregation could have stayed hidden, since they did not have signs in the friendship networks.

In our analysis, we also found an interesting, but quite unexpected tendency. Our results suggest that both minority and majority students tend to dislike those less whom they perceive as majority classmates, but who, at the same time, identify with the minority group. The acceptance of these peers is even somewhat supported in the friendship networks (in case of minority *Egos*) as well. At first sight, this category is somewhat similar to the case of individual mobility, when people identify as majorities but are still perceived as minorities by (at least some) others. However, the tendencies here are exactly the opposite.

This raises two questions. First, we should examine how prevalent this category is in our sample, and whether this is concentrated in only few of the individual classrooms. For this, we create a histogram of the proportion of being perceived as majority for those who self-identify as minority students. We present this for the whole sample (see Figure 8.3); the class-level histograms can be found in the Appendix F for classrooms separately.

Figure 8.3 shows that the case of being nominated as a majority while self-identifying as a minority is not as unlikely as we might think. In the first wave, there is, on average, one self-identified minority student in every class who is not perceived as a minority member by anyone - this is a slightly lower number in the second wave. We already saw at the descriptive statistics in Chapter 3.3 that in the second wave, there are more minority classification ties in the community. Figure 8.3 also demonstrates that this will make the classifications more “precise”, that is, more

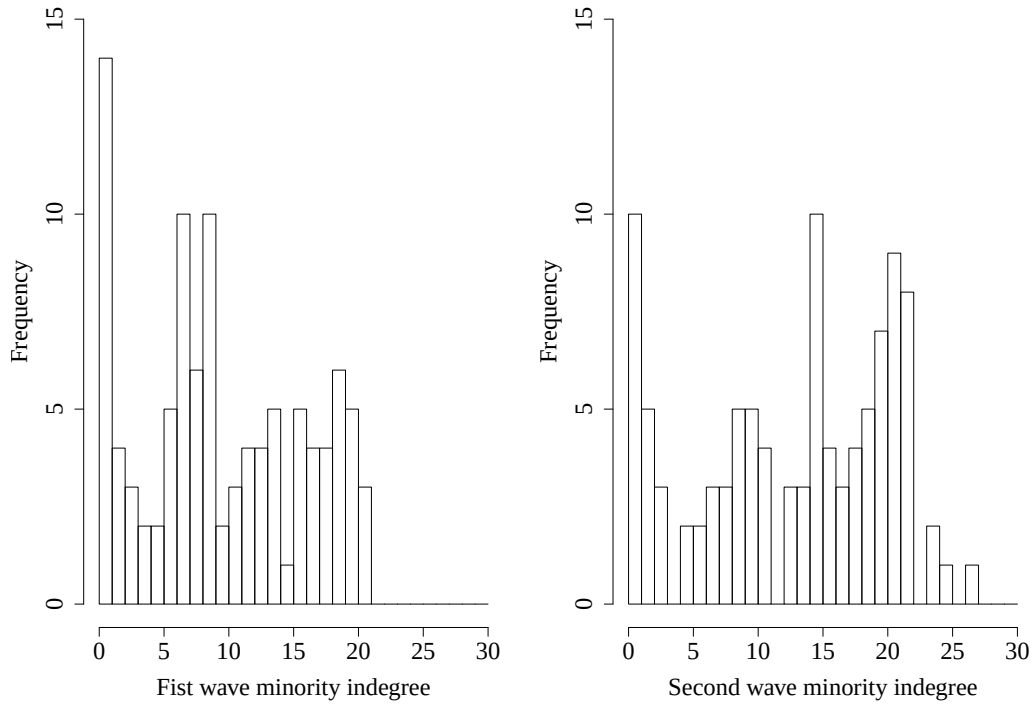


Figure 8.3: Minority In-Degrees of Self-Identified Minority Students at Wave 1 and 2

likely to match self-identifications. Still, nominations about self-identify minority students substantially vary in both waves. The individual level models show that this is not the result of one or two classrooms, though communities also show quite some variation on this.

Second, we need to understand why these students are particularly attractive to their peers. We argue that even though this type of an inconsistent categorisation is the opposite of what we expected for minority students' individual mobility, it might still be related to ethnic assimilation. This is because assimilation is not always the consequence of direct efforts; instead, sometimes perceptions about a person change, which is often, but not always followed by a change in self-identification. Therefore, these students might be accepted members of the community as majority peers regardless of the fact that they (still) self-identify as minorities. Given that based on our results, being a majority member comes with a much higher status than being a minority member, about those who have good social positions in the community their peers might unconsciously assume that they belong to the majority group, since minorities are, in general, disliked. Saperstein and Penner (2012) suggest that an increase in someone's socio-economic status comes with a higher likelihood that this

person will be later perceived as white, based on stereotypes about socio-economic status. If our communities develop stereotypes related to the hierarchical situation of the groups and the general preference for majority students in the community, we can indeed likely observe that those in good social positions are perceived as majority members rather than minorities. However, this is just a possibility that we do not elaborate in the thesis, since this effect is not modelled in the minority perception part in the co-evolution model. However, Part III directly focuses on similar effects on the formation and maintenance of minority perceptions.

Even the results we found based in this chapter are already very interesting on their own, for a deeper understanding we need to consider them together with the cross-sectional results. As we argued several times earlier, the combination of these findings can reveal a lot about the nature of the integration (or segregation) process. In our case, this seems even more exciting, since substantive results are quite different based on the cross-sectional and the longitudinal models separately. Therefore, in the next (and last) chapter of this part of the thesis, we will make an attempt to synthesize all the knowledge we gained from our analysis so far. This way, we will be able to make more precise conclusions about interracial integration of adolescents in school.

Chapter 9

Synthesis

This part of the thesis has examined interracial relationships in closed school communities, focusing on the state and development of relational integration. We provided a comprehensive theoretical background to situate our chapters utilizing the social identity approach. By operationalising several important social psychological mechanisms based on the original theory and its offshoots, we constructed an analytical framework to examine interracial 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. Thus, social network analysis should be a natural tool for them, yet they are rarely interpreted in a social network framework.

We argued that relational integration is the main goal of maintaining formally integrated environments for students. The concept of relational integration itself can be understood in two major ways: the prevalence of different same-race and cross-race friendships and negative ties in the group, and the dynamic processes affecting tie changes (and maintenance) between students. Therefore, we conducted analyses for both questions, and found quite different regularities in the two cases. In this chapter we make an effort to synthesize these findings and make conclusions based on the joint interpretation of the cross-sectional and longitudinal models.

To be able to better compare the two sets of results, we now present them in the same tables for both friendships and negative ties in Table 9.1 and 9.2. For the interpretation, it is important to keep in mind that the cross-sectional results are based on the *second* wave of the longitudinal sample, that is, they capture the state of integration at the end point of the dynamic processes modelled. While the cross-sectional results describe the interethnic situation in terms of a collection of likelihoods

at a certain point of time, the longitudinal model reveals tendencies between an earlier observation and that point of time.

		<i>Alter's ethnicity</i>			
		Majority	Minority		
<i>Ego's ethnicity</i> (self-identified)					
		Majority	"Consistent" minority (in both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
Cross-sectional	Majority	1	0.922	0.836*	1.098
	Minority	0.850	1.656**	1.187	1.191
Longitudinal	Majority	1	1.000	0.986	1.014
	Minority	1.045	0.946	1.221 ⁺	0.811

+ $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Reference category: majority - majority nomination

Table 9.1: ERGM and SAOM results: Ethnicity on Friendship Ties Selection Table

9.1 Minority Homophily

In the friendship networks (Table 9.1), our most important cross-sectional result is minorities' same-ethnic preference: they are more likely to nominate each other as friends than any other types of nominations in the networks. This tendency does not seem to be supported by a similar longitudinal process, since the respective variable is not significant in the dynamic model. This implies that even though same-ethnic friendships between minority students are more prevalent than other ties, these are not more likely to be formed or maintained between the two observations than other friendships. Therefore, a likely explanation is that an initially high level of minority-minority friendships is "conserved" over time via endogenous network processes, without actual same-ethnic preferences.

However, between the two observations not only changes in relationships, but also those in ethnic perceptions were modelled. Therefore, another possibility is while minority students maintain their friendships, their perceptions about their friends' ethnicity changes over time; that is, they start to perceive their friends whom they thought were majorities as minorities over time. This would also result in the prevalence of (perceived) same-ethnic friendships without forming or maintaining more

friendship ties based on ethnicity. This alternative explanation will be further discussed based on results from the next part of the thesis, where we will focus on the social effects behind racial perceptions.

		Alter's ethnicity			
		Majority	Minority		
Ego's ethnicity (self-identified)					
		Majority	"Consistent" minority (in both ways)	Self-identified minority but perceived majority	Perceived minority but self-identified majority
Cross-sectional	Majority	1	1.754 **	1.067	1.656 ***
	Minority	1.440 ⁺	1.197	0.836	1.987 **
Longitudinal	Majority	1	1.743 ***	0.726 **	2.401 ***
	Minority	0.899	4.726 ***	0.778 *	1.293

+ $p < 0.1$ * $p < 0.05$ * * $p < 0.01$ * * * $p < 0.001$
Reference category: majority - majority nomination

Table 9.2: ERGM and SAOM results: Ethnicity on Negative Ties Selection Table

9.2 Minority Students' Rejection by Majority Peers

Substantively, our results on negative ties are even more intriguing. All in all, this network revealed much more complex tendencies behind the integration process than friendship networks. Comparing the cross-sectional and the longitudinal results to each other, there is one major aspect in which we found similarities, while there are several substantial differences between them.

As a similarity, we found that majority students tend to (over time), and are more likely to (cross-sectionally), exclude minority students. This is a crucial finding and a strong evidence for the rejection of minority students by their majority peers, since it is observed as a state which is supported by processes pointing at the same direction.

9.3 Minority - Minority Negative Ties

One major difference between the two sets of results is related to minority-minority relationships. While cross-sectionally, we found that minority students are likely to be friends with their "consistent" minority peers, longitudinal results showed a strong tendency for *dislikes*. Though besides friendships, negative ties between these

minority students are also somewhat more likely in the cross-sectional results than the reference category, this difference is relatively small and is not significant. We cannot compare parameter sizes between the two models, yet we have to note that in the longitudinal model, this conditional odds ratio is 4.73, which is a large number, and it is highly significant.

Therefore, we see a tendency for minority students to tend to form and maintain negative ties towards those peers whom they perceive as minorities, and who also self-identify that way. However, we also see that at the end of the observation there are not significantly more negative ties between these students than between others. A probable explanation for this difference could be that first, minority students were really *unlikely* to dislike each other compared to everyone else, but these negative ties have started to develop later. This way, the very strong dynamic tendency would still result in just a “normal” level of dislike by the end of the observed period.

An alternative (or additional) explanation relies on the fact that our longitudinal model does not distinguish between forming new ties and maintaining existing ones. If either happens relatively often, this can result in a strong parameter for the given variable. Therefore, it is also an option that the large parameter is due to the *stability* of these negative ties instead of a tendency for them to *form*. This would mean that negative ties between minority students are very stable, while other negative ties dissolve more easily.

To decide about the relative importance of these processes, we should either design a SAO model that distinguishes between creation and maintenance of ties, or build an additional ERG model for the first point of time of the observed period. Although the first solution seems quite problematic due to power issues (the model is already close to being overspecified), the second one could be a good idea for further analysis of the topic. However, we should note that both processes refer to some kind of an enmity or competition *within* the minority group, whether starting from the first observation or developing later.

Finally, though, we have to mention a last alternative explanation for this discrepancy. In theory, it can also add to the observed tendency that we modelled not only relationships but perceptions over time, therefore, perceptions could have changed instead of relationships. This would mean that minority students might have realized that those they disliked (and have kept disliking) are also minority instead of majority members, which would increase their tendency to dislike other minority classmates. If this was true, we should see in the ethnic perception evolution model part that minority students tend to perceive those whom they dislike as minorities over time,

since the creation of such ties adds to this parameter. Based on our SAOM results, this is not the case (see the full set of results in Appendix D; this effect is expressed by the non-significant Negative tie parameter in the Minority classification part of the model). Therefore, we cannot confirm this alternative explanation.

9.4 Black Sheep Effect

Another difference between the cross-sectional and the longitudinal results is related to the “black sheep phenomenon”, that is, minority students’ rejection towards those whom they perceive as minorities, but who, at the same time, self-identify as majorities. While in the cross-sectional models, we found strong evidence for this, the relevant effects were not significant in the longitudinal models. At the same time, parameters still point to the right direction in the longitudinal analysis as well, so it still is possible that this tendency exists.

Alternatively, these results can also mean that the rejection of these students already existed at the first observation, and has been maintained until the second one due to endogenous processes. This would mean no additional tendency for excluding these peers; however, their exclusion still would exist.

9.5 About Those Perceived as Majorities but Self-Identify as Minorities

Finally, a very interesting piece of results is the tendency of both minority and majority students to dislike those *less* whom they perceive to be majorities, but who, at the same, time, have minority self-identifications. Moreover, in the friendship networks, we found a marginally significant tendency for minority students to nominate these peers as friend. We cannot capture this effect cross-sectionally; furthermore, we found that majority students are less likely to nominate these peers and *friends*. In the cross-sectional chapter, we called this as the “reverse black sheep phenomenon”.

Similarly to the previous cases, there are a number of explanations for these differences between which we cannot distinguish at the moment. For instance, it can be a result of the relative dislike of these individuals at the first observation but tendencies to dislike them less over time. Moreover, it can also be the result of perception changes. Finally, it is also possible that these people are more *stably* accepted than others.

9.6 About the Comparisons

Even though here we make a comparison between our longitudinal and cross-sectional results, it is important to highlight here that these sets of results do not allow very precise and reliable conclusions, since they have been gained based on somewhat different samples, estimating different model specifications, and using different methods. Therefore, in theory, differences can be fully or partly results of these other factors as well.

The first and probably most serious problem is that the two analyses were conducted on different subsamples: 16 classes for the cross-sectional analysis and 12 for the longitudinal analysis, of which 11 classes are overlapping. This is a big difference: the two datasets are distinct enough to be possibly responsible for a large part of the inconsistencies in the results. Therefore, as a robustness check, we redid the ERGM meta-analysis on the subset of the 11 classes that are also included in the longitudinal analysis. These new ERGM results, although not identical with the old ones, show quite similar tendencies, suggesting that the differences between the ERGM and the SAOM results are not consequences of the partially different data used.

Second, model specifications for the two analyses are also somewhat different. This is partly due to empirical reasons: the different model types required different structural effects to capture the tie distribution or tie evolution of the groups. However, we should not expect that these could be solely responsible for the main differences between the two sets of results: even if not in the same way, both model types included some variables to capture reciprocity, clustering, indegree and out-degree distributions. This means that the most important endogenous “alternative explanations” shown in Chapter 7 (such as reciprocity, clustering, etc.) are controlled for in both cases.

Third, SAOMs and ERGMs, the two methods used for the two analyses, are also different from each other more than just along the cross-sectional-longitudinal dimension (see Block et al., 2015). Still, these differences probably should not affect not-structural parameters as much as the magnitude of discrepancies in our results. Similarly, the different ways of aggregating class-level data (meta-analysis or multi-level models) can also affect the outcome, but it is unlikely that it could be responsible for such large differences.

Therefore, despite the lack of our basis for a very precise joint analysis of the cross-sectional and the longitudinal results, it is very likely that the main conclusions of our comparison still stand. Since just based on the cross-sectional models, or just

based on the longitudinal ones, we would probably draw different conclusions about this topic, our analysis confirmed that examining integration both cross-sectionally and longitudinally gives us a unique insight into this important phenomenon.

9.7 Discussion

Although in this part of the thesis, 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 one another 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 minority, but self-declared majority students may seem to other minority 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.

At the end of Chapter 6, we suggested that despite the evidence for the higher likelihood of inter-ethnic than that of same-ethnic negative relationships, one should not draw a conclusion against integrated education. There, we highlighted the importance of a dynamic analysis, to see whether the likelihoods found are results of processes pushing towards integration or instead segregation, and to take it into account that racial perceptions also change, partly even based on social ties. Now, we have evidence that the observed rejection of minority students by their majority peers is a result of a process where this rejection tends to be formed and maintained over time. In spite of this evidence, we still argue that it is not sufficient to draw conclusions against integrated education, for at least two more reasons.

First, our results cannot be fully generalised to other minorities than the Roma, and even the generalisation for the situation of Roma people in Hungary has its limits due to the non-representative nature of our sample in this regard. At the same time, we argue that these findings should still need to be “taken seriously”, since we found numerous tendencies we expected derived from general theories. Second, we emphasized earlier that 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. We explicitly studied a case when only formal integration, that is, ethnic mixing is provided, and investigated whether relational integration would be reached in such a situation. 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.

Most of these very important results would have remained hidden without the observation of negative networks and the application of the concept of perceived race. Moreover, they would have been hidden without directly focusing on, and controlling for endogenous network processes. Hence, future research in this field should focus more on friendship negative networks together, as well as on the discrepancy between racial self-identification and perceived race, in order to design and establish special interventions and pedagogical programmes.

Part III

Social Effects on Racial Perception

Chapter 10

Theory

10.1 Introduction

10.1.1 The Socially Constructed Nature of Race

It is generally accepted among social scientists that race is a social construct (American Sociological Association, 2003). However, it is not certain what exactly this statement means: the socially constructed nature of race can be understood and interpreted on several different interrelated levels. In this section, we make an attempt to find and link together the different aspects of the socially constructed nature of race.

As a basis of social categorisation processes, we turn to the the social identity approach again. According to this approach, the perception of ingroups and outgroups is based on the cognitive grouping of environmental stimuli (Tajfel and Turner, 1979). The categorisation of someone as a member of the ingroup or the outgroup depends on perceived differences between individuals in the situation along important dimensions. Therefore, the process consists of two major parts: the perception of individual characteristics, and their relevance in the given situation. In the next subsections, we focus on the role of both parts and the processes based on how they contribute to the socially constructed aspects of race.

10.1.2 Macro and Micro Level Salience

First, the dimensions that serve as a basis for “relevant” similarities are not fixed and universal, but are changeable and context-dependent. This can be called the varying *salience* of dimensions, and it refers to the *social meaning* of certain differences between individuals. However, micro level salience is highly influenced by the wider

environment. In certain societies, language might be a crucial source of perceived differences, while in other environments individuals rather differentiate between people based on their skin colour (Tajfel and Turner, 1979). These factors have their own historical origins and their political, economical and sociological reasons.

However, not only the relevant dimensions vary along societies and change over time, but also the constituting categories of these dimensions and their definitions. Even though race is generally found to be an important factor of differentiations (McPherson et al., 2001), “official” categories of race vary by country and have changed throughout history (Davis, 2001; Saperstein and Penner, 2012). An example for such macro level changes is the “whitening” process of Eastern- and Southern-European immigrants in the U.S during the early 20th century (see Saperstein and Penner, 2012). Consequently, individual racial memberships cannot be considered fixed as categorisations are influenced by macro level changes, which are usually based on important sociological changes in the given society. This is the first, macro level of the socially constructed nature of race. In this sense, macro changes apply to groups of people and change their categorisations in similar ways.

Besides the macro level effects, categorisation itself is always embedded in a social situation. Therefore, dimensions for categorising others also depend on the given social context. We can think of a friend or a colleague based on their race, gender, nationality, and so on; each of these dimensions might be relevant in certain situations and irrelevant in others. When perceiving strangers, a dimension is more likely to get “activated” as a primary source of categorisation if the other person is perceived as a typical member of the given category, or when the given dimension is emphasized in the social situation. When someone seems too atypical to the perceiver, and his or her category membership is not highlighted in the context, others are more likely to categorise this person based on other characteristics (Brown and Hewstone, 2005). For example, individuals having strong stereotypes about a certain racial group are less likely to acknowledge someone’s racial group membership if this person does not match the stereotypes. Similarly, people having friends from certain groups they are otherwise prejudiced about appear to ignore the friends’ membership in the given category, and when being directly asked about that dimension, they are often found to refer to the friend as an “exception” to that group (Brown and Hewstone, 2005).

The potential discrepancies between globally and locally salient dimensions are crucial. If someone does not match the stereotypes about a globally salient dimension and thus is not categorized based on it, this usually means that the potential positive experience about this person does not get generalized for the whole group (Brown and

Hewstone, 2005). In our case, a racial minority person is not categorized based on his or her race in the given context; therefore, the perceiver's racial stereotypes remain untouched. In these situations, even common positive interpersonal experience in a society cannot truly affect the macro level salience of the given dimension. However, in contexts in which the category memberships – in our case, race – are emphasized, this aggregated positive experience can affect the global salience of the certain dimension as a main source of differences between people; the dimension can become irrelevant.

10.1.3 The Fluidity of Individual Categorizations

The answer to the question which individual attributes are important for the categorisation of people depends on the salient dimensions in the given context. However, even if we can identify the relevant dimensions in a particular situation, usually there is a high individual variation in these attributes, which makes precise judgements impossible. In terms of race, most individual characteristics that could be used as indicators for racial memberships are not categorical but continuous, and show greater variations within than between racial groups (Harris and Sim, 2002). Given that the categorisation process as a whole is cognitive and perceptual, what truly seems to matter in this regard is the *perception* of race-related characteristics. Regarding race, there will always be a proportion of individuals who can be categorized in more than one racial groups, even if these categories are not equally likely for each of them. In more racially mixed societies, such as Brazil, the proportion of individuals with “ambiguous” racial memberships should be higher, since mixing creates a smoother scale for fixed attributes of individuals (such as skin colour). Not surprisingly, Brazil is often focused on when examining racial fluidity (Saperstein and Penner, 2012).

Besides the external categorisation of others, there is evidence that individual racial memberships are also not fixed but can be different across social contexts and change over time (Harris and Sim, 2002; Hitlin et al., 2006; Saperstein and Penner, 2012). Therefore, race is socially constructed not only in a sense that its definition and categories change in the macro structure over time, but it is also conceptually fluid on the individual level. We refer to this as the micro level aspect of racial fluidity.

Micro level fluidity has serious social consequences. If individuals achieving higher social status “lose” their racial memberships at the same time, they can hardly serve as positive examples for others in their original racial groups or for the outside society. This is similar to a phenomenon mentioned earlier, that is, positive experience about a cross-race person does not affect racial stereotypes when the individual is not

categorised based on his or her race by others. Because the person does not cognitively belong to the outgroup, in neither case can we expect improving attitudes and decreasing prejudice as a result of a positive interpersonal experience. However, in the first scenario, someone would be perceived as a female, a rock singer or a social scientist instead of as a black or Roma individual, while in the second scenario these people would be explicitly perceived as white instead of black, or non-Roma instead of Roma. Consequently, the second scenario is much more dependent on the nature of attributes in focus and their individual variations: a Roma person is, on average, much less visually distinguishable from a non-Roma one than black person from a white one.

10.1.4 Racial Mixing

Social meaning is the key concept for the third level of the socially constructed nature of race. Race is based on the perception of “meaningful” differences, part of which are fixed for the individuals, such as skin colour or other physical features. Thus, we can argue that these differences could always serve as basis of differentiations between individuals again, even if they once become non-salient. However, if these characteristics lose their social meanings, they should not be factors of relationship formation between individuals any more. Therefore, they should not affect preferences for partner selection. This means that racial categories would only be related to partner selection to the extent it coincides with other relevant characteristics, such as social class. This should lead to an increased level of racial mixing; as a consequence, after many generations, race could eventually disappear. We consider this the third, dynamic level of the socially constructed nature of race.

10.2 Micro-Level Racial Shifts

In this chapter, we argue that race is a social construct in several aspects. Among these, our focus is on micro level changes in individual racial memberships. We emphasize that race, even in this sense, is not fixed but fluid by nature. However, empirical research has only recently started paying attention to the fact that individuals’ race can change even within their lifetime - both the way they identify themselves, and how they are classified by others (Saperstein and Penner, 2012). Racial shifts have been found surprisingly often, and they are related to changes in social background; “whitening” is associated with increasing, and “darkening” with decreasing social status. For example, people losing their jobs are more likely to self-identify and

be classified as black, and people getting married as white, regardless of their previous self-identification and classification. Since race is considered as one of the most important sources of inequalities in many Western societies, ignoring the fact that not only race affects social position but also the other way around causes bias in traditional sociological analyses: the effect of race on social status will be overestimated (Saperstein and Penner, 2012).

Moreover, there is no objective truth about someone's race. Therefore, it is suggested that researchers should define it in terms of beliefs, perceptions, and understandings (Brubaker, 2004). Most importantly, someone's racial self-identification is not necessarily the same as how it is categorised by others in different social interactions and relations (Saperstein and Penner, 2012). We can call this the discrepancy between racial identification (self-perception) and racial classification (perception by others). These aspects follow different patterns and have different social implications; for example, we showed in this thesis earlier (Part II) that rejection of minority students seems to operate based on how someone is perceived by others more than based on self-identifications.

Changes in racial perceptions are surprisingly common: one in five people in the U.S. experience at least one change over a 19-year period when their racial memberships are classified by others external and previously unknown to the individuals (Saperstein and Penner, 2012). This provides evidence that classification depends on the given context; however, it does not offer mechanisms about changes in perceptions of people who already know the given individual. Most importantly, it is not yet clear how exactly racial perceptions can change when people are embedded in communities. We argue that these shifts cannot be fully explained by external characteristics of the individuals, but are also shaped by endogenous processes within the group.

Recently, the fluid and subjective nature of race has started to draw more attention in social sciences. However, research mostly concentrated on identifications of individuals whose racial category choices seem less evident (e.g. Xie and Goyette, 1997; Farley, 2002; Harris and Sim, 2002; Snipp, 2003; Herman, 2004; Hitlin et al., 2006; Vaquera and Kao, 2006; Rockquemore and Brunsma, 2008). In practice, this includes two main groups of subjects: 1) multiracial individuals, who, by definition, are expected to have more than one "obvious" racial category to choose from, and/or people in multiracial social settings, such as Brazil, where the level of mixing is high; and 2) individuals who belong to groups with physical and facial characteristics not obvious to categorise for others (mostly Hispanics in the U.S.). We also suggested

earlier that racial changes are not equally likely for all groups and individuals. However, following Saperstein and Penner (2012) we argue that if the *concept* of race is defined as continuous by nature instead of being a collection of distinct categories, race should be treated as a changeable attribute for members of all populations.

10.3 Racial Shifts as Signals of Individual Mobility

Probably, the most crucial finding about racial shifts is their strong relationship with changes in social background (Saperstein and Penner, 2012). These shifts might be unintended consequences of increasing or decreasing socio-economic status; however, Tajfel and Turner (1979) propose that individual mobility can be understood as a valid strategy for members of lower-status social groups to enhance their social identity, and therefore, their self-esteem (this is described in more detail in Chapter 5 of this thesis). This means that they dissociate themselves from their original group, and attempt joining a more positively perceived one. In Chapter 5, we already presented a quote as an example for this behaviour, but it so important for this part of the thesis as well that we once again include it here.

“[Leroy:] When you see someone go downtown and get a good job, if they be Puerto Rican, you see them fix up their hair and put some contact lens in their eyes. Then they fit in. And they do it! I seen it. They turnovers. They people who wanna be white. Man, if you call them in Spanish, it wind up a problem. I mean like, take the name Pedro - I’m just telling you this as an example - Pedro be saying, [imitating a white nasal accent] ‘My name is Peter.’ Where do you get Peter from Pedro? Just watch how Spanish people fix up their hair. When they get nice jobs like that, all of the sudden, you now, they start talking proper.” (p.170 Bourgois, 2003)

Whether and to what extent individual mobility is a relevant strategy depends on the cognitive availability of this and of alternative options, such as engaging in direct competition with the higher status group. This is strongly influenced by the status differences between the groups, and the stability of the hierarchy (Tajfel and Turner, 1979). Besides, in different social settings perceptions about distinct groups are based on different dimensions; in other words, not the same attributes (e.g. skin color, language) are salient in every social context (Tajfel and Turner, 1979). These dimensions are based on the broader social environment (e.g. stereotypes in a given society), and local processes at the same time. Therefore, individual opportunities can

be also limited based on what the salient dimensions are, depending on the attributes of a given individual along these dimensions. Indeed, Bourgois (2003) implies that the anger “Leroy” expresses in the above quote might be partly because his too dark skin colour would not allow for him to become a “turnover”.

There is more evidence that changing one’s self-identification is not enough for “passing”, but it also has to be accepted by others: for instance, the strongest finding of Part II is that majority students tend to exclude those whom they perceive as minorities regardless of these students’ self-identifications. Moreover, we find some evidence as well, though only cross-sectionally, that minority students are likely to reject those whom they also perceive as minorities, but who, at the same time, identify with the majority group). This highlights the importance of perceptions, which seem to be the key for joining a higher status racial group.

10.4 Conclusions

This chapter focused on the socially constructed nature of race, describing several aspects in which race can be understood as a social construct. Among these, we concentrated on the most surprising one that individuals’ race can change within their lifetime without large macro-level changes in the definitions of race and racial categories. We argued that racial shifts can be reasons or consequences of individual mobility, when a member of a lower-status racial group leaves his or her original group and tries to join a more positively perceived one. We emphasized that changes in others’ perceptions are crucial in this regard, since these will decide whether or not the individual mobility was successful, and the person is actually perceived as a member of the new group.

In Chapter 11 and 12, we propose three types of micro-level mechanisms shaping racial perceptions. First, we concentrate on dyads and examine how individuals perceive their own friends (Chapter 11). Since friendships are based on time spent together, we assume that friends learn a lot about each other over time, this way they should be more likely to be aware of and accept how their friends self-identify. Therefore, we expect that classifications about friends tend to be more “precise”, that is, more likely to match these friends’ self-identifications. On the other hand, the attraction-similarity hypothesis (Morry, 2005) suggests that attraction leads to the perception of similarity, thus, people in general tend to overestimate their friends’ similarity to themselves. Therefore, we also predict that they tend to classify their own friends as being the same race as themselves more than would be expected

based on these friends' self-identifications. If both processes exist, their effects can be partially cancelled out by each other.

Second, we focus on other friendships in the community as sources of context for perceptions and social influence (Chapter 12). In this chapter, we first argue that the perceived racial composition of someone's friendship group can affect how this person is classified by others. Because individuals have the experience that similarity and attraction are generally related, they tend to assume that friends are more similar to each other than they actually are – in our case, more similar than their self-identifications are (Morry, 2005). Therefore, if others perceive that a given peer has a lot of friends who, to them, seem to belong to a certain racial group, they will be more likely to classify this person as a member of that group as well. Third, we concentrate on the fact that opinions and perceptions are subject to social influence in communities (Steglich et al., 2006; Huisman, 2013). Therefore, we expect that peers, and especially friends, affect each others' perceptions about others' race in the group, and tend to agree in their classifications.

Our micro-level approach is based on applying concepts and techniques from social network analysis that were introduced earlier in this thesis (Chapter 4). This is extremely useful here, as it allows a focus on how a given individual classifies a given peer in the community, and an explanation of this by the characteristics of these two individuals, and of the network structure they are embedded in. The process is understood from the perceiver's point of view. This means that in our models, each individual is assumed to classify others based on his or her *own* perception about the racial composition of their friends. Similarly, when analysing the influence of friends on racial perceptions, we model how each individual's judgement is affected by the perception of his or her *own* friends. By this, we take into account that though all the actors in a group belong to the same network, the specific micro-environment is different for each of them, since each has different set of friends and different perceptions about others. This allows us to avoid the unnecessary aggregation of data and, consequently, to prevent ecological fallacy.

Chapter 11

Dyadic effects

11.1 Introduction

This chapter introduces and tests dyadic friendship mechanisms behind racial perceptions. Previous chapters in Part II already provided evidence that racial perceptions have crucial roles in forming friendships and negative ties, taking into account that racial perceptions can also change over time; moreover, their formation may also be affected by social ties. Relationships and racial perceptions are interrelated: both of them explains changes in the other.

Like earlier, in the focus of the current chapter is also the dyad, but this time we concentrate on the other direction of the two-way process: the main research question is how friendships influence the way individuals perceive each other's race. The nature of this relationship is not obvious at all. It can be argued that people are more likely to categorize their friends' race "correctly", that is, as matching their self-identifications, than that of others, since they have more information about their friends, and they collect even more over time. At the same time, certain social psychological results suggest based on attraction, that individuals will be more biased when deciding about friends' characteristics and tend to overestimate their similarity to them.

For examining these processes, our "reference point" is the self-identification of the perceived peer. That is, we are interested in how much the proposed processes influence the tendency of individuals to classify someone the way he or she self-identifies. This is important since there is a strong relationship between self-identifications and classifications (see Chapter 3.3), but we can also observe important differences. The sociologically most interesting cases are related to these differences, therefore, we aim to identify factors explaining these discrepancies. Therefore, in this chapter we focus on dyadic processes as "on top of" the effect of *Alter*'s self-identifications, which can

allow us to better explain the cases when self-identifications and perceptions about someone are different.

11.2 Theory and Hypotheses

Friendships are close and intimate relationships which require a lot of time spent together (Fischer, 1982). During this, friends are generally assumed to share information about themselves with each other. Over time, we learn more and more about our friends and their individual attributes: characteristics, personalities, norms, values, attitudes; especially in early phases of the friendship. Therefore, we can assume that individuals make more informed and precise decisions when they judge their friends' race than when deciding about others, for at least two reasons. First, based on shared information, friends should be more likely to be *aware* which racial group someone identifies with. Second, based on positive emotions and interactions between them, friends should also be more likely to *accept* this categorisation once they know about it. This indeed suggests that their classifications should be more precise than others', that is, more similar to how these friends self-identify.

Even though these assumptions seem reasonable, it is not certain that friendship (only) influences perceptions this way. Based on the social identity approach (Tajfel, 1974; Turner, 1975), we can build a quite different argument. The theory suggests that individuals tend to give preferential treatments to others whom they perceive to belong to the same group along relevant dimensions, such as race (also see Chapter 5). Since the process behind in-group favouritism is based on the cognitive grouping of environmental stimuli, categorization does not require actual groups, or even objectively given characteristics, but only the perception of in- and out-group memberships. Therefore, the social identity approach implies that perceived similarities should be more important in relationship formation than actual similarities.

Empirical research provides evidence for this. Among students, perceived similarities in psychological characteristics are better predictors for friendships than actual similarities (Selfhout et al., 2009). Also, this thesis has already presented that majority students in school classes tend to exclude peers whom they classify as minorities, regardless of those students' self-identifications (see Chapter 6).

However, friends are not only similar to each other, but also tend to over-perceive the level of similarity between themselves. In psychology, it is often studied that characteristics of the perceiver influence perceptions about others; some concepts based on this phenomenon are projection, social projection, attributive projection,

ego-centric bias, and egocentrism (see Morry, 2005). The related attraction-similarity hypothesis (Morry, 2005) predicts that attraction will lead to the projection of the self onto the other person, thus, to the perception of similarity. Empirical findings support these predictions. Students' perceptions about their friends' school performance correlate more strongly with their own performance than friends' actual level of performance does (Berndt and Keefe, 1995). Moreover, college students tend to overestimate their friends' similarity to themselves in psychological traits (Morry, 2005, 2007). Finally, in a school community approximately every fourth adolescent has been found to falsely perceive their best friend's attitudes towards minorities as similar to theirs (Váradi, 2014). Based on this, we can expect that friendships cause bias when people perceive their friends' race: they will overestimate their similarity to themselves compared to their similarity in their racial self-identifications.

Based on the arguments above, we have two possible processes that can shape racial perceptions of friends. As both of them seem to be reasonable to operate when categorizing our own friends, the goal of our study is to separate these, and decide whether and in what cases these have effects on racial perceptions. For this, racial self-identifications should also be parts of the analysis, since they are strongly related to perceptions, and their relationship should be controlled for. As we mentioned earlier, we interpret our processes "on top of" the most likely expectation that individuals are perceived in the way they self-identify. Therefore, our information and bias processes presented in this chapter are proposed as extra effects adding important information to the more simple picture. This can provide us interesting insights in patterns of racial perceptions when they are actually *different* from self-identifications. Therefore, we start with an initial baseline hypothesis that

H/b: individuals will tend to agree with others' self-identifications.

In terms of the "extra effects" mentioned above, we propose two other processes which can modify the effect of this baseline hypothesis by taking friendships into account. First, because friends have more information about each other than other classmates do, we hypothesize that

H/1: friendship increases the tendency to categorize others as they self-identify.

Moreover, based on the perception bias predicted by the attraction-similarity hypothesis, we also hypothesize that

H/2: friendship increases the tendency to categorize others in the same race as oneself.

Table 11.1 illustrates the predicted additional effects of a friendship on racial classification in the simple case of two groups: a majority and a minority group. The four predictions of each hypothesis show how a friendship tie from the *Ego* to *Alter* affects the likelihood that *Ego* classifies *Alter* as a minority (controlling for the main effects of the self-identifications of both individuals). The “+” sign means a positive expected additional effect of the friendship, while the “−” sign stands for a negative additional effect.

		Friend’s self-identification	
		majority	minority
Perceiver’s self-identification	majority	H1/a (info): −	H1/b (info): +
		H2/a (bias): −	H2/b (bias): −
	minority	H1/c (info): −	H1/d (info): +
		H2/c (bias): +	H2/d (bias): +

Table 11.1: The Additional Effect of a Friendship on Minority Classification about Others

Table 11.1 demonstrates the different predictions of H/1 and H/2. H/1 suggests that the information people collect about their friends will make their classifications more likely to match the friends’ self-identifications; majorities will tend to be perceived as majorities (H1/a and H1/c), and minorities as minorities (H1/b and H1/d). However, H/2 predicts that perception bias will make people more likely to classify their friends in the same race to themselves than how these friends self-identify: majorities will tend to perceive their friends as majorities (H2/a and H2/b), and minorities as minorities (H2/c and H2/d). When *Ego* and the friend belong to the same group based on their self-identifications (H/1-2a and H/1-2d), the two hypotheses lead in the same direction, but in the other two cases (H/1-2b and H/1-2c), they have opposite predictions. If we expect both mechanisms to operate to some extent, then in case of same-race friendships (based on self-identifications) this should result in strong positive or negative effects on minority perceptions, while in case of cross-race friendships (based on self-identifications) the effects should partly cancel each other out.

11.3 Model

For our analysis, we need to operationalise our hypotheses in SAOM terms, and “translate” them to SAOM configurations. The effect of these exact configurations will be tested on the dependent variable, that is, the probability of *Ego* classifying *Alter* as a minority (1 is minority, 0 if majority). For these configurations, others’ minority nominations (1 if minority, 0 if majority in all cases), minority self-identifications (1 if minority, 0 if majority), and friendship nominations (1 if *Ego* nominates *Alter* as a friend, 0 otherwise) are taken into account. Table 11.2 lists, illustrates, and explains the configurations tested in the model. Black ties stand for minority nominations, grey ties for majority nominations, and dashed ties for friendship nominations. Black nodes are self-declared minorities, grey nodes are self-declared majorities; the ethnicity of white nodes is not specified, they can be either minorities or majorities. For example, the table starts with H/b, where we test whether in cases when *Alter* is a self-identified minority (therefore, *Alter*’s node is black in the table) it will be more likely that *Ego* perceives *Alter* as a minority, compared to the reference category (that is, *Alter* is a majority); here, *Ego*’s identification is irrelevant, he or she can self-identify with either minority or majority group (therefore, *Ego*’s node is white in the table).

Table 11.2 illustrates the effects that express our hypotheses in social networks terms. In Appendix G, there is more information on how these effects are calculated, with visual illustrations and the mathematical formulation of these hypothesis based on the SAOM effects used.

For the analysis, we estimated one large random-coefficient multilevel SAOM on our longitudinal subsample of Hungarian secondary students with Roma minority and non-Roma majority students. More details about the method can be found in Chapter 4, and about the data in Chapter 3.

11.3.1 Other Variables in the Model

Besides these main explanatory variables, many others are also necessary for a correct model. Most importantly, while minority classifications are modelled based on configurations also including friendship ties, friendship networks are simultaneously modelled, based on configurations also including minority classifications (this is similar to our model in Chapter 8). This way, it can be separated whether friendships affect racial perceptions (e.g. I, as a minority, will perceive the friends I already have as minorities), or racial perceptions affect friendships (e. g. I, as a minority,

Configuration	Illustration	Prediction	Expected β
<i>H/b: individuals will tend to agree with others' self-identifications.</i>			
Alter self-identified minority		<i>Ego</i> will be more likely to classify <i>Alter</i> as a minority	$\beta_{H/b} = +$
<i>H/1: friendship increases the tendency to categorize others as they self-identify</i>			
<i>H/2: friendship increases the tendency to categorize others in the same race as oneself</i>			
Additional effects of a friendship tie from <i>Ego</i> to <i>Alter</i> if...			
...both <i>Ego</i> and <i>Alter</i> are self-identified majorities		H/1 & H/2: <i>Ego</i> will be less likely to classify <i>Alter</i> as a minority	$\beta_{H/1a} = -$ $\beta_{H/2a} = -$
...<i>Ego</i> is self-identified majority, <i>Alter</i> is self-identified minority		H/1: <i>Ego</i> will be less likely; H/2: <i>Ego</i> will be more likely to classify <i>Alter</i> as a minority	$\beta_{H/1b} = -$ $\beta_{H/2b} = +$
...<i>Ego</i> is self-identified minority, <i>Alter</i> is self-declared majority		H/1: <i>Ego</i> will be more likely; H/2: <i>Ego</i> will be less likely to classify <i>Alter</i> as a minority	$\beta_{H/1c} = +$ $\beta_{H/2c} = -$
...both <i>Ego</i> and <i>Alter</i> are self-identified minorities		H/1 & H/2: <i>Ego</i> will be more likely to classify <i>Alter</i> as a minority	$\beta_{H/1d} = +$ $\beta_{H/1d} = +$

Blank arrow: minority classification; dashed arrow: friendship

Black node: minority actor; grey node: majority actor; white node: any actor (based on self-identifications)

Figure 11.2: Model Specification

will make friends with others I already perceive as minorities). In order to model friendships properly, structural effects based on findings of earlier studies are also included (Steglich et al., 2010b). Appendix H presents the whole model specification with explanations about each variable used in the model, introducing the minority classification part and the friendship part as well.

11.4 Results

11.4.1 Descriptive results

First, here we present some descriptive characteristics of our sample, and refer back to some more details from Chapter 3.3 as well. Our baseline hypothesis states that minority perceptions and self-declarations are not independent: those who self-identify as minorities will be more likely to be perceived so. Chapter 3.3 illustrates that there is a strong positive relationship between minority self-identification and students' indegrees in the minority classification networks, that is, how many others perceive them as a minority. This already provides some initial evidence for our H/b: individuals tend to agree with others' self-identifications. Moreover, we also demonstrated in Chapter 3.3 that minority perception indegrees are consistent over time.

In the next step, related to our information (H/1) and bias (H/2) hypotheses, we examine whether students perceive the ethnicity of their friends and their “non-friends” differently. Table 11.3 demonstrates the results. The percentages in the table stand for the proportion of dyads in which *Ego* classifies *Alter* “correctly”, that is, when *Ego*’s classification matches *Alter*’s self-identification. For this purpose, the same-ethnic and cross-ethnic categories are created based on self-identifications, since we are interested in how someone is categorized by others compared to his or her self-identification.

		Same-ethnic	Cross-ethnic
Friends	Wave 1	93% (N=1380)	58% (N=275)
	Wave 2	94% (N=1169)	66% (N=283)
Non-friends	Wave 1	90% (N=4809)	64% (N=1928)
	Wave 2	93% (N=4647)	69% (N=1897)

Table 11.3: Proportion of Dyads in which *Ego* Categorizes *Alter* the Same Way as *Alter*’s Self-Identification, by Friendship and Ethnicity

Table 11.3 (first column) shows that students tend to accept the self-identification of friends whose self-identification is the same as their own. For cross-ethnic friendships, *Ego*’s perception matches *Alter*’s self-identification in only 58% of the cases at the first observation, and 66% at the second observation. This seems to support our bias hypothesis: individuals tend to overestimate their (cross-race) friends’ similarity to themselves, while they agree with their same-race friends’ similarity. Interestingly, though, the tendencies are similar in case of non-friends as well: for same-ethnic

dyads, there is a high agreement with *Alter*'s self-identification (90% and 93%), and for cross-race dyads, this proportion is still quite low (64% and 69%). Therefore, it seems that individuals have a general tendency to categorize others with different self-identifications to the same category with themselves; though this is, as expected, stronger for friends in both waves. Moreover, classification of others seems to get closer to their self-identifications over time, and this increase is also larger in friendship dyads (58% $\rightarrow$ 66% for friends, 64% $\rightarrow$ 69% otherwise). This supports our information hypothesis as well, suggesting that friends learn about each other over time (even more than others).

However, by comparing aggregated data over time, we cannot make causal conclusions. The demonstrated differences between the two data waves can be partly, or completely, consequences of changes in friendships. Following this, we calculate what proportion of same-ethnic and cross-ethnic friendships are stable over time. Table 11.4 shows these results; here, *Alter*'s ethnicity is first defined based on self-identifications (row 1), and then based on *Ego*'s perceptions (row 2) in the first observation. Our results suggest that, indeed, cross-ethnic friendships are less likely to be maintained over time, regardless the definition of *Alter*'s ethnicity (38% and 40%, instead of 51%).

	% of same-ethnic friendships	% of cross-ethnic friendships
Based on self-identifications	51%	40%
Based on <i>Ego</i> 's perceptions	51%	38%

Table 11.4: Proportion of Friendship Nominations from the First Wave that were Maintained by the Second Wave

11.4.2 SAOM results

The original table of results, together with the friendship evolution, is presented in Appendix I. That is, similarly to our previous multilevel SAOM model, an overwhelming amount of data, therefore this section only focuses on results directly relevant to our hypotheses. Appendix I also provides a more detailed description of the results presented here, with estimates, standard errors, and whether the parameter was fixed or randomly varying.

Table 11.5 presents estimates for our hypotheses. The parameters presented here are, in several cases, not directly estimated in the model, but are calculated and tested as a sum of other SAOM effects. Appendix G introduces these effects and based on

which parameters they are calculated; while Chapter 4.5 describes the statistical methods for testing these joint parameter estimates. The estimates presented in Table 11.5 (and also in the Appendix) should be interpreted as similar to log odds ratios in logistic regression models.

Configuration tested		Estimate (β)		Credible interval	
				from	to
H/b	<i>Alter</i> self-identified minority	0.87	***	0.67	1.07
<i>Additional effects of a friendship tie from Ego to Alter if...</i>					
H/1a	both <i>Ego</i> and <i>Alter</i> are self-identified majorities	0.09		-0.41	0.57
H/2a					
H/1b	<i>Ego</i> is self-identified majority, <i>Alter</i> is self-identified minority	0.26		0.17	0.70
H/2b					
H/1c	<i>Ego</i> is self-identified minority, <i>Alter</i> is self-identified majority	0.55	**	0.07	1.01
H/2c					
H/1d	both <i>Ego</i> and <i>Alter</i> are self-identified minorities	0.72	***	0.40	1.03
H/2d					
* * * < 0.001 < ** < 0.01 < * < 0.05; 95% credible interval					

Table 11.5: SAOM Results

First, our baseline hypothesis (H/b) states that individuals will be likely to accept their peers' self-identifications. This is expressed by the *Alter* self-declared minority effect. Table 11.5 shows that its value is $\beta_{H/1b} = 0.87$ and it is strongly significant. Therefore, we find evidence for this baseline hypothesis.

The first hypothesis posits that information friends collect about each other affects their perceptions, while the second one predicts a bias when perceiving friends. Our descriptive results has suggested that the difference is in fact larger between the perception of (self-identified) cross-ethnic peers and same-ethnic ones than between the perception of friends and non-friends, implying that individuals are likely to "falsely" perceive others dissimilar to themselves; though this effect has indeed been even stronger for friends. However, it has also been shown that inter-ethnic friendships are more likely to dissolve over time, therefore including friendship evolution in the model might change these tendencies.

SAOM results do not show any significant effects for majority perceivers, demonstrated by the non-significant estimates for the cases when *Ego* is a majority student. For minority *Egos*, though, parameter estimates are significant. When both are self-identified minority members, *Ego* is more likely to perceive *Alter* as a minority student

if they are friends than otherwise ($\beta_{H-2/d} = 0.72$, $p < 0.001$). This meets our expectations but does not decide about the two hypotheses, since it is predicted by both of them. However, minority *Egos* also tend to “misperceive” their self-identified majority friends as minorities more than other (non-friend) majority peers ($\beta_{H1-2/c} = 0.55$, $p < 0.01$). This is evidence for the bias hypothesis instead of the information one in case of minority *Egos*. Note that in the friendship evolution part of the model, we controlled for the fact that these students might have become (and stayed) friends in the first place because *Ego* (“falsely”) perceived *Alter* as similar to him/herself; therefore, this effect cannot be explained by friendship effects.

11.5 Conclusions

This chapter identified two main groups of micro-level mechanisms shaping racial perceptions. First, based on the attraction-similarity hypothesis we predicted that psychological processes cause bias when perceiving our own friends. This means that given their ethnic self-identification, our perception of our friends is biased towards classifying them in our own ethnic group. Moreover, we also expected that we learn about our friends over time, which makes us more likely to “correctly” classify them, that is, to match their self-identifications. These partly contradicting processes were simultaneously tested on an example of two ethnic groups. Based on the two processes, we formed predictions for all four nomination types (majority and minority *Ego* and *Alter*), and calculated whether *Ego* is more likely to perceive *Alter* as a minority if they are friends than otherwise. For this, we assumed that in general, students tend to accept each other’s self-identifications; our two processes are tested whether they significantly affect this tendency.

First of all, we found strong evidence that indeed, students tend to categorize others in the way they self-identify. Surprisingly, however, of the two processes proposed on top of this our results only provided clear evidence for the bias hypothesis. That is, minority students tend to “falsely” classify their majority friends as minorities more often than they do other majority peers. Moreover, minorities are also more likely to “correctly” categorize their minority friends as minorities than they do other minority peers; but this was the prediction of both the bias and the information hypotheses, therefore in this case, we cannot distinguish between these processes. At the same time, we could not find evidence for either mechanism in case of majority students categorizing others.

This discrepancy in our findings between majority and minority students might be a consequence of status differences between these groups: if minorities feel that their social position is more vulnerable, they might have stronger group identity and find it more important that their friends share this identity. This, however, is unlikely, since Part II found tendencies for outgroup preference of minority students. Alternatively, they might assume that those who are their friends must be minorities, due to the strong rejection from majority students towards their minority peers (see Part II). At the same time, majorities might find it natural that their minority peers want to befriend them, therefore, once a friendship is formed, they do not have to explain it to themselves. It is still surprising, though, that we could not find strong evidence for the information hypothesis. This suggests that the group identification processes in the community are strong but hidden; it is possible that students do not explicitly discuss inter-group issues, but still are very much influenced by ethnic differences.

Chapter 12

Context Effects and Social Influence

12.1 Introduction

Similarly to our previous chapter, this one also focuses on shifts in racial perceptions. While Chapter 11 examines the role of dyadic processes, that is, how friendships influence who perceives whom as a minority student, this chapter concentrates on mechanisms related to the broader group context. Here we argue that when actors are embedded in groups, shifts in racial perceptions cannot be fully explained by external characteristics, but they are also results of different, endogenous social micro-mechanisms. If “race is not simply a marker of privilege or stigma ascribed at birth; like other status characteristics, race also implies and is in part defined by a set of expectations by which people are continually judged in everyday interactions” (Saperstein and Penner, 2012, p. 678), changes in someone’s classifications are also results of everyday interactions, embedded in different social relations. Because social relations are not independent but form interrelated social networks, people’s perceptions about others are also not independent but affect each other, especially in communities.

To understand the nature of these processes, we focus on different network configurations, examining two major types of mechanisms. First, someone’s social ties can serve as a context for others’ classifications about them; that is, an individual with several friends who (are perceived to) belong to a certain racial group will be more likely to be categorized as another member of that group by others. Indeed, a common element of individual mobility scenarios is dropping social ties with members of the original racial group (Portes and Sensenbrenner, 1993). Second, others’ racial classifications about someone can vary, even within the same social environment.

Therefore, we focus on understanding why a certain individual perceives another one in a certain way. This means that we still explain dyadic perceptions (similarly to the previous chapter), but our explanatory variables are based on the broader network of the group.

This chapter examines friendship context and social influence processes on racial classification. Similarly to our chapter on dyadic explanations (Chapter 11), all mechanisms presented in this paper are proposed as extra effects on top of individuals being categorized the same way they self-identify; and also on top of effects described in Chapter 11. In the next sections, we briefly summarize the most relevant theories and empirical findings related to the relationship between race and social ties in general, contextual processes behind racial categorization, and different social influence effects, mainly from the fields of social psychology and social network analysis.

12.2 Theory and Hypotheses

12.2.1 Friendship Context Effects

In Chapter 11, we introduced the attraction–similarity hypothesis (Morry, 2005). The hypothesis suggests that people usually overestimate their friends’ similarity to themselves. This is because individuals have the belief that attraction and similarity are related; therefore, they also tend to assume that those attracted to each other are likely to be similar as well. Therefore, the hypothesis does not only apply to the perceptions of someone’s own friends: in the broader context, we are also more likely to perceive pairs or groups of friends as similar to each other more than their actual level of similarity. Consequently, individuals having more friends who are perceived (by a certain peer) to belong to a certain racial group will be more likely to be perceived themselves as members of that group (by the same peer).

Therefore, we hypothesize that

H/1: an individual will tend to classify others as members of a racial group if these others have more friends whom the individual also perceives as members of that group.

This means, using the basic case of two racial groups again (see Chapter 11), that others will be more likely to classify individuals as minorities if they perceive that these have more minority friends; and as majorities in case of more majority friends. We should note here that being more likely to be classified as a majority peer also

means to be *less* likely to be classified as a *minority* one, which is our dependent variable (because for this example, we assume only these two categories).

The number of someone’s friends can be defined either based on those nominating him or her as a friend, that is, his or her popularity, or based on those he or she nominates as friends, that is, his or her friendship activity. Both of these aspects of friendships are important for our purposes, since they measure different “sides” of the friendships. Therefore, H/1 has four predictions: those someone perceives as (H/1a) more popular among minorities, or (H/1b) more active towards minorities, will be more likely to be classified as minorities by this person; at the same time, those someone perceives as (H/1c) more popular among majorities, or (H/1d) more active towards majorities, will be less likely to be classified as minorities by this person. This means that we assume that popularity amongst and activity towards a certain group both strengthen others’ tendency to perceive someone as a group member. However, measuring the number of friendships in two different ways (popularity and activity) can give us indications whether there are differences between the effects of these.

12.2.2 General Peer Influence and Friendship Influence

Social networks have essential roles in the diffusion of opinions, attitudes and tastes in communities (Steglich et al., 2006; Huisman, 2013). Interpersonal interactions are generally embedded in different social groups, providing direct and indirect opportunities for the actors to affect each other in several ways. In closed and relatively small communities, it is reasonable to expect that to some extent, everyone has the chance to affect others. However, not all peers are equally relevant in this matter, and the main sources of social influence are those subjectively meaningful to the individual, such as their close friends (Lomi et al., 2011). Sociological and psychological studies, therefore, typically tend to focus on actual relationships, mostly friendships within the communities, when analysing peer influence.

In schools, students have been found to influence each others’ characteristics, such as deviant behaviour, aggression, or academic achievement (Wentzel et al., 2004; Steglich et al., 2006; Sijtsema et al., 2010; Lomi et al., 2011; Light et al., 2013). Moreover, though without suggesting causal inference, general prejudice against minorities is also found to be shared with friends in classrooms (Váradi, 2014). Either due to selection or influence processes, this suggest that friends think similarly about minorities, and given the evidence about students’ capability of affecting each others’ opinions and attitudes towards different topics, they may be expected to affect each others’ opinions on their peers and specifically their peers’ race as well.

Based on this argument, our second hypothesis refers to the social influence of classmates in general:

(H2) Classroom members will tend to agree in their classifications;

while the last hypothesis predicts an additional friendship effect as well:

(H3) friends will tend to agree in their classifications even more strongly than other classroom members.

12.3 Model

For our analysis, we need to operationalize our hypotheses in SAOM terms, and “translate” them to SAOM configurations (see more about SAO models in Chapter 4). The effect of these exact configurations will be tested on the dependent variable, that is, the probability of *Ego* classifying *Alter* as a minority (1 if minority, 0 if majority). For these configurations, others’ minority nominations (1 if minority, 0 if majority in all cases), minority self-identifications (1 if minority, 0 if majority), and friendship nominations (1 if Ego nominates Alter as a friend, 0 otherwise) are taken into account. Table 12.1 lists, illustrates, and explains the configurations tested in the model. Black ties stand for minority nominations, grey ties for majority nominations, and dashed ties for friendship nominations. Black nodes are self-declared minorities, grey nodes are self-declared majorities; the ethnicity of white nodes is not specified, they can be either minorities or majorities. For example, the table starts with H/b, where we test whether in cases when Alter is a self-identified minority (therefore, Alter’s node is black in the table) it will be more likely that Ego perceives Alter as a minority, compared to the reference category (that is, Alter is a majority); here, Ego’s identification is irrelevant, he or she can self-identify with either the minority or the majority group (therefore, Ego’s node is white in the table).

These effects are not all directly testable in their current form; like in previous cases, we will have to calculate them based on the sum of other variables in the model, and then test this joint estimate. For the calculation of these effects, see Appendix J. Methods for the joint parameter test can be found in Chapter 4.5. To test our hypotheses, we included these effects in the model estimated in Chapter 11; the whole model specification can be found in Appendix H. This is really advantageous, since this way we already control for the dyadic processes described and found in the previous chapter when testing our current hypotheses.

Configuration	Illustration	Prediction	Expected β
<i>H/1: an individual will tend to classify others as members of a racial group if these others have more friends whom the individual also perceives as members of that group</i>			
Ego's popularity among those Alter classifies as minorities: (1) the number of friendship ties Alter receives (2) from those classified as minorities by Ego		(3) Ego will be more likely to classify Alter as a minority	$\beta_{H/1a} = +$
Ego's activity towards those Alter classifies as minorities: (1) the number of friendship ties Alter sends (2) towards those classified as minorities by Ego		(3) Ego will be more likely to classify Alter as a minority	$\beta_{H/1b} = +$
Ego's popularity among those Alter classifies as majorities: (1) the number of friendship ties Alter receives (2) from those classified as majorities by Ego		(3) Ego will be less likely to classify Alter as a minority	$\beta_{H/1c} = -$
Ego's activity towards those Alter classifies as majorities: (1) the number of friendship ties Alter sends (2) towards those classified as majorities by Ego		(3) Ego will be less likely to classify Alter as a minority	$\beta_{H/1d} = -$
<i>H/2 Classroom members will tend to agree in their classification.</i>			
Peer influence		(2) Ego will be more likely to classify Alter as a minority	$\beta_{H2} = +$
<i>H/3 Friends will tend to agree in their classifications even more strongly than other classroom members</i>			
Friend influence		(3) Ego will be more likely to classify Alter as a minority	$\beta_{H3} = +$

Blank, black arrow: minority classification; blank, grey arrow: majority classification; dashed arrow: friendship

Figure 12.1: Model Specification

12.4 Results

The original table of results, together with the friendship evolution, is presented in Appendix I. This section only focuses on results that are relevant to our hypotheses directly. Appendix I also provides a more detailed description of the results presented here, with estimates, standard errors, and between-classroom differences. The estimates presented in Table 12.2 should be interpreted as similar to log odds ratios in logistic regression models.

Before presenting our results about our hypothesis, it is important to note again that we found evidence in the previous chapter that individuals are likely to accept their peers' self-identifications. Therefore, as highlighted before, all results should be understood as additional effects on top of this relationship.

Configuration tested		Estimate (β)		Credible interval	
				from	to
H/1a	<i>Alter's</i> popularity among those <i>Ego</i> classifies as minorities	0.37	***	0.20	0.58
H/1b	<i>Alter's</i> activity towards those <i>Ego</i> classifies as minorities	-0.03		-0.18	0.12
H/1c	<i>Alter's</i> popularity among those <i>Ego</i> classifies as majorities	-0.08	***	-0.14	-0.03
H/1d	<i>Alter's</i> activity towards those <i>Ego</i> classifies as majorities	0.04	**	0.01	0.07
H/2	Peer influence	0.13	***	0.11	0.15
H/3	Friend influence	0.18	***	0.11	0.26

*** < 0.001 < ** < 0.01 < * < 0.05

95% credible interval

Table 12.2: SAOM Results

For the first hypothesis, four predictions are tested on how *Alter's* popularity among, and activity towards, minorities and majorities affects *Ego's* perceptions about *Alter*. First, results suggest that if someone is seen as popular amongst minorities, he or she will be very likely to be perceived as a minority as well (note again that this is after controlling for his or her self-identification). The parameter is positive as predicted by H/1a, and its value is $\beta_{H/1a} = 0.37$ ($p < 0.001$), which should be understood as the effect of every additional minority member nominating *Alter* as a friend; therefore, it is a strong effect. *Alter's* friendship activity towards minorities, however, does not seem to affect how he or she is perceived by others. Therefore, we did not find evidence for H/1b.

At the same time, both popularity and activity amongst majority peers seem to matter. As H/1c predicted, the more popular someone is amongst those perceived

as majorities by *Ego* the less likely that *Ego* will classify him or her as a minority member ($\beta_{H/1c} = 0.08, p < 0.001$). However, while H/1d has similar predictions for the friendship activity towards majorities, our evidence contradicts this hypothesis. Nominating more majorities as friends, in fact, makes it more likely that someone will be perceived as a minority by others ($\beta_{H/1d} = 0.04, p < 0.01$).

To better understand these somewhat surprising results, we should keep in mind that we estimate these parameters in the same model, therefore controlling for each other. Hence, these parameters should be interpreted together. The heatmap in Figure 12.3 illustrates whether someone is more likely to perceive a peer as a minority or as a majority, based on how he or she perceives this peer's position amongst majority students (number of incoming and outgoing ties from and towards majority members). Red colour means high conditional odds for a minority classification, while black colour for a majority classification; white colour stands for equal chances to be classified as a minority or a majority student. The black 45° line shows the cases when individuals send to and receive from equal number of friendship nominations towards and from minorities; while the red line demonstrates the combination of incoming and outgoing ties that come with conditional odds of 1.

As the popularity effect is larger in absolute value than the activity effect, having the same number of incoming and outgoing ties from and to majority students comes with a negative effect on being perceived as a minority, all other factors being the same (see the black 45° line in Figure 12.3). Compared to this situation, every additional friendship tie sent to a majority peer increases the likelihood of being perceived as a minority, and every friendship tie received from a majority peer decreases it. Figure 12.3 demonstrates that students who are perceived as more popular amongst than active towards the majority group (above the black ° line) are considered as majorities by others (illustrated by the black end of the colour scale). Students who are more active towards than popular amongst their majority peers, though, can be perceived as both minorities and majorities. If their difference between this popularity and activity is not very large (close to the black line), and/or the level of their popularity amongst majorities itself is somewhat higher (bottom half of the heatmap), they are still more likely to be perceived as majorities than minorities (all else being the same). Only those who are much less popular amongst than active towards majority students (left bottom), or those who seem to make little, mostly unreciprocated effort towards the majority group (right bottom), are more likely to be perceived as minority than majority students.

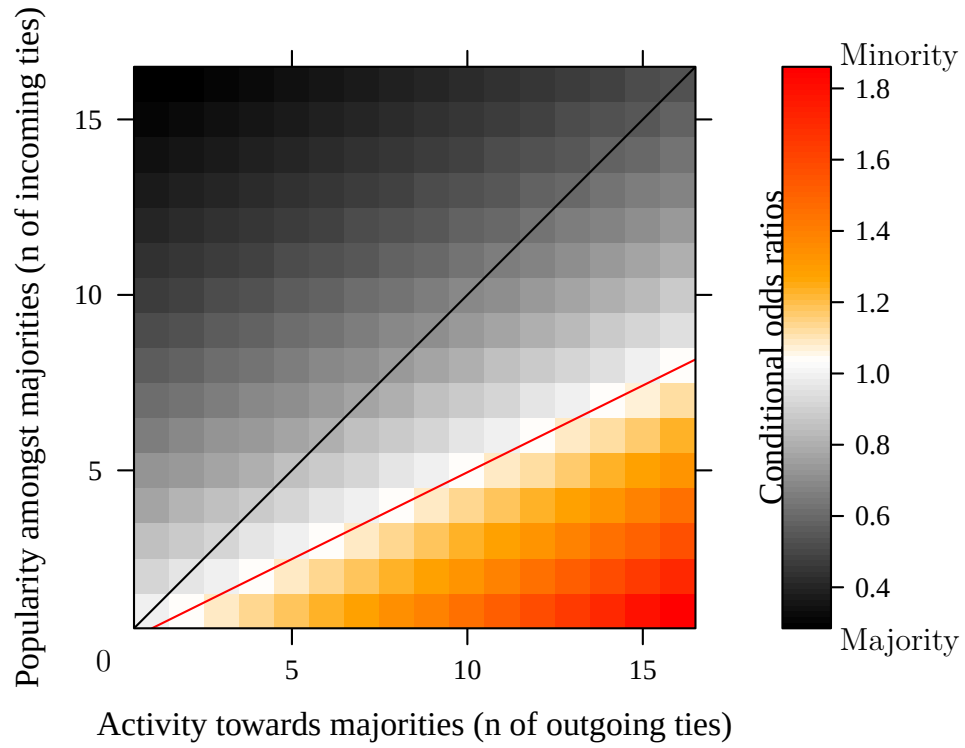


Figure 12.3: Conditional Odds for Being Perceived as a Minority Student, based on Popularity among and Activity towards Majorities

These results indicate hierarchical relationships between the majority and the minority groups in these communities, and help us to identify different social positions related to racial perceptions. Most importantly, it seems that there are two distinct hierarchies: the majority and the minority ones. Students who are popular in the minority hierarchy are likely to be seen as minorities themselves, and every additional minority student choosing them as a friend adds to this likelihood ($\beta_{H1/3} = 0.37$). However, the structure of the majority hierarchy seems to be more complicated than this. Here, we can distinguish between at least three major types of social positions. First, those perceived to have a balanced social position in the majority group (that is, they have a similar number of majority students naming them as friends to the number of majorities they name) are relatively likely to be classified as majorities (see the black 45° line in Figure 12.3). This likelihood is larger if this balance comes with more friends on both sides, that is, the more central the actor is (as we go towards the right-top from the left-bottom along the black line). Second, students perceived

as more popular than active in the majority group (above the black 45° line) are even more likely to be perceived as majority members. This likelihood increases if either the level of popularity, or the difference between the level of popularity and activity is higher. This includes those who can be considered the high-status students in the majority group and who have high level of popularity, but fewer peers *they* name as friends. Finally, those trying to belong to the majority group but only achieving peripheral positions, that is, those who choose majority students as friends but are nominated by them much less, are likely to be seen as minorities by others. A higher level of activity, or a larger difference between activity and popularity further increases this likelihood. These results provide us with quite a detailed picture on how students think about inter-ethnic relations in the community.

For social influence effects, we find positive and significant parameters ($p < 0.001$) as predicted: $\beta_{H/2} = 0.13$ for the general peer effect, and $\beta_{H/3} = 0.18$ for friend influence. This is evidence both H/2 and H/3: peers tend to agree in their classifications on others, and this is even stronger for friends.

12.5 Conclusions

This chapter investigated social effects on racial perception, and identified micro-mechanisms influencing perceptions on others' race in closed groups. Explaining the formation and fluidity of racial perceptions is essential, since these play an even more important role in how people relate to each other than self-identifications. Various previous examples support that in cases of individual mobility, perceptions are also the key: the new group membership chosen by the individual has to be accepted by others.

While there is previous evidence that racial classifications are fluid, it has not yet been examined how perceptions can change when actors are embedded in groups. We argued that these shifts cannot be fully explained by external characteristics of the individuals; they are also shaped by endogenous processes within groups. Therefore, we chose a longitudinal social networks approach to analyse the formation of racial perceptions in communities.

This chapter identified two main groups of micro-level mechanisms that are based on the whole network. First, it focused on the effect of someone's perceived friendships as a context on how this person is categorized by others. The attraction-similarity hypothesis proposes that people have the overall experience that attraction and similarity are related, hence, they tend to assume that friends are more similar to each

other than their “actual” level of similarity (based on their self-identifications). Therefore, the prediction was that the more friends we perceive a given peer to have from a certain racial group the more likely that we classify this person as a member of that group as well. This chapter found that the situation is more complex than this, and the combination of popularity and activity has a crucial role on how someone is perceived by others. The minority group seems to be perceived as a coherent social group; everyone who is perceived to be well-liked by minorities will be likely to be classified as a minority member as well. This is after controlling for individuals’ tendency to make friends with each other based on their (self-identified and perceived) race, and for the fact that those who self-identify as minorities will be more likely to be perceived as minorities as well. Therefore, it seems that students generally do not assume that majorities could have central positions in the minority hierarchy. This is consistent with social identity theory which suggests that it is the members of the lower-status group who try to join other social groups, while this does not make sense for members of the higher status group.

At the same time, the majority hierarchy is perceived as more heterogeneous: those with well-balanced social positions are usually perceived as majorities, even those who are somewhat less popular than active; the highest status students are perceived as majorities even more strongly; and those perceived to make efforts to belong to the majority group but who partly or completely fail (as others do not choose them as friends) are perceived to be minority members. This is also consistent with social identity theory: a number of minorities might be perceived in these communities to try to join the majority hierarchy. Our results provide evidence that the role of others’ friendship ties is crucial when perceiving their race. There are two social positions associated with classifying someone as a minority: having a central position in the (perceived) minority network; and, less strongly, trying to join the (perceived) majority network, but having only a peripheral position in it.

Because opinions and perceptions are subjects of social influence in communities, we also expected that peers, and especially friends, affect one another’s perceptions on their peers’ race in the group, and tend to agree in their classifications. Our results provide strong evidence for such social influence processes: the effect of classmates in general was positive and significant, while the effect of friends was, as expected, even stronger. This suggests that students indeed have the ability to affect each others’ perceptions about their classmates’ race.

Our micro-level approach utilized concepts and techniques from social network analysis; our results are based on stochastic actor-oriented models. Because of the

actor-oriented perspective, we were able to model social processes at the micro level, always from the given perceiver's perspective, which allowed us to avoid analysing aggregated data. At the same time, using longitudinal models made it possible to distinguish between the effect of friendship ties on racial perceptions, and racial perceptions on friendship ties. These are great advantages of our approach, providing us with robust results on the fluidity of racial perceptions. Moreover, using the random coefficient multilevel SAOMs allowed us to analyze multiple school classes communities together, and estimate global parameters based on these.

Part IV

Epilogue

Chapter 13

Discussion and Further Steps

This thesis has focused on the interplay between race and social ties, proposing a new approach for the joint understanding of the two. Though sociological research generally treats race as the input and social ties as the output when focusing on their relationship, we argue that race and social ties are interrelated. Analysing the influence of one on the other, without focusing on the reverse effects, can cause significant bias in empirical results.

Race is a social construct, a fluid and flexible characteristic rather than an objectively given fixed one. Saperstein and Penner (2012) already demonstrated that racial shifts happen quite often, and are strongly related to changes in social background: “whitening” is associated with increasing, while “darkening” with decreasing social status. However, there are no mechanisms offered yet to explain racial changes when people are embedded in communities. Since individuals are parts of various formal and informal groups, this is a crucial question. We argued that in this case, racial shifts cannot be explained by external factors only; they are also influenced by endogenous micro-level mechanisms within communities relying on interpersonal ties. This implies that the relationship between social ties and race is a “two-way street”. Thus, the most important goal of this thesis was to disentangle the effect of race on social ties from that of social ties on race.

Building on the literature which emphasizes that race is multidimensional, perceptual and situational by nature, in this thesis we also distinguished between racial self-identifications and the way someone’s race is perceived by others. We argued that these aspects are related to each other but yet, they often show important differences: people are not always classified by others in the same way they self-identify. Even though sociological research rarely focuses on racial classifications, we proposed and confirmed that individuals’ perceptions about each other’s race have crucial roles in the formation and maintenance of their social ties.

The social setting we chose for our research is education. We focused on racially mixed secondary school classes. This is perfect for our purpose, since formally integrated school communities are perhaps the easiest places for racially or ethnically different individuals to meet; in fact, the most important reason behind creating these school classes is to provide students with such meeting opportunities. Direct contact opportunities can contribute to the development of relational integration, that is, a situation in which positive social ties between racially different students are frequent. Our thesis investigated the crucial question whether, and to what extent, formal integration results in relational integration. Answering this is highly relevant for both theoretical and practical reasons, since interracial relationships are generally considered among the most efficient ways to decrease prejudice in society.

13.1 Main Contributions of the Study

The thesis consists of two major empirical parts: first, we examined interracial social ties in secondary school classes, focusing on both self-identified and perceived race (Part II), and second, on the evolution of racial perceptions based on social ties. We defined racial perceptions on the micro-level: we measured how each individual perceives each of his or her peers in the classroom. The collection of individual perceptions was then treated and analysed as a network, allowing us to focus on perceptions on the dyadic level (every *Ego*'s perception about every *Alter* in the group). This way, we are not only able to investigate the structure of perceptions in the group, but we can also avoid unnecessary aggregation of data which could lead to ecological fallacy. This is an important contribution of this thesis, since to our knowledge, this conceptualisation and measurement of race have not been used in similar studies before.

Our analysis on interracial integration found that in relationship formation perceptions have even more important roles than self-identifications; for instance, social exclusion of others seems to operate based on perceptions. Moreover, by including the two aspects of race in our models together we gained more detailed insights into the important negative effect of discrepancies between self-identifications and perceptions on someone's relationships.

Our thesis extends existing research on interracial integration in another major way. We argued that the state of relational integration should be described not only by the prevalence of positive, but also by the absence of negative (dislike, hate) interracial social ties; therefore, we focused on both friendships and negative ties in

our analysis. Since so far only a few studies took negative ties into account when analysing integration, this is also an important contribution to current research on the topic. Indeed, this thesis found that by analysing negative ties together with friendships, we can capture more aspects of relational integration or segregation. Furthermore, our most important results are related to negative networks and not to friendships, suggesting that negative ties have a major role in segregation. This remains hidden in most sociological analysis.

Finally, our research also took the network structure into account. We proposed, and provided evidence, that ignoring endogenous structural processes might result in false conclusions on racial preferences. This is because there are certain mechanisms – such as the tendency for reciprocity and for befriending friends of friends – which can conserve existing tendencies of segregation without (further) same-race preference. Indeed, we presented simple network models with and without controlling for endogenous processes, and found that these variables explained most of the race effects found in the previous model (see Chapter 7).

To investigate the effectiveness of integration, there are two questions we focused on. First, we described integration as a state, that is, we examined the likelihoods for different types of relationships between students (see Chapter 6). This means comparing the conditional likelihoods of four types of friendship and negative nominations: majority-minority, minority-majority, majority-majority and minority-minority ones. The second aspect focuses on integration or segregation as a process, that is, the change in these relationships over time (see Chapter 8). For a detailed picture about integration, both questions are relevant. A cross-sectional analysis can reveal the actual relative likelihoods of same-race and interracial relationships, while the longitudinal models help us to understand the direction and extent of changes, thus, the underlying process.

As a theoretical framework, we built on the social identity approach (Tajfel, 1974; Turner, 1975). The approach is based on the central idea that individuals have an underlying need to increase or maintain the level of their self-esteem. Social identity is a main source of this, and it is based on evaluative comparisons between the perceived ingroup and perceived outgroup. Therefore, individuals usually strive to achieve positive social identity for their groups.

Tajfel and Turner (1979) proposed four main strategies for dealing with a situation when individuals perceive their ingroup's social identity as too negative: 1) social creativity, that is, finding new, more favourable ways for the comparison; 2) engagement in social competition with the higher status group; 3) individual mobility, that

is, dissociation from the ingroup in order to join the higher status outgroup; 4) internalization of the inferior social status and the achievement of satisfactory self-esteem without positive social identity. When examining interracial relationships, we also focused on the strategies our findings implied, and found potential evidence for some of them. However, as we concluded in Chapter 9 for the full picture we should consider these results together with findings on the effect of social ties on racial perceptions (see Part III).

In the second empirical part of the thesis, we concentrated on racial perceptions directly (Part III). Based on the fact that not only race affects social ties but this also happens the other way around, we investigated the different ways in which friendships can affect racial perceptions. First, we focused on dyadic effects and examined how individuals perceive their friends (see Chapter 11). For this, we tested two competing mechanisms. On the one hand, friendship implies time spent together; thus, we assumed people to learn about their friends over time, and give more “precise” classifications about them than about others. On the other hand, it is also suggested that attraction leads to the perception of similarity (Morry, 2005), implying that people tend to classify their friends in the same race as themselves. Interestingly, our findings supported the latter instead of the former mechanism.

Second, we focused on the broader community as a source of context for perceptions and of social influence (see Chapter 12). Here we suggested that the perceived racial composition of someone’s friendship group can affect how this person is classified by others: for instance, if others see that somebody has a lot of friends whom they perceive as minorities, they tend to be more likely to classify this person as a minority member as well. However, we found that the situation is more complicated than this, and our results implied a hierarchy between the two groups rather than simply a perception bias towards someone’s friendship group. Moreover, we found that peers – and especially friends – affect each others’ perceptions about race in the group. As a result of this, there is an emergent agreement about the classification of peers in the group, which is especially strong among friends.

13.2 Integrating the Key Findings

In the two empirical parts of the thesis, we examined the same interrelated concepts from two different aspects: the effect of race on social ties, and of social ties on racial perceptions. By testing various hypotheses, we collected a large amount of information about the underlying processes. To be able to fully understand this, here

we make an attempt for the joint interpretation of our most important findings about race and social ties.

In Part II, we conducted both cross-sectional and longitudinal analyses to investigate the prevalence and development of same-race and interracial friendships and negative ties. First, we found that majority students strongly reject their minority peers. They show a high likelihood – and also a strong dynamic tendency – to dislike those they perceive as minorities, regardless of these students’ self-identifications. At the same time, we did not find strong evidence that minorities would also dislike their majority peers (though in the cross-sectional analysis, there is a marginally significant parameter implying some negative ties towards them). This suggests a hierarchical relationship between the two ethnic groups: minority students are much more rejected by their majority peers than vice versa. Besides, our results can also imply outgroup preference.

As we mentioned earlier, our findings on racial perceptions confirm this idea. Here we found that those having central positions among majority students are likely to be classified as majorities themselves; however, those whose friendships to majority students are not reciprocated are more likely to be perceived as minorities. This is true after controlling for students’ self-identifications; therefore, this is an additional effect on top of the tendency of students to accept others’ self-identifications. This suggests that students are likely to see those who try to integrate in the majority groups but fail as minorities. This also implies that there might be attempts for individual mobility in the groups: people seem to have the idea that students at the periphery of the majority hierarchy are minorities who try to leave their groups but do not succeed at it.

Our results for the hierarchical positions of the majority and the minority group are very strong: we found tendencies in both the positive and negative networks, and when focusing on both racial perceptions and on social ties. This suggests that minority students are in a tough social situation: their group has a lower-status than the majority group. Therefore, according to the social identity approach they should to react to this situation in order to improve their self-esteem. We mentioned four possible strategies they can choose from: social creativity, direct competition, individual mobility, and outgroup preference; however, in Part II we did not find a conclusive evidence about which strategies are followed in our communities and which ones are not. Examining the relationship choices of minority students together with the effects of being perceived as a minority can potentially help us in finding an answer to this question.

In our cross-sectional analysis on interracial friendships, we found a significant homophily effect amongst minorities, that is, minority students are more likely to be friends with those whom they perceive as minorities, and who also self-identify this way. However, we could not find evidence for this process longitudinally. This means that there is no significant tendency implying that these friendships would be more likely to form or be maintained over time, even though they are overrepresented at the end of the observed period. (Be reminded that the cross-sectional analysis was conducted based on the second data wave, which is the end of the period analysed longitudinally.) For this discrepancy, we suggested two explanations. First, these friendships could have existed already at the *beginning* of our observed period, and then could have been reinforced by endogenous mechanisms (reciprocating existing ties, remaining in existing clusters) which would mostly conserve the initial state of the community.

Second, it also is possible that minority students start to *perceive* their friends as minorities over time, regardless of their ethnic self-identifications. This could also explain another finding that minority students dislike less, and like more, those whom they perceive as minorities, but who identify with the majority group: they perceive these friends as minorities instead of majorities because they like them more *already*.

To decide about this second explanation, we can turn to Part III, which directly focuses on the evolution of racial perceptions. Here we found evidence that minority students indeed have a significant tendency to perceive their friends as minorities compared to how these friends self-identify. Therefore, the cross-sectionally observed prevalence of minority-minority friendships is at least partly a consequence of a bias when minority students judge their friends' race rather than their actual tendency to befriend minority peers.

Moreover, there is another interesting tendency we found related to our friendship context hypotheses. Students embedded in the majority hierarchy are likely to be perceived as majority students, and those peripheral as minorities. However, those popular amongst their minority peers seem to be strongly perceived as minorities. Therefore, it appears that the general perception about minorities is that they are strongly connected to each other, even though there is no evidence for actual same-race preference amongst them.

While we did not find evidence that minority students make friends with other minorities over time, we observed a tendency for *dislike* against minority peers; even though by the end of the observed period this strong tendency has not resulted in the actual overrepresentation of minority-minority negative ties yet. This means that

besides existing minority-minority friendships, there is a tendency for forming and maintaining negative ties towards each other. These results imply that minority students are not a homogeneous group, but they should form at least two, competing subgroups following different strategies to improve their self-esteem; negative ties develop as a consequence of this, while friendships within (a part of the) subgroups are maintained. This could explain the already mentioned marginally significant parameter for a cross-sectional minority-majority dislike; a subgroup of minority students probably competes against the majority group. There is a possibility that the other subgroup aims to follow the strategy of social mobility, which is destructive of group solidarity in the original group and, thus, induces negative ties. The fact, though, that these individuals still self-identify as minorities suggests that the process of mobility has not far developed – in line with our other findings.

Related to this, cross-sectionally, we also observed that minority students strongly dislike those whom they perceive as minorities, but who, at the same time, identify with the majority group. This can also be related to the strategy of individual mobility: minority students perceive these peers as traitors of their original ethnic groups. However, the tendency is not significant in the longitudinal analysis. Still, we argue that this tendency can exist; it is a possibility that individual mobility already happened by the first observation, and its effect is maintained by endogenous network processes.

Finally, a last but very important piece of our findings is that on top of all these processes described above, we also observed social influence on two different levels. First, students tend to accept their classmates' opinions about others' race in the class. Second, this effect is stronger in case of friends: they tend to agree with each other in this matter even more.

13.3 General Discussion

This thesis found that race and social ties are linked together in numerous ways, confirming that there are strong interrelations between them. Friendships and negative ties are strongly influenced by race, but at the same time, our relationships – and our perceptions about others' relationships – strongly influence how we perceive others' race. Friendships that are perceived as same-race friendships can be created by forming a friendship tie towards someone, or by starting to perceive our friends as same-race individuals. Therefore, we argue that racial integration should not be examined without taking assimilation into account. Our results also suggest that racial

boundaries are not explicit in these communities, and judgement about others is very much embedded in social networks. This shows the strong, but hidden nature of race here: students do not collect information about each others' racial memberships over time, but they still find it an important dimension, which is shown by, for instance, the bias we found when deciding about their friends' race.

This thesis focused on racial perceptions, friendships and negative ties. However, we did not have the chance to take into account that not only perceptions but self-identifications might change over time. This was mostly because our dataset does not span a period long enough to document too many changes in self-identification. Therefore, future research should focus on social effects on racial self-identifications as well. Finding changes in someone's self-identification and how this person is perceived by others could be a strong sign for the assimilation of this person. Moreover, our Part III only focused on the effect of friendship tie configurations on racial perceptions and ignored negative ties. The effect of negative ties on racial perceptions (and self-identifications) should be also studied in future, especially because we observed that negative relationships describe integration in much more detail than friendships.

The specific context for this study was the situation of the Roma ethnic minority group in Hungary. This is a good example for testing the general processes we proposed: the Roma minority group has a low social status in the Hungarian society, yet, Roma people are not as different in their observable physical characteristics from majority individuals that judgements about their categorisations would be unambiguous. This was advantageous for our analysis, since this way more changes can be expected in the categorizations. However, our context limits the conclusions for our analysis. The results cannot be generalized to other minorities than the Roma; even the generalization for Roma people in Hungary is limited, because the sample is not representative in this respect. To be able to draw reliable conclusions about social effects on racial perceptions, similar analyses should be conducted on larger, representative samples from various social contexts. However, it is important to emphasize that the hypotheses were derived from general theories; therefore, for the supported hypotheses this gives evidence for the social mechanisms involved.

For a deeper understanding on the topic, we need to test our approach in other social contexts as well. Admittedly, we would probably find much fewer changes per person, for instance, examining black and white students in the U.S. However, in theory our processes, even if to a smaller extent, should also work on intergroup situations where individuals are more different from each other than they are in our current sample. Moreover, this approach should be excellent to analyse the situation

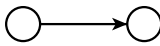
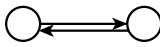
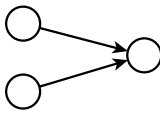
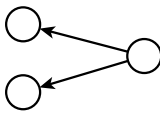
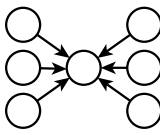
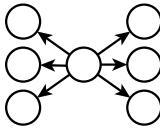
of ethnic migrant groups in various social contexts, for instance – especially nowadays – in Western-Europe. Just one of the most crucial and exciting research topics is whether minority students need to “leave” their original ethnic group memberships behind in order to integrate in the school class, and if so, what will help them to be perceived as majority members. For this, we need new, large datasets measuring students’ racial perceptions about each other together with friendships and negative ties. The extension of the current thesis could this way greatly contribute to our knowledge on racial integration and the nature of race itself. Hopefully, our study is an important first step towards a new perspective of examining interracial integration and racial shifts in communities.

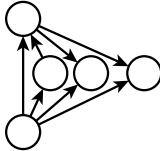
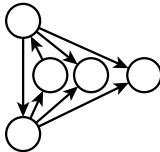
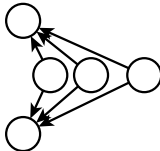
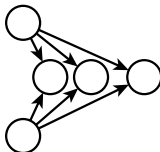
Part V

Appendix

Appendix A

ERGM Model Specification for Chapter 6

Name	Description	Illustration	Included in Models	
			Friend	Negative
Arc	Occurrence of nominations		x	x
Reciprocity	Occurrence of mutual ties		x	x
Two-in-star	Occurrence of shared nominations received		x	
Two-out-star	Occurrence of shared nominations sent		x	
Simple connectivity	Occurrence of paths connecting three actors		x	x
Popularity spread	Dispersion of in-tie distribution		x	x
Activity spread	Dispersion of out-tie distribution		x	
One-sided isolates (non-receivers)	Occurrence of actors with zero in-degree			x
One-sided isolates (non-senders)	Occurrence of actors with zero out-degree			x

Name	Description	Illustration	Included in Models	
			Friend	Negative
Path closure	Closure of two-paths		x	
Cyclic closure	Cyclic closure of two-paths		x	
Shared in-ties	In-tie-based structural equivalence (being nominated by the same actors)			x
Shared out-ties	Out-tie-based structural equivalence (nominating the same actors)			x

Appendix B

Full ERGM Results for Chapter 6

	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
Minority																
Ego's self-id.	-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
Alter's self-id.	-0.143	(0.079)	0.00	16.6	0.344						-0.179	(0.089)	0.00	8.0	0.920	16
Ego $\times$ Alter	0.643	(0.162)	0.48	29.3	0.015						0.518	(0.171)	0.45	21.7	0.115	16
Minority classification tie						0.012	(0.138)	0.35	26.4	0.034	0.093	(0.115)	0.00	15.7	0.402	16
Ego $\times$ class. tie						0.808	(0.139)	0.08	26.0	0.038	0.450	(0.188)	0.22	18.1	0.255	16
Gender																
Ego	-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
Alter	-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
Ego $\times$ Alter	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																
Ego	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
Alter	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

Table B.1: Meta-Results for Friendship Ties

	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	
<i>Structural effects</i>																
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	(0.387)	0.00	17.5	0.357	-0.263	(0.406)	0.00	14.7	0.545	0.151	(0.054)	0.00	20.1	0.215	16
Non-senders	-0.066	(0.436)	0.00	12.1	0.736	0.262	(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
<i>Minority</i>																
Ego's self-id.	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
Alter's self-id.	0.333	(0.188)	0.58	24.4	0.081						0.065	(0.109)	0.00	17.8	0.335	16
Ego $\times$ Alter	-1.023	(0.279)	0.78	27.8	0.034						-0.420	(0.190)	0.00	12.9	0.681	16
Minority classification tie						0.593	(0.129)	0.21	15.7	0.477	0.505	(0.124)	0.00	5.8	0.990	16
Ego $\times$ class. tie						-0.572	(0.203)	0.00	35.9	0.003	-0.194	(0.223)	0.00	17.2	0.376	16
<i>Gender</i>																
Ego	-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
Alter	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
Ego $\times$ Alter	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
<i>Socio-economic status</i>																
Ego	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
Alter	-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

Table B.2: Meta-Results for Negative Ties

Appendix C

Full SAOM Results for Chapter 7

Effect name	Model A				Model B			
	Global	Between-group			Global	Between-group		
	Est	(S.E.)	Q	p	Est	(S.E.)	Q	p
Outdegree (density)	-0.86	(0.09)	44.81	0.000	-1.32	(0.04)	16.96	0.109
<i>Ethnicity effects</i>								
Alter is minority	-0.28	(0.12)	25.17	0.008	-0.27	(0.12)	22.42	0.02
Ego is minority	-0.08	(0.14)	26.64	0.005	0.07	(0.13)	21.09	0.033
Both minorities	-0.18	(1.03)	4326.02	0.000	0.03	(0.60)	1212.08	0.000
<i>Structural effects</i>								
Reciprocity					1.44	(0.11)	24.62	0.010
Transitive triplets								
Transitive reciprocated triplets								
Alter's popularity								
Alter's friendship activity								
Ego's friendship activity								

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

Effect name	Model C				Model D			
	Global		Between-group		Global		Between-group	
	Est	(S.E.)	Q	p	Est	(S.E.)	Q	p
Outdegree (density)	-2.04	(0.09)	16.64	0.119	-1.45	(0.15)	12.55	0.324
<i>Ethnicity effects</i>								
Alter is minority	-0.19	(0.12)	21.61	0.028	-0.07	(0.11)	18.25	0.076
Ego is minority	0.07	(0.11)	18.28	0.075	0.11	(0.12)	15.60	0.157
Both minorities	-0.15	(0.77)	2584.24	0.000	-0.11	(0.60)	1393.80	0.000
<i>Structural effects</i>								
Reciprocity	1.93	(0.14)	12.05	0.360	2.22	(0.14)	10.07	0.524
Transitive triplets	0.40	(0.03)	6.40	0.845	0.43	(0.04)	8.23	0.692
Transitive reciprocated triplets	-0.42	(0.06)	10.23	0.510	-0.24	(0.06)	8.15	0.700
Alter's popularity					0.01	(0.02)	15.45	0.164
Alter's friendship activity					-0.17	(0.02)	22.07	0.024
Ego's friendship activity					-0.01	(0.01)	10.46	0.490

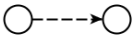
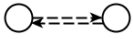
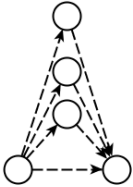
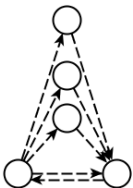
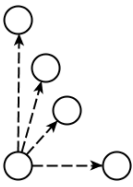
Estimated parameters; estimated standard errors; test-statistics and p-values testing whether there is a difference between parameters among classrooms

Appendix D

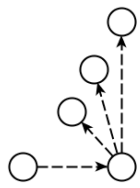
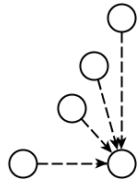
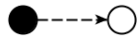
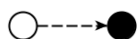
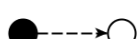
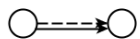
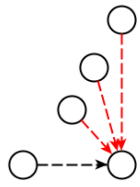
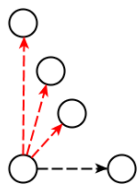
SAOM Full Model Specification for Chapter 8

Dependent variable: friendship

Ego nominates Alter as a friend, creating or maintaining the described substructure

	Name	Formula	Description	Illustration
<i>Same-network structural</i>				
1	Outdegree	F_{ij}	"intercept" – nomination when every parameter is 0 (1=tie, 0=no-tie)	
2	Reciprocity	$F_{ij}F_{ji}$	Ego's tendency to reciprocate friendship nominations	
3	Transitive triplets	$\sum_h F_{ij}F_{ih}F_{hj}$	tendency for clustering	
4	Transitive reciprocated triples	$\sum_h F_{ij}F_{ji}F_{ih}F_{hj}$	interaction between reciprocity and clustering	
5	Ego's friendship activity	$F_{ij} \sum_h F_{ih}$	tendency of Egos nominating many as friends to nominate Alter as well (control for "activeness" of Ego)	

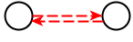
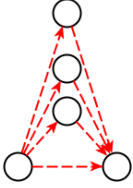
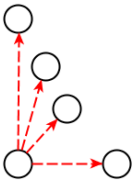
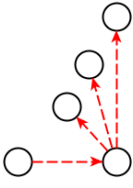
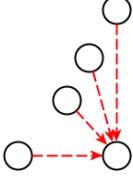
F /black dashed arrow: friendship; N /red dashed arrow: negative tie; M /blank arrow: minority classification; m , g /black node: self-id. minority or female actor; white node: any actor; i :Ego; j :Alter; h : other actor (e.g. ij : tie from Ego to Alter; jh : tie from Alter to a third person)

6	Alter's friendship activity	$F_{ij} \sum_h F_{jh}$	tendency to nominate those as friends who nominate many	
7	Alter's popularity	$F_{ij} \sum_h F_{hj}$	tendency to nominate those as friends who are nominated by many (<i>capturing the "Matthew effect", that is, popularity inducing more popularity</i>)	
<i>Covariate effects</i>				
8	Ego's self-identification	$m_i F_{ij}$	tendency of self-identified minorities to send more friendship nominations	
9	Alter's self-identification	$m_j F_{ij}$	tendency to nominate more self-identified minorities as friends	
10	Ego × Alter self-identification	$m_i m_j F_{ij}$	tendency of self-identified minorities to nominate more self-identified minorities (<i>with Effects 8-9, it captures racial homophily in friendships</i>)	
11	Ego's gender	$g_i F_{ij}$	tendency of females to send more friendship nominations	
12	Alter's gender	$g_j F_{ij}$	tendency to nominate more females as friends	
13	Ego × Alter gender	$g_i g_j F_{ij}$	tendency of females to nominate each other more	
<i>Mixed-network effects</i>				
14	Roma tie	$F_{ij} M_{ij}$	Egos' tendency to send friendship nominations towards those whom they perceive as minorities	
15	Roma tie × Ego's identification	$m_i F_{ij} M_{ij}$	self-identified minority Egos' tendency to send friendship nominations towards those whom they perceive as minorities	
16	Negative tie	$F_{ij} N_{ij}$	Egos' tendency to send friendship nominations towards those whom they nominate as a disliked person	
17	Reciprocity with a negative tie	$F_{ij} N_{ji}$	Egos' tendency to send friendship nominations towards those who nominate them as a disliked person	
18	Level of dislike towards Alter	$F_{ij} \sum_h M_{hj}$	tendency to nominate those as friends who get negative ties from many	
19	Ego's dislike activity	$m_i F_{ij} \sum_h M_{hj}$	tendency of Egos to send a friendship nomination they nominate many in the negative network	

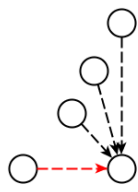
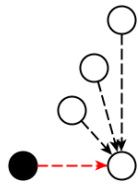
F /black dashed arrow: friendship; N /red dashed arrow: negative tie; M /blank arrow: minority classification; m , g /black node: self-id. minority or female actor; white node: any actor; i :Ego; j :Alter; h : other actor (e.g. ij : tie from Ego to Alter; jh : tie from Alter to a third person) 149

Dependent variable: negative tie

Ego dislikes Alter, creating or maintaining the described substructure

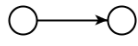
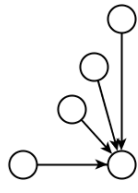
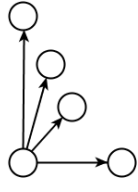
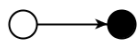
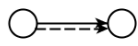
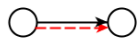
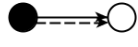
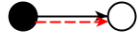
	Name	Formula	Description	Illustration
<i>Same-network structural</i>				
20	Out-degree	N_{ij}	"intercept" – nomination when every parameter is 0 (1=tie, 0=no-tie)	
21	Reciprocity	$N_{ij}N_{ji}$	Ego's tendency to reciprocate negative ties	
22	Transitive triplets	$\sum_h N_{ij}N_{ih}N_{hj}$	tendency for closed negative triads (according to balance theory, these should not exist)	
23	Ego's dislike activity	$N_{ij} \sum_h N_{ih}$	tendency of Egos disliking many to dislike Alter as well (control for "activeness" of Ego)	
24	Alter's dislike activity	$N_{ij} \sum_h N_{jh}$	tendency to dislike those who dislike many	
25	Level of dislike towards Alter	$N_{ij} \sum_h N_{hj}$	tendency to dislike those who are disliked by many (capturing the negative "Matthew effect", that is, unpopularity inducing more unpopularity)	
<i>Covariate effects</i>				
26	Ego's self-identification	$m_i N_{ij}$	tendency of self-identified minorities to dislike more	
27	Alter's self-identification	$m_j N_{ij}$	tendency to dislike self-identified minorities	
28	Ego × Alter self-identification	$m_i m_j N_{ij}$	tendency of self-identified minorities to dislike self-identified minorities	
<i>Mixed-network effects</i>				
29	Roma tie	$N_{ij}M_{ij}$	Egos' tendency to dislike those whom they perceive as minorities	
30	Roma tie × Ego's self-identification	$m_i N_{ij}M_{ij}$	self-identified minority Egos' tendency to dislike those whom they perceive as minorities	
31	Friendship	$N_{ij}F_{ij}$	Egos' tendency to dislike those whom they nominate as a friend	
32	Reciprocity with a friendship	$N_{ij}F_{ji}$	Egos' tendency to dislike those who nominate them as a friend	

F/black dashed arrow: friendship; *N*/red dashed arrow: negative tie; *M*/blank arrow: minority classification; *m*, *g*/black node: self-id. minority or female actor; white node: any actor; *i*:Ego; *j*:Alter; *h*: other actor (e.g. *ij*: tie from Ego to Alter; *jh*: tie from Alter to a third person)

33	<i>Alter's</i> popularity	$F_{ij} \sum_h M_{hj}$	tendency to dislike those who get friendship ties from many	
34	<i>Alter's</i> popularity × <i>Ego's</i> self-identification	$m_i F_{ij} \sum_h M_{hj}$	tendency of minority <i>Egos</i> to dislike those who get friendship ties from many	

Dependent variable: Minority classifications

Ego nominates *Alter* as a minority, creating or maintaining the described substructure

	Name	Formula	Description	Illustration
<i>Same-network structural</i>				
35	Out-degree	M_{ij}	"intercept" – a minority classification exists when every parameter is 0 (1=tie, 0=no-tie)	
36	Reciprocity	$M_{ij} M_{ji}$	<i>Ego's</i> tendency to reciprocate minority classifications	
37	<i>Alter's</i> level of being classified as a minority	$M_{ij} \sum_h M_{hj}$	tendency to classify those as minorities who are classified so by many	
38	<i>Ego's</i> minority classification activity	$M_{ij} \sum_h M_{ih}$	tendency of those who classify many as minorities to classify <i>Alter</i> as well	
<i>Covariate effects</i>				
39	<i>Ego's</i> self-identification	$m_i M_{ij}$	tendency of a self-identified minorities to classify more as minorities	
40	<i>Alter's</i> self-identification	$m_j M_{ij}$	tendency of a self-identified minorities to be classified as minorities as well	
<i>Mixed-network effects</i>				
41	Friendship tie	$M_{ij} F_{ij}$	tendency to classify friends as minorities	
42	Negative tie	$M_{ij} N_{ij}$	<i>Egos'</i> tendency to classify those they dislike as minorities	
43	Friendship tie × <i>Ego's</i> identification	$m_i M_{ij} F_{ij}$	minority <i>Egos'</i> tendency to classify their friends as minorities	
44	Negative tie × <i>Ego's</i> identification	$m_i M_{ij} N_{ij}$	minority <i>Egos'</i> tendency to classify those they dislike as minorities	

F/black dashed arrow: friendship; *N*/red dashed arrow: negative tie; *M*/blank arrow: minority classification; *m*, *g*/black node: self-id. minority or female actor; white node: any actor; *i*:*Ego*; *j*:*Alter*; *h*: other actor (e.g. *ij*: tie from *Ego* to *Alter*; *jh*: tie from *Alter* to a third person)

Appendix E

Full SAOM Results for Chapter 8

	Estimate	(S.D.)	Posterior prob.	Credible interval		Varying
	from	to				
Friendships						
<i>Same-network structural</i>						
Outdegree	-1.307	0.433	0.004	-2.174	-0.47	+
Reciprocity	1.925	0.268	0.000	1.382	2.461	+
Transitive triplets	0.426	0.093	0.000	0.245	0.608	+
Trans. reciprocated triplets	-0.249	0.045	0.000	-0.336	-0.148	-
<i>Alter's</i> popularity	0.005	0.012	0.352	-0.017	0.027	-
<i>Alter's</i> friendship activity	-0.155	0.013	0.000	-0.179	-0.129	-
<i>Ego's</i> friendship activity	-0.011	0.041	0.382	-0.097	0.073	+
<i>Covariate</i>						
<i>Alter's</i> self-identification	-0.014	0.107	0.458	-0.225	0.188	-
<i>Ego's</i> self-identification	0.044	0.081	0.304	-0.114	0.201	-
<i>Ego</i> $\times$ <i>Alter's</i> self-identification	0.17	0.127	0.088	-0.067	0.415	-
<i>Alter's</i> gender	-0.038	0.085	0.334	-0.195	0.126	-
<i>Ego's</i> gender	-0.065	0.083	0.23	-0.225	0.089	-
<i>Ego</i> $\times$ <i>Alter's</i> gender	0.053	0.089	0.285	-0.117	0.214	-
<i>Mixed-network</i>						
Minority tie $\times$ <i>Ego's</i> self-identification	-0.268	0.222	0.108	-0.705	0.146	-
Negative tie	-2.08	0.557	0.000	-3.373	-1.207	+

	Estimate	(S.D.)	Posterior prob.	Credible interval		Varying
				from	to	
Reciprocity with a neg. tie	-0.542	0.26	0.010	-1.085	-0.073	-
Level of dislike towards <i>Alter</i>	-0.023	0.013	0.026	-0.048	0	-
<i>Ego</i> 's dislike activity	-0.008	0.010	0.223	-0.029	0.011	-
Minority tie	0.014	0.192	0.465	-0.395	0.376	-
Negative ties						
<i>Same-network structural</i>						
Out-degree	-2.445	0.452	0.000	-3.331	-1.524	+
Reciprocity	0.519	0.361	0.071	-0.202	1.208	+
Transitive triplets	-0.169	0.101	0.042	-0.374	0.025	+
Level of dislike towards <i>Alter</i>	0.147	0.047	0.005	0.054	0.241	+
<i>Alter</i> 's dislike activity	0.009	0.015	0.305	-0.019	0.034	-
<i>Ego</i> 's dislike activity	0.11	0.045	0.010	0.021	0.197	+
<i>Covariate</i>						
<i>Alter</i> 's self-identification	-0.32	0.109	0.001	-0.526	-0.115	-
<i>Ego</i> 's self-identification	-0.106	0.09	0.106	-0.285	0.055	-
<i>Ego</i> × <i>Alter</i> self-identification	0.175	0.125	0.081	-0.062	0.412	-
<i>Mixed-network</i>						
Minority tie × <i>Ego</i> 's self-identification	-0.514	0.197	0.003	-0.921	-0.135	-
Friendship	-1.701	0.372	0.000	-2.426	-0.993	+
Reciprocity with a friendship	-0.708	0.244	0.000	-1.224	-0.267	-
<i>Alter</i> 's popularity	-0.03	0.014	0.014	-0.057	-0.004	-
<i>Ego</i> 's friendship activity	-0.009	0.012	0.213	-0.033	0.013	-
Minority tie	0.876	0.174	0.000	0.524	1.223	-
Minority classification						
<i>Same-network structural</i>						
Out-degree	-4.229	0.497	0.000	-5.211	-3.239	+

	Estimate	(S.D.)	Posterior prob.	Credible interval		Varying
				from	to	
Reciprocity	-0.146	0.127	0.128	-0.388	0.1	-
<i>Alter's</i> level of being classified as a minority	0.159	0.045	0.003	0.065	0.244	+
<i>Ego's</i> minority classification activity	0.127	0.048	0.007	0.029	0.221	+
<i>Covariate</i>						
<i>Alter's</i> self-identification	0.909	0.077	0.000	0.767	1.064	-
<i>Ego's</i> self-identification	0.151	0.119	0.104	-0.071	0.384	-
<i>Mixed-network</i>						
Negative tie $\times$ <i>Ego's</i> self-identification	-0.167	0.286	0.268	-0.702	0.412	-
Friendship $\times$ <i>Ego's</i> self-identification	0.665	0.252	0.003	0.186	1.162	-
Friendship	0.017	0.22	0.465	-0.418	0.43	-
Negative tie	0.301	0.235	0.102	-0.172	0.737	-

Estimated parameters; estimated standard errors; posterior probabilities; credible interval for the estimated parameters; parameters randomly varying (+) or fixed (-) in the model

We present the posterior probabilities of values less than 0 for positive estimates, and the posterior probabilities of values larger than 0 for negative estimates.

Appendix F

Histograms by Class for Chapter 8

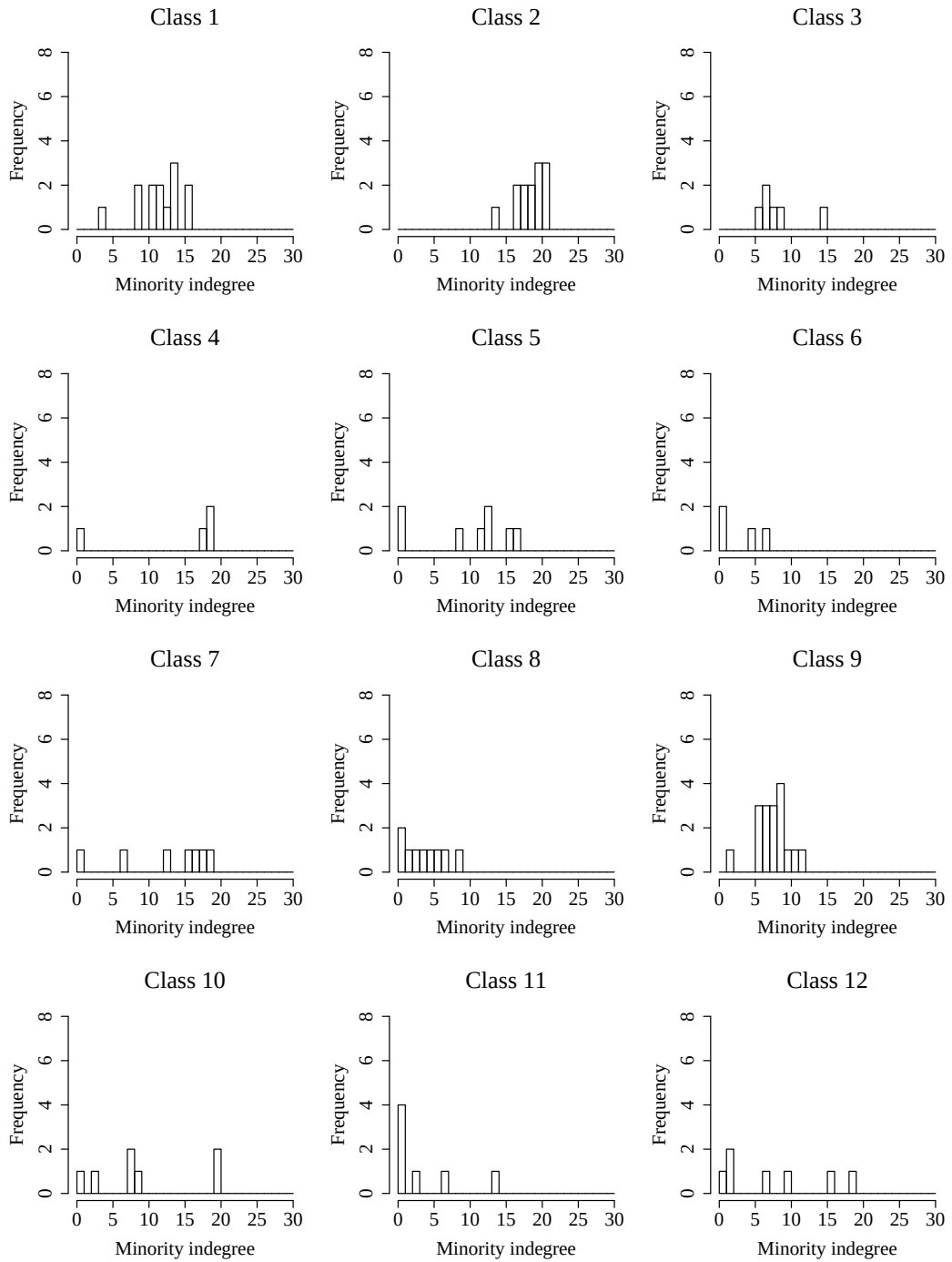


Figure F.1: Incoming Minority Nominations of Self-Identified Minority Students per Class, Wave 1

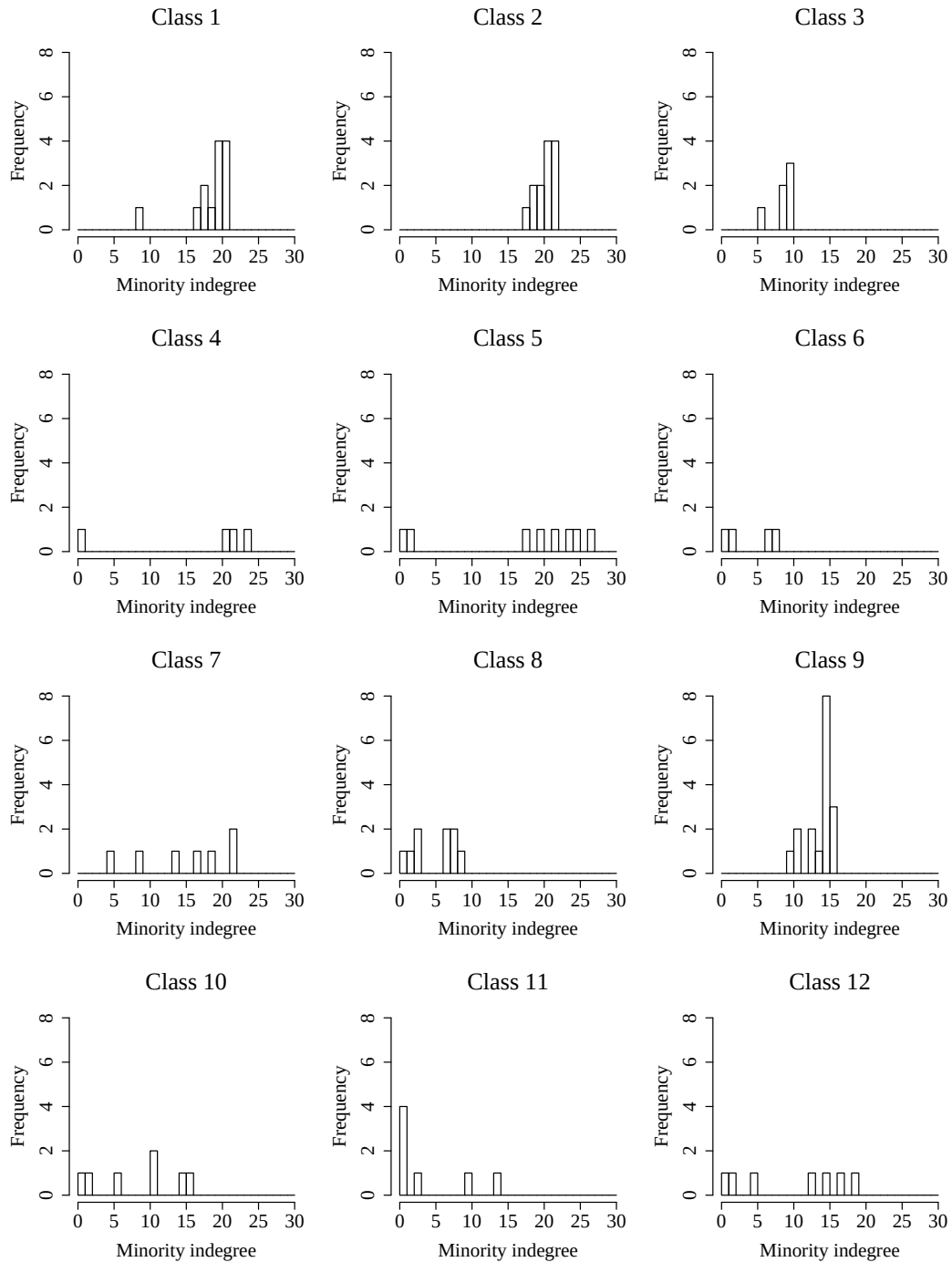


Figure F.2: Incoming Minority Nominations of Self-Identified Minority Students per Class, Wawe 2

Appendix G

Configurations as combinations of SAOM effects for Chapter 11

Appendix G provides more information about how each configuration expressing our hypotheses in Chapter 11 can be tested in RSiena, the implementation of SAOMs. This is necessary since not all of these configurations are directly testable in the model; some should be calculated as a sum of two or more effects. This is because the variables these configurations are built on are dummy variables; therefore, one category (majority self-identifications, and the non-friendships) is always the reference category.

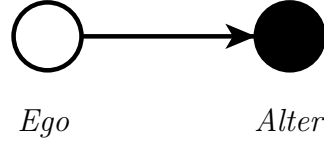
We review every hypothesis from this aspect, explaining which SAOM effect, or which combination of multiple effects is able to express the prediction of each hypothesis; providing visual illustration and mathematical explanations in all cases.

G.1 The Baseline Hypothesis

H/b can be directly expressed by the self-identification of Alter effect (Figure 3); that is, if Alter is a self-identified minority (Alter's self-identification=1), Ego will be more likely to perceive Alter as a minority compared to the reference category (Alter's self-identification=0, therefore, Alter is a self-identified majority).

G.2 Hypotheses 1 and 2

For testing the additional effect of a friendship tie a on racial perception tie, we need to examine four different node configurations, which are presented in Figure 1 and Table 2 in the main text. Recall that self-identification has two categories: its value is 1 for minorities, and 0 for majorities who constitute the reference category for the analysis. Therefore, we cannot model all these combinations directly, as that would lead to perfect multicollinearity (similarly to any regression-type analysis). Table 7 illustrates the SAOM effects which are



$$M_j M_{ij}$$

Blank arrow: minority classification; black node: self-identified minority actor; white node: any actor

M : minority classification; m : self-identified minority actor; i : *Ego*; j : *Alter* (ij : tie from *Ego* to *Alter*)

Figure G.1: *Alter's* Self-Identification

included in the model, and demonstrates which effects have to be summarized to get the parameter values for each hypothesis. Although this table only presents the friendship tie (main) effect and its two interactions, the self-identification *Ego* and *Alter* main effects are also included in the model.

Here we give a short summary and formal reformulation of the above argument is presented. Including the friendship tie and the two interaction effects together, RSiena estimates the following:

$$\beta_1 M_{ij} F_{ij} + \beta_2 m_i M_{ij} F_{ij} + \beta_3 m_j M_{ij} F_{ij}$$

where β_1 is the parameter estimate for the friendship tie effect, while β_2 and β_3 belong to the interactions between the friendship tie and *Ego's* and *Alter's* self-declared minority status, respectively. This can be expressed as

$$(\beta_1 + \beta_2 m_i + \beta_3 m_j) M_{ij} F_{ij}$$

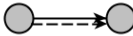
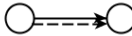
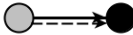
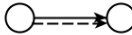
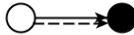
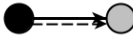
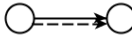
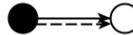
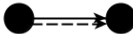
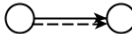
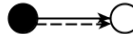
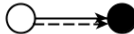
H/1-2a has predictions about the additional effect of friendship ties on minority perceptions between *Ego* and *Alter* in case of both *Ego* and *Alter* being self-declared majority students ($m_i = 0$ and $m_j = 0$). This means that in this case,

$$\beta_1 M_{ij} F_{ij}$$

expresses H/1-2a. Similarly, H/1-2b refers to the case when *Ego* is a self-identified majority student, but *Alter* identifies with the minority group ($m_i = 0$ and $m_j = 1$). Consequently,

$$(\beta_1 + \beta_3 m_j) M_{ij} F_{ij}$$

expresses H/1-2b. H/1-2c expresses the friendship tie effect when *Ego* is a self-declared

Hypothesis	Configuration	SAOM effects					
H/1-2a		=					
H/1-2b		=		+			
H/1-2c		=		+			
H/1-2d		=		+		+	
			1 friendship tie		interactions: friendship tie ×		
					2 <i>Ego</i> self-identified minority		3 <i>Alter</i> self-identified minority
Formula			$M_{ij}F_{ij}$		$m_i M_{ij} F_{ij}$		$m_j M_{ij} F_{ij}$

Blank arrow: minority classification; black node: self-identified minority actor; white node: any actor

M : minority classification; m : self-identified minority actor; i : *Ego*; j : *Alter* (ij : tie from *Ego* to *Alter*)

Figure G.2: Expressing Network Configurations with SAOM Effects for Hypotheses 1 and 2

minority member, and *Alter* identifies with the minority group ($m_i = 1$ and $m_j = 0$). In this case,

$$(\beta_1 + \beta_2 m_j) M_{ij} F_{ij}$$

expresses H/1-2c. Finally, H/1-2d has predictions about the additional effect of a friendship tie on a minority perception tie between *Ego* and *Alter* if both are self-identified minorities ($m_i = 0$ and $m_j = 0$). In this case,

$$(\beta_1 + \beta_2 m_i + \beta_3 m_j) M_{ij} F_{ij}$$

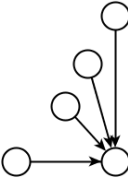
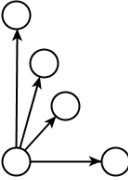
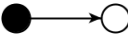
expresses H/1-2d.

Appendix H

SAOM Model Specification for Chapters 11 and 12

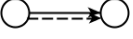
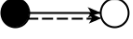
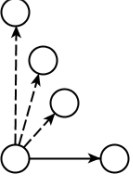
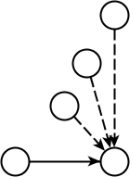
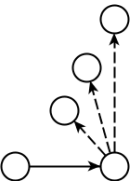
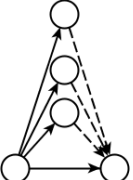
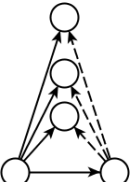
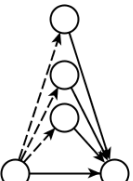
Dependent variable: Racial perception

***Ego* nominates *Alter* as a minority, creating or maintaining the described substructure**

	Name	Formula	Description	Illustration
<i>Same-network structural</i>				
1	Outdegree	M_{ij}	"intercept" – minority classification when every parameter is 0 (1=tie, 0=no-tie)	
2	Reciprocity	$M_{ij}M_{ji}$	<i>Ego's</i> tendency to reciprocate minority classifications	
3	<i>Alter's</i> level of being classified as a minority	$M_{ij} \sum_h M_{hj}$	tendency to classify as minorities those who are classified so by many (<i>for Chapter 12 H/2 and H/3</i>)	
4	<i>Ego's</i> minority classification activity	$M_{ij} \sum_h M_{ih}$	tendency of those who classify many as minorities to classify <i>Alter</i> as well (<i>control for the how active Ego is at nominating others as minorities</i>)	
<i>Covariate effects</i>				
5	<i>Ego's</i> self-identification	$m_i M_{ij}$	tendency of a self-identified minorities to classify more as minorities)	
6	<i>Alter's</i> self-identification	$m_j M_{ij}$	tendency of a self-identified minorities to be classified as minorities as well (<i>for Chapter 11 H/b</i>)	

N/blank arrow: minority classification; *F*/dashed arrow: friendship; *m* or *g*/black node: self-identified minority or female actor; white node: any actor; *i*: *Ego*; *j*: *Alter*; *h*: other actor (e.g. *ij*: tie from *Ego* to *Alter*; *jh*: tie from *Alter* to a third person)

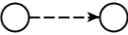
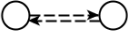
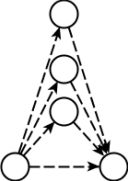
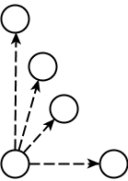
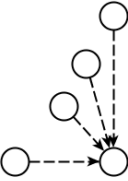
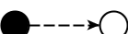
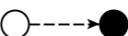
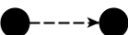
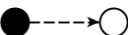
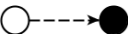
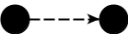
Mixed-network effects

7	Friendship tie	$M_{ij}F_{ij}$	tendency to classify friends as minorities (for Chapter 11 H/1-2)	
8	Friendship tie × Ego's self-identification	$m_i M_{ij}F_{ij}$	minority Egos' tendency to classify their friends as minorities (for Chapter 22 H/1- 2c and d)	
9	Friendship tie × Alter's self-identification	$m_j M_{ij}F_{ij}$	tendency to classify self-identified minority friends as minorities (for Chapter 11 H/1-2b and d)	
10	Ego's friendship activity	$M_{ij} \sum_h F_{ih}$	Ego's tendency to classify many as minorities if Ego nominates many as friends (control for Ego's activeness in nominating in both networks)	
15	Alter's popularity	$M_{ij} \sum_h F_{hj}$	tendency to nominate those as minorities who are nominated as friends by many people (for Chapter 12 H/1a and c)	
11	Alter's friendship activity	$M_{ij} \sum_h F_{jh}$	tendency to nominate those as minorities who nominate many people as friends (for Chapter 12 H/1b and d)	
12	Alter's popularity amongst (perceived) minorities	$M_{ij} \sum_h M_{ih}F_{hj}$	Ego's tendency to nominate those as minorities who are nominated as friends by many others whom Ego classifies as minorities (for Chapter 12 H/1a)	
13	Alter's friendship activity towards (perceived) minorities	$M_{ij} \sum_h M_{ih}F_{jh}$	Ego's tendency to classify those as minorities who nominate many others as friends whom Ego classifies as minorities (for Chapter 12 H/1b)	
14	Friends' agreement in minority classifications	$M_{ij} \sum_h F_{ih}M_{hj}$	Ego's tendency to accept his/her friends' perceptions on Alter (for Chapter 12 H/3)	

N /blank arrow: minority classification; F /dashed arrow: friendship; m or g /black node: self-identified minority or female actor; white node: any actor; i : Ego; j : Alter; h : other actor (e.g. ij : tie from Ego to Alter; jh : tie from Alter to a third person)

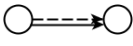
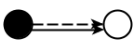
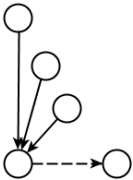
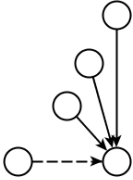
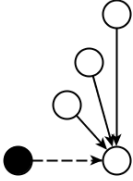
Dependent variable: friendship

Ego nominates Alter as a friend, creating or maintaining the described substructure

	Name	Formula	Description	Illustration
<i>Same-network structural</i>				
15	Outdegree	F_{ij}	"intercept" – friendship nomination when every parameter is 0 (1=tie, 0=no-tie)	
16	Reciprocity	$F_{ij}F_{ji}$	<i>Ego's</i> tendency to reciprocate friendship nominations	
17	Transitive triplets	$\sum_h F_{ij}F_{ih}F_{hj}$	tendency for clustering	
18	<i>Ego's</i> friendship activity	$F_{ij} \sum_h F_{ih}$	tendency of <i>Egos</i> nominating many as friends to nominate <i>Alter</i> as well	
19	<i>Alter's</i> popularity	$F_{ij} \sum_h F_{hj}$	tendency to nominate those as friends who are nominated by many	
<i>Covariate effects</i>				
20	<i>Ego's</i> self-identification	$m_i F_{ij}$	tendency of self-identified minorities to send more friendship nominations	
21	<i>Alter's</i> self-identification	$m_j F_{ij}$	tendency to nominate more self-identified minorities as friends	
22	<i>Ego</i> × <i>Alter</i> self-identification	$m_i m_j F_{ij}$	tendency of self-identified minorities to nominate more self-identified minorities	
23	<i>Ego's</i> gender	$g_i F_{ij}$	tendency of females to send more friendship nominations	
24	<i>Alter's</i> gender	$g_j F_{ij}$	tendency to nominate more females as friends	
25	<i>Ego</i> × <i>Alter</i> gender	$g_i g_j F_{ij}$	tendency of females to nominate each other more	

N/blank arrow: minority classification; *F*/dashed arrow: friendship; *m* or *g*/black node: self-identified minority or female actor; white node: any actor; *i*: *Ego*; *j*: *Alter*; *h*: other actor (e.g. *ij*: tie from *Ego* to *Alter*; *jh*: tie from *Alter* to a third person)

Mixed-network effects

26	Roma tie	$F_{ij}M_{ij}$	<i>Egos'</i> tendency to send friendship nominations towards those whom they perceive as minorities	
27	Roma tie × <i>Ego's</i> self-identification	$m_i F_{ij}M_{ij}$	self-identified minority <i>Egos'</i> tendency to send friendship nominations towards those whom they perceive as minorities	
28	Roma in-degree of <i>Ego</i>	$F_{ij} \sum_h M_{hi}$	tendency of those classified as minorities by many to nominate more as friends	
29	<i>Ego's</i> minority classification activity	$F_{ij} \sum_h M_{hj}$	tendency to nominate those as friends who are classified as minorities by many	
30	<i>Ego's</i> minority classification activity × self-identification	$m_i F_{ij} \sum_h M_{hj}$	minority <i>Egos'</i> tendency to nominate those as friends who are classified as minorities by many	

N/blank arrow: minority classification; *F*/dashed arrow: friendship; *m* or *g*/black node: self-identified minority or female actor; white node: any actor; *i*: *Ego*; *j*: *Alter*; *h*: other actor (e.g. *ij*: tie from *Ego* to *Alter*; *jh*: tie from *Alter* to a third person)

Appendix I

Full SAOM Results for Chapters 11 and 12

	Estimate	(S.D.)	Posterior prob.	Credible interval		Varying
	from	to				
Minority classification						
<i>Same-network structural</i>						
Outdegree	-3.801	0.387	0	-4.568	-3.037	+
Reciprocity	-0.228	0.126	0.034	-0.47	0.019	-
<i>Alter's</i> level of being classified as a minority	0.13	0.011	0	0.109	0.151	-
<i>Ego's</i> minority classification activity	0.07	0.009	0	0.053	0.087	-
<i>Covariate</i>						
<i>Alter's</i> self-identification	0.873	0.104	0	0.667	1.07	-
<i>Ego's</i> self-identification	0.208	0.103	0.019	0.011	0.403	-
<i>Mixed-network</i>						
Friendship tie $\times$ <i>Ego's</i> self-identification	0.453	0.226	0.025	0	0.892	-
Friendship tie $\times$ <i>Alter's</i> self-identification	0.169	0.227	0.229	-0.263	0.631	-
Friendship tie	0.091	0.253	0.353	-0.419	0.576	-
<i>Alter's</i> popularity	-0.08	0.028	0.001	-0.137	-0.027	-
<i>Alter's</i> friendship activity	0.042	0.016	0.003	0.012	0.074	-
<i>Ego's</i> friendship activity	-0.045	0.019	0.005	-0.084	-0.009	-
Friends' agreement in minority classifications	0.054	0.043	0.102	-0.025	0.141	-
<i>Alter's</i> popularity amongst minorities	0.45	0.111	0	0.245	0.694	-
<i>Alter's</i> friendship activity towards minorities	-0.068	0.088	0.219	-0.251	0.098	-
Friendships						
<i>Same-network structural</i>						

	Estimate	(S.D.)	Posterior prob.	Credible interval		Varying
				from	to	
Outdegree	-1.796	0.336	0	-2.468	-1.138	+
Reciprocity	1.135	0.096	0	0.935	1.325	+
Transitive triplets	0.25	0.064	0	0.128	0.375	+
<i>Alter's</i> popularity	-0.068	0.063	0.129	-0.194	0.056	+
<i>Ego's</i> friendship activity	-0.002	0.056	0.484	-0.109	0.109	+
<i>Covariate</i>						
<i>Alter's</i> self-identification	0.391	0.147	0.002	0.118	0.685	+
<i>Ego's</i> self-identification	0.156	0.137	0.13	-0.119	0.428	+
<i>Ego</i> $\times$ <i>Alter</i> self-identification	0.128	0.16	0.2	-0.197	0.435	-
<i>Alter's</i> gender	-0.038	0.087	0.34	-0.212	0.122	-
<i>Ego's</i> gender	-0.143	0.085	0.055	-0.303	0.028	-
<i>Ego</i> $\times$ <i>Alter</i> gender	0.202	0.076	0	0.062	0.349	-
<i>Mixed-network</i>						
Minority tie $\times$ <i>Ego's</i> self-identification	-0.158	0.248	0.262	-0.664	0.335	-
<i>Alter's</i> popularity $\times$ <i>Ego's</i> self-id.	0.034	0.014	0.013	0.005	0.061	-
Minority tie	0.047	0.231	0.415	-0.408	0.475	-
<i>Alter's</i> level of being classified as a minority	-0.073	0.058	0.103	-0.193	0.037	+
<i>Ego's</i> minority classification activity	-0.009	0.007	0.081	-0.022	0.004	-

Estimated parameters; estimated standard errors; posterior probabilities; credible interval for the estimated parameters; parameters randomly varying (+) or fixed (-) in the model.

We present the posterior probabilities of values less than 0 for positive estimates, and the posterior probabilities of values larger than 0 for negative estimates.

Appendix J

Configurations as combinations of SAOM effects for Chapter 12

Similarly to Appendix G, this appendix provides information about how each configuration expressing our hypotheses, this time in Chapter 8, can be tested in RSiena. This is necessary since not all of these configurations are directly testable in the model; some should be calculated as a sum of two or more effects. This is because the variables these configurations are built on are dummy variables; therefore, one category (the majority classifications, the majority self-identifications, and the non-friendships) is always the reference category.

We review every hypothesis from this aspect, explaining which SAOM effect, or which combination of multiple effects is able to express the prediction of each hypothesis; providing visual illustration and mathematical explanations in all cases.

J.1 Hypothesis 1

H/1 has four predictions, which cannot be all modelled directly in the analysis. This is because racial perceptions are also captured by a dummy variable; that is, the presence of a majority tie equals the absence of a minority tie. Table 12.1 describe the configurations we need to test in our model. Figure J.1 expresses these configurations using SAOM effects, showing which effect parameters need to be summarized in order to express our hypotheses.

The table shows that some of the configurations we are using are substructures of each other: effect II includes effect I, adding an additional minority nomination from *Ego* towards those nominating Alter as friends; similarly, effect IV includes effect III. Effects I and III capture the influence of Alter's friends in general; while effects II and IV the influence of Alter's minority friends specifically. However, if all effects IIV are in the model, the general friendship effects of effect I and III should be interpreted by keeping in mind that friendships from/towards minorities are captured by effects II and IV; therefore, the estimated param-

Hypothesis	Configuration	SAOM effects			
H1/c		=			
H1/a		=	 effect I <i>Alter's popularity (no. of friendships Alter gets)</i>	+	 effect II <i>the additional effect of these ties if sent by minorities</i>
Formula		$M_{ij} \sum_h F_{hj}$	$M_{ij} \sum_h M_{ih} F_{hj}$		
H1/d		=			
H1/b		=	 effect III <i>Alter's activity (no. of friendship ties Alter sends)</i>	+	 effect IV <i>the additional effect of these ties if sent towards minorities</i>
Formula		$M_{ij} \sum_h F_{jh}$	$M_{ij} \sum_h M_{ih} F_{jh}$		

Reference category: majority-majority nominations

Black arrow: minority classification; dashed arrow: friendship tie; white node: any actor

M: minority classification; F: friendship tie; m: self-identified minority actor; *i*: *Ego*; *j*: *Alter*; *h*: other actor (e.g. *ij*: tie from *Ego* to *Alter*; *jh*: tie from *Alter* to a third person)

Figure J.1: Expressing Network Configurations with SAOM Effects for Hypothesis 1

eters for these effects express the friendship effects from/towards the "reference category", that is, majority students. Therefore, if all four effects are in the model, the parameter values of effect I and effect III directly express H/3c and H/3d. At the same time, the sum of the parameters estimated for effects I and II includes the effects of friendship ties Alter gets, with the additional influence of these friendships being sent by minorities, expressing H/3a; similarly, the sum of effect III and IV expresses H/3b. Here we present a short summary and mathematical reformulation of the above argument. Including effects I-IV together, RSiena estimates the following:

$$\beta_I M_{ij} \sum_h F_{hj} + \beta_{II} M_{ij} \sum_h M_{ih} F_{hj} + \beta_{III} M_{ij} \sum_h F_{jh} + \beta_{IV} M_{ij} \sum_h M_{ih} F_{jh}$$

which can be expressed as

$$\begin{aligned} & (\beta_I + \beta_{II}) M_{ij} \sum_h F_{hj} M_{ih} + \beta_I M_{ij} \sum_h F_{jh} (1 - M_{ih}) + \\ & (\beta_{III} + \beta_{IV}) M_{ij} \sum_h F_{jh} M_{ih} + \beta_{IV} M_{ij} \sum_h F_{jh} (1 - M_{ih}) \end{aligned}$$

In this case,

$$(\beta_I + \beta_{II}) M_{ij} \sum_h F_{hj} M_{ih}$$

expresses $\beta_{H/1a}$, since it is referring to those cases where Alter's in-coming friendship ties are sent by those classified as minorities by *Ego*, while

$$\beta_I M_{ij} \sum_h F_{jh} (1 - M_{ih})$$

expresses $\beta_{H/1c}$ as it refers to the effect of incoming friendship ties from individuals classified as majorities (captured by the $1 - M_{ih}$ component).

Similarly,

$$(\beta_{III} + \beta_{IV}) M_{ij} \sum_h F_{jh} M_{ih}$$

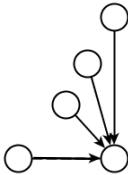
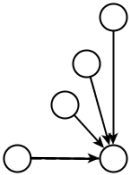
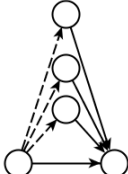
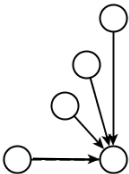
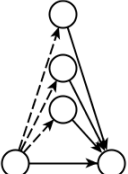
expresses $\beta_{H/1b}$, because it captures the effect of the outgoing nominations sent by Alter towards those perceived as minorities by *Ego*. Finally,

$$\beta_{IV} M_{ij} \sum_h F_{jh} (1 - M_{ih})$$

$\beta_{H/1d}$, as it equals to the effect of friendships sent towards those perceived as non-Roma by *Ego*.

J.2 Hypotheses 2 and 3

Similarly to the predictions of the first hypothesis, H/2 and H/3 cannot be all modeled together directly in the analysis. Table 2 in the main text show the two configurations we need to test in our model. Table 9 expresses these configurations by either one or the combination of two SAOM effects.

Hypothesis	Configuration	SAOM effects
H/2		
H/3		 + 
		effect V Alter's level of being classified as a minority (no. of classification ties) effect VI the <i>additional</i> effect of these ties if sent by minorities
Formula		$M_{ij} \sum_h M_{hj}$ $M_{ij} \sum_h F_{ih} M_{hj}$

Reference category: majority-majority nominations

Black arrow: minority classification; dashed arrow: friendship tie; white node: any actor
M: minority classification; F: friendship tie; m: self-identified minority actor; *i*: *Ego*; *j*:
Alter; *h*: other actor (e.g. *ij*: tie from *Ego* to *Alter*; *jh*: tie from *Alter* to a third person)

Figure J.2: Expressing Network Configurations with SAOM Effects for Hypothesis 2 and 3

The peer influence effect models how much each minority classification Alter gets will increase the likelihood that Alter will be nominated as a minority by *Ego* as well. Here, a positive parameter value is expected. The friend influence effect models the extra effect of these minority classifications if they are coming from *Ego*'s friends. As friends are expected to be more influential on *Ego*'s classifications than others, here also a positive parameter value is expected. The total influence of *Ego*'s friends can be expressed by the sum of these two parameters.

Estimating the peer influence and the friend influence effects together, the part of the evaluation function estimated by RSiena is

$$\beta_V M_{ij} \sum_h M_{hj} + \beta_{VI} M_{ij} \sum_h F_{ih} M_{jh}$$

which can be also expressed as

$$(\beta_V + \beta_{VI}) M_{ij} \sum_h F_{ih} M_{jh} +$$

$$\beta_V M_{ij} \sum_h (1 - F_{ih} M_{jh})$$

where the first part expresses the cases when the Roma nominations are sent to Alter by *Ego*'s friends (F_{jh}), therefore

$$(\beta_V + \beta_{VI}) M_{ij} \sum_h F_{ih} M_{jh}$$

expresses $\beta_{H/3}$, and the second part expresses the cases when they are sent by other peers, that is, *Ego*'s "non-friends" ($1 - F_{jh}$). Consequently,

$$\beta_V M_{ij} \sum_h M_{hj}$$

expresses $\beta_{H/2}$

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