

# The Relational Approach in Sociology: a Study of Dependence

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**Abstract:** Social relations are often crucial elements of a large variety of social phenomena that social scientists study. However, the formalisation of a relational approach in sociology is relatively incomplete. In this study we draw up an analytical framework within which the aims of empirical research can be formulated and analysed. Our main point of departure is the notion of dependence, which arises through the evolution of relations among individuals, connects them on the meso-level of inquiry, and results in outcomes at the group level. We show that the social mechanisms that are responsible for the evolution of these interpersonal relations can be empirically operationalized within the right methodological framework. Finally, we introduce a longitudinal project and describe a unique data set that is suited to the examination of a wide range of social phenomena in an educational setting. We do this by clarifying key theoretical and methodological concepts in the hope that more empirical research and data collection will be carried out in a relational framework in which individuals and their interpersonal relations are considered to be similarly important.

## Introduction

When it comes to theoretical thinking, and especially to empirical research, the prevailing trend in sociology involves preoccupation with the idea that it is individuals that come first, and the relations among them only afterwards. Lately, however, scholars have been looking for feasible analytical approaches to reverse this assumption of a rather atomised social reality, and to focus more attention on the relations that connect individuals (Brandes et al., 2013). Even though several classical figures in sociology have, to some extent, established the theoretical basis for a relational sociology, it is only in the last few decades that scholars have started developing a relational sociological theory in a more or less systematic way. The first attempts were made by Donati (1983), shortly after which other publications emerged, such as, for example, those of Bajoit (1992), White (1995), Laflamme (1995), Emirbayer (1997), Tilly (1999), Crossley (2010) and Archer (2012). Dpelteau and Powell's (2013) work, however, suggests that these formulations substantially differ from each other, and that the term relational sociology is used with a wide range of meanings. Moreover,

Fushe and Mützel (2011) argue that over the past two decades a multi-faceted theory of social networks has emerged which combines the traditional structural approach with a strong emphasis on culture and meaning in networks, including the work of White (2008), as well as Pachucki and Breiger (2010).

Empirical research that has employed a relational framework, nonetheless, has an even shorter history. From an empirical viewpoint, however, network science in general, including social network analysis, is somewhat more unified through a common form of conceptualisation that assumes the existence of complex relational structures among individuals and locates them at the centre of analysis (Robins, 2015). This approach to complexity among entities is in striking contrast to other social science research that assumes the independence of observations. Social network analysis instead rests on the claim that individual outcomes are influenced by the structure of relations among individuals, that relations are affected by individual attributes, and that the evolution of relations is a consequence of other relations in the given social context. Therefore, the units of the analysis – let them be individual outcomes or relations –, are not independent of each other, which has crucial methodological consequences.

In this paper we emphasize that the ontology of relational sociology should include both social relationships and social actors with their attributes (Simmel, 1950; Robins, 2015). We need to observe both in a much more detailed way to better understand the interdependent social mechanisms that operate in social groups. For this reason, our relational perspective needs to be accompanied by explicit theoretical explanations about relations and dependence, as well as methodological decision-making that makes modelling complex social mechanisms possible (Brandes et al., 2013). In doing this, we can still rely on regularly used theories about individuals and social groups, the majority of methodological considerations still apply, and most measurements and observation techniques are still relevant. However, each of these three components of sociological research require some revision and will be reviewed later on.

In practice, network research should be conducted when the theoretical understanding of the research question suggests that social processes or social structures may be crucial explanatory elements. Robins (2015) argues that “you do network research because you must and because you will”, suggesting that the researcher should either eliminate networks as a possible explanation, or produce evidence of their significance. He also provides general examples of social science research aims that involve studying networks (Robins, 2015):

- One can study, for example, whether the social environment affects individual outcomes. It can be argued that social partners might affect individuals through contagion or influence; perhaps some properties (attitudes, information) can spread across the network from one individual to the other.

- It is also possible to study whether individuals in certain social positions have different individual outcomes. Popularity or isolation in a certain social setting may result in different outcomes, or brokers might form bridges between distinct groups and reap the benefits of their roles.
- Another relevant research aim is investigating how individuals affect social structure. There may be individual factors that make individuals more likely to choose certain social partners or occupy certain positions in the social structure.
- Furthermore, one might study the social processes that underpin and sustain the social structure, or examine how individual outcomes and social structure are entwined. In this case, the researcher seeks to understand what casual processes may be present: do individual factors or social factors – or both – provide the best explanation of the phenomenon?
- Finally, on the group level, one could study the global outcomes of the studied social structure in order to understand, for example, whether it is possible to intervene to improve either individual or system outcomes.

Our main argument in this paper is simply that a relational approach in sociology, despite its currently incomplete formalisation, can be especially fruitful in the investigation of a wide range of social phenomena. Consequently, our main task is specifying the most important parts of the relational analytical framework that is required for empirical sociological research. The theoretical part of the framework will be developed based on the relatively unified theoretical formulations of a group of sociologists (H. White, C. Tilly and M. Emirbayer, among others) whom Mische (2011) calls the “New York School of Relational Sociology”. Here, we will describe how a relational framework affects the main concepts of the research and can bridge levels of inquiry.

In the methodological part of this paper we further develop the notion of dependence and explain how this comes about in a relational framework, how it relates to social mechanisms, and how to analyse it with statistical tools (SAOMs and ERGMs) that have been developed to model multiple complex dependencies within social networks.

Finally, the observational part of the analytical framework will be contextualised and illustrated by describing the first phase of data collection of a research group (anonymised), as well as the database that will be made publicly available on the website of the research group. Since the main goal of this project was to describe ethnic segregation in Hungarian high schools, the majority of the theoretical explanations and empirical examples in this paper will be related, but not limited, to this topic.

## Theoretical considerations

In order to avoid misunderstanding, we would like to make it clear that we do not intend to develop the ontology of relational sociology in this paper. Instead, we

would simply like to draw up a broad analytical framework for relational sociology to illustrate its advantages in empirical research. Hereby, we predominantly follow Emirbayer's call for a new relational social science (Emirbayer, 1997), even though there are alternative theoretical formulations, and critiques of his views do exist. According to Donati (2015), Emirbayer and other prominent figures of the "New York School" prefer a "flat ontology" that deals exclusively with dyadic relations, neglecting the importance of context and individuals, while putting too much emphasis on relations. We do not want to reflect on this accusation but instead simply argue that individual attributes, as well as relations, are equally important when studying social phenomena.

In his manifesto, Emirbayer (1997) characterizes the relational approach by comparing it with the offshoots of the substantialist tradition. The point of departure of this perspective is the notion that it is entities of various kinds that constitute the fundamental units of the investigation. One element in the perspective of the substantialist approach concerns 'self-action' which considers "things ... as acting under their own powers" (Dewey and Bentley, 1949:108), independently of one another. Emirbayer (1997) points out that the notion of self-action in the social sciences shows great persistence in the form of methodological individualism. Another perspective, rational-choice theory in its original form, considers individual human action and interaction as the elementary unit of social life (Elster, 1989). This approach begins with rational, calculating actors but also assumes that the interests, goals and preferences that drive their actions are given and inflexible. Similarly, according to game theory, when actors engage in game-playing with other actors, their underlying characteristics remain unaltered. As a safeguard against the utilitarian dangers of rational action theory, the neo-Kantian perspective takes norm-following individuals and the inner forces which drive them as the basic unit of analysis. The main point is basically the same: neofunctionalist, system theorist and historical-comparative analysts tend to rely on the assumption that it is durable, coherent entities that constitute the starting points of sociological inquiry (Emirbayer, 1997).

Another perspective of substantialist thinking is that of 'inter-action', where entities no longer generate their own activities, but instead, relevant action takes place among the entities and the entities themselves remain fixed throughout the interaction (Emirbayer, 1997). This dominant, "variable-centred" approach assumes that entities with variable attributes "interact, in causal or actual time, to create outcomes, themselves measurable as attributes of fixed entities" (Abbott, 1988:170). From this perspective, the entities in question do not act. If anything, it is the variable attributes that "act", or rather, that provide the initiative which results in conclusions such as: a "disadvantaged position leads to increased competitiveness" without the engagement of any particular actor in competitive behaviour (Emirbayer, 1997:286). To put it differently: "It [is] when the variable does something narratively that [analysts] think themselves to be speaking most directly of causality" (Abbott, 1992:58).

Emirbayer (1997) fundamentally opposes from the varieties of substantialist perspective the approach of trans-action which is the key concept of the relational view. As Emirbayer explains, the units involved in the transactions (which refer to the relations, using his terminology) derive their meaning and identity from the changing attributes, behaviour or functional roles they play within that transaction. The dynamic, unfolding process of transaction becomes the primary unit of the analysis rather than the compositional elements themselves (Emirbayer, 1997). In this relational view, entities “are not assumed as independent existences present anterior to any relations, but ... gain their whole being ... first in and with the relations which are predicated of them” (Cassirer et al., 1953:36). Individual persons, whether strategic or norm following, are considered to be inseparable from the transactional context within which they are embedded. What is distinct about the transactional approach is that it sees relations among individuals as predominantly dynamic, ongoing processes, affecting and affected by individual processes. “Previously constituted actors enter [transactions] but have no ability to traverse [them] inviolably. ... What comes out are new actors, new entities, new relations among old parts” (Abbott, 1995:836).

## Main concepts in empirical research

In order to be able to empirically examine social phenomena, the main concepts behind the research should be described and linked together using the relational theoretical framework that was described by Emirbayer (1997) as the transactional approach. The following concepts that we describe here may have received some attention in various fields of sociological research, but they are particularly important when it comes to the investigation of relational segregation processes in educational settings.

The research group’s (anonymised) project, which we use here as an example, was concerned with the idea that integrated education has an important role in fighting social and economic inequality by increasing the human and economic capital of minority groups. Furthermore, it was emphasized that an integrated educational setting can only be successful if positive interpersonal relations cross ethnic boundaries, while cross-ethnic negative relations do not disproportionately prevail.

The idea of inequality (or equality) is generally defined as a matter of individual variability in the possession of human or economic capital. For example, “Encountering racial differences in job assignments, researchers ask whether across categories individuals distribute differently with respect to residential location. Uncovering evidence of sharp ethnic differences in industrial concentration, analysts only begin to speak of discrimination when they have factored out individual differences in education, work experience, or productivity” (Tilly, 1999:9). From a transactional point of view, inequality comes from the everyday practises of certain actors as they face challenges relating to control over symbolic, positional, or emotional resources (Emirbayer, 1997). For instance, members of a categorically bounded network,

such as recently arrived migrants, acquire access over some valuable resources (information about employment opportunities), hoard their access to it (sharing it only among themselves), and develop practices that perpetuate this restricted access (by staying in touch with their places of origin through frequent visits back home). These advantages and disadvantages then become durable through these practices (Tilly, 1999). As Emirbayer (1997) argues, these tend to take the form of unfolding transactions within inter-personal networks, not the pre-constituted attributes that effectively explain inequality.

Although the notion of freedom is not necessarily the centre of interest when it comes to segregation, it is important for us as it creates the linkage between context and agency that we must understand in order to explain the evolution of interpersonal relations. In a substantialist fashion, freedom is often defined as a possession, a legal status represented in laws. The relational view, however, regards freedom not as a fixed, given attribute, but rather as the potential for its use under given circumstances, in a given context. It thus means nothing apart from the concrete transactions in which individuals engage within cultural, social structural, and social psychological contexts of action; it derives its significance entirely from the constant interplay of decision, consequence and reaction (Emirbayer, 1997).

Agency is often identified within the self-actional notion of human will as a property that can be activated by passive individuals or groups that would otherwise remain perpetually at rest. By contrast, the transactional approach sees agency as inseparable from the unfolding dynamics of situations and their problematic features. The internal nature of agency involves different ways of experiencing and acting in a certain context. It always involves agency towards something, and in this process actors can engage in relationships with surrounding people, places, meanings, and events. It implies transactions within collectively organised relational contexts (cultural, social structural, and social psychological); as such, agency is path dependent, as well as contextually embedded.

Finally, we should address identity as a key concept of research into inter-ethnic segregation. According to Tilly (2005), individuals form identities by answering the questions, "Who am I?", "Who are you?", "Who are we?", or "Who are they?". Identities as such indicate boundaries that separate 'us' from 'them'. On both sides of the boundaries, people maintain certain relations with each other and carry on relations across the boundaries. They also create social norms to describe and prescribe relations within and between boundaries. These boundaries, along with relations and social norms, make up collective identities (Tilly, 2005). By following a relational approach, we can, like the majority of previous research has done, treat identities as characteristics of individual consciousness, or 'how you think of yourself'. However, we can do more. If we accept the core idea that identities are shaped by social relations, it can be argued that every individual or social group has as many identities as it has relations with other individuals and social groups. Consequently,

the identity of these individuals and social groups may alter as their relations change. Hence, instead of focusing on self-declared ethnicity only, and treating it as a fixed individual attribute, researchers should define ethnic identity in terms of beliefs, perceptions, and understandings (Brubaker, 2004). Related to this, it is important to distinguish between ethnic self-identification (that is, self-reported ethnicity), and ethnic classification (i.e. ethnicity as perceived by others) (Saperstein and Penner, 2012; Boda and Néráy, 2015).

## Levels of inquiry

In his manifesto, Emirbayer (1997) also describes the different levels of sociological inquiry from a relational point of view that can help us understand the ways which this framework can bridge the different levels of inquiry, and the methodological consequences this implies. First of all, the notion of the individual can be reconsidered on the micro-level. Emirbayer (1997) argues that individual identities and interests are not pre-constituted, and individuals do not enter into relations with their attributes already fixed. As Pizzorno (1991:218) points out, self-subsistent identities are in fact actors lacking stable, durable identities. He suggests that the formation of identity and agency requires some relation with others, because “The individual human agent is constituted as such, when he is recognised and named by other human agents” (Pizzorno, 1991:218).

On the meso-level, the analytical research framework has been significantly influenced by Robert K. Merton’s well-known notion of middle-range theory (Merton, 1968). On this level, scientific inquiry aims to describe clear mechanisms through which actions and transactions on the individual level lead to macro-level facts such as inequality or segregation. Emirbayer (1997) argues that social mechanisms that link the micro and meso-level can be revealed by focusing on face-to-face encounters in which individuals engage in different relations with each other.

Whereas these encounters have most typically been seen in self-actional or interactional terms as a result of the mutual interplay among pre-constituted actors (Emirbayer, 1997), Goffman argues that it “is not the individual and his psychology, but rather the syntactical relations among the acts of different persons mutually present to one another (Goffman, 1967:2). Goffman’s sociology of occasions takes dynamic processes as its unit of analysis; one which develops within cultural, social cultural, and social psychological matrices: “Not, then, men and their moments. Rather moments and their men” (Goffman, 1967:3). Goffman describes these occasions as shifting entities “created by arrivals and killed by departures” (Goffman, 1967:2), which emphasises, again, the importance of social context, suggesting that the same individuals might act differently inside certain temporal and spatial boundaries than outside of them (see also Stinchcombe, 1991; White, 1973).

On the macro-level, society is often interpreted as an autonomous, internally

organised, self-sustaining system, and sociological thinkers who view society through a macroscopic lens tend to begin their inquiry by examining integrated, sovereign entities such as national states or countries (Emirbayer, 1997). Here, we would like to simply argue that the analysis of such entities might be possible within the relational approach, although from a practical viewpoint it is more fruitful to define the macro-level of inquiry as an emergent property of individual and meso-level transactions; that is, the overall network structure of the observed social group. At the same time, the macro structure generates constraints on face-to-face encounters, as well as individual processes. However, within a relational approach, accounting for these macro-level processes and constraints in the traditional sense is a more difficult venture. Instead, in order to be able to fully investigate this interplay of individual attributes, interpersonal-relations and the overall network structure of the social group, we have to understand how processes of network structure capture and induce relevant social processes on the group and individual level. For this reason, in the next section we give some examples of relational mechanisms on the meso-level that can create, using the right methodological framework, linkages between the micro- and the macro-level.

## Methodological consequences of the relational approach

It is the interdependence of interpersonal relations and individual actors that makes the individualisation of social structure problematic (Emirbayer, 1997). Since we are actors embedded in social relations (Abbott, 1988), we cannot merely focus our attention on the analysis of the individual – which is the prevailing methodological trend according to the variable-oriented substantialist approach. Instead, to understand social mechanisms, we need a relational methodology, not a methodology that assumes that every individual is independent.

If our research aim concerns a social phenomenon that possibly involves the investigation of interpersonal connections, and we cannot theoretically exclude their interpretation as part of our sociological explanation, then we need statistical tools that allow us to test our hypothesis and answer our research questions according to statistical inference, while accounting for the properties of social networks. The methodological tools presented here are recognised statistical approaches to modelling social networks. They are theory driven in the sense that their use requires the researcher to consider the complex, intersecting and potentially competing theoretical reasons why social ties in an observed network arise.

## Social mechanisms: the source of dependence

Conventional statistical methods, such as regression analysis, work under the assumption that the units of observation, either individuals or the social ties among them, are independent of one another. Within a relational approach, such a lack of



dependence is an unreasonable assumption for several reasons, and can be handled in two major ways. Within a traditional analytical framework, one can (only) control for the lack of independence, or within a relational methodological framework one can model it, and then capitalise on it.

First of all, the lack of independence at the individual level arises from the nature of social network studies; that is, the units of observation are clustered within groups. This is incorporated in very well-known research designs in traditional educational research, and several multilevel (hierarchical) regression techniques have been developed to tackle the statistical challenges that arise due to this situation (Snijders and Bosker, 2011).

Moreover, there are two additional sources of dependence. One is related to the interplay of individual attributes and network ties, whereas the other is due to endogenous network formation processes. Hence, it is a theoretical and empirical task to delineate the various forms of dependence that are exhibited in actual social structures. Of course, there are many network theories that can explain tie formation; here we summarise the most prominent ones. These are simple examples of how theoretically driven meso-level social mechanisms can be operationalized in a way so as to create linkages between the individual and group level.

When it comes to individual attributes, the role of homophily is probably the most best-documented mechanism (McPherson et al., 2001). This phenomenon describes how certain characteristics of actors influence (on the micro-level) tie formation (on the meso-level). Steglich and his co-authors give a good description of the implied methodological challenges that arise due to the interdependence between group members' individual traits and the network structure of social ties between them (Steglich et al., 2010).

The study of this interdependence has a long tradition in theoretical and empirical social sciences. Prominent sociologists discovered a long time ago that structural cohesion among group members is important for conformity with group norms (Durkheim, 1893; Homans, 1974).

Social identity theory, for example, identifies within-group similarity and between-group dis-similarity as principles by which social groups are subdivided into cohesive smaller social units (Abrams and Hogg, 1990). Furthermore, detailed network studies (Padgett and Ansell, 1993) and discussion essays (Emirbayer and Goodwin, 1994; Stokman and Doreian, 1997) have made it clear that to obtain a deeper understanding of social action and social structure, it is necessary to study the dynamics of individual outcomes and network structure and how these mutually depend upon one another. In methodological terms, this means that the complete network structure as well as relevant actor attributes – one may think here of indicators of performance, attitudes or behavioural tendencies – must be studied as joint dependent variables in a longitudinal framework in which the network structure and the individual attributes mutually influence one another.

Finally, the third main source of dependence is caused by endogenous tie formation processes. From a theoretical viewpoint these serve as linkages between individual and group-level outcomes as they are defined as relations among two or more individuals and can describe the formation of the network structure within the social group.

In a traditional analytical framework we would assume that tie-formation happens randomly among actors; that is, there is no interdependence at all among ties. However, it has been argued that the observation of a tie is not independent of the observation of other ties in the network. This means that social mechanisms on the meso-level are created partly as a result of endogenous processes.

Reciprocity or exchange, for example, is seen as a basic and universal human activity (Blau, 1964). Based on social exchange theory (Emerson, 1976; Rusbult and Buunk, 1993), reciprocity is seen not only as a by-product of other processes behind friendship formation (for instance), but in how individuals also actively look for reciprocated friendships instead of non-reciprocated ones. According to this theory, friendship is interpreted as investment: people seek rewards for the time, energy or sometimes even material goods they invest in a relationship.

Beyond dyads, the importance of triadic relations was proposed by Simmel (1950). His work was followed by that of Heider (1958) and Cartwright and Harary (1956) who introduced structural balance theory, describing a triangulation process among social ties, also known as path closure or network closure. A tendency towards transitive closure on the individual level may lead to clustering on the group level, and cyclical closure will result in generalised exchange. A few decades later, Granovetter (1973) contrasted the closure of strong ties to the non-closure of weak ties. Burt (1992), studied network brokerage and structural holes, arguing that taking a position in the centre of a non-closed structure is advantageous. Other theories suggest that socially well-connected individuals may occupy prominent positions in the network. For example preferential attachment describes how network popularity may induce further popularity (Merton, 1968; Barabasi and Albert, 1999).

These theoretical concepts of social mechanisms provide an explanation of how ties might be associated with individual attributes, why ties might be present in the network, and how ties might come to form particular local patterns, or so-called “network configurations” (Lusher et al., 2012) or “micro structures” (Snijders et al., 2010). Although these configurations embody some ideas about how networks may be patterned locally, it is an empirical question whether a particular configuration is present in a given network.

## Operationalizing social mechanisms

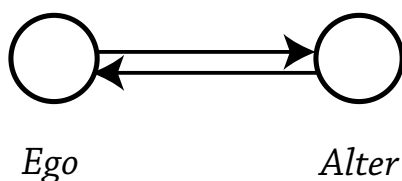
The empirical analysis of these network configurations is a risky venture. Although there are techniques to control for the lack of independence such as running robustness

checks, conventional regression methods are unable to investigate these endogenous network structures due to statistical inference. However, other methodological tools that were developed for examining social networks make the assumption that there is interdependence among network ties. These methods model dependence, instead of trying to control for a lack of independence.

When modelling empirically observed networks, the analyst is generally confronted with a choice between two candidate models that are common in the literature: Exponential Random Graph Models (ERGM) (Lusher et al., 2012), and Stochastic Actor-oriented Models (SAOM) (Snijders, 2001; Snijders et al., 2010; Steglich et al., 2010). Even though the two models accomplish the same inferential task in a relatively similar way, the difference in the underlying theoretical assumptions alone is often not strong enough to help the analyst make a clear decision between them (Leifeld and Cranmer, 2015), and the empirical performance of the two techniques is rarely compared directly (Desmarais and Cranmer, 2012; Leifeld and Cranmer, 2015).

Because an introduction to these statistical tools would exceed the limits of this paper, here we only point out the similarity of the two methods; that is, that an SAOM can be seen as a special case of an ERGM which is estimated via a somewhat different process, given that the SAOM has an ERGM as its limiting distribution (Snijders, 2001). Hence, these models both permit inferences to be made about whether, in a network of interest, there are significantly more (or less) network configurations (e.g. reciprocated ties, or triangles) than we would expect to occur by chance (Snijders et al., 2010; Desmarais and Cranmer, 2012; Lusher et al., 2012). In addition to this function, these models allow for individual and dyadic attributes and group-level variables to be included in the model, hence providing an opportunity for the researcher to examine more substantive research questions, while controlling for endogenous network processes and analysing them simultaneously.

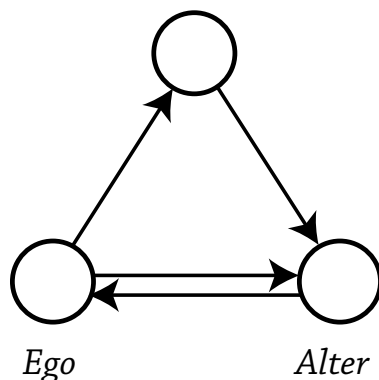
Figure 1: Reciprocity



By including such endogenous network configurations together in the relevant statistical model, one can test the effects of one against the other, and so infer the social processes that have built the network. Nonetheless, it is also important to understand that these models always include effects that are not only statistically correlated (like in most regression models), but which are also embedded in each other (Boda, 2016). This is because the micro-structures included in the model are of

different levels of complexity, and the more complex structures always contain less complex structures. These configurations or structures can be considered to arise from local social processes, whereby actors in the network form connections in response to other ties in the network (Lusher et al., 2012).

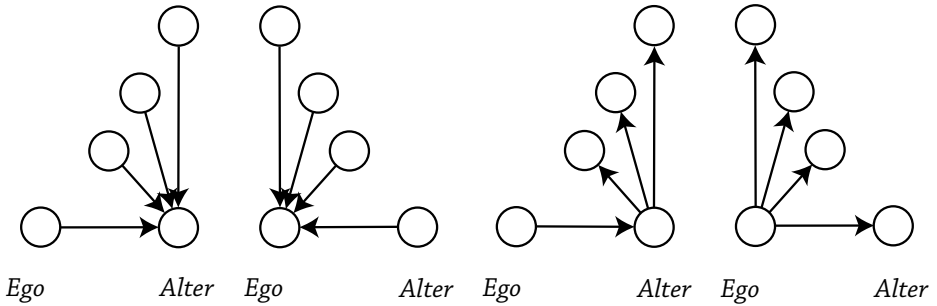
Figure 2: Transitive reciprocated triplet



For example, with regard to reciprocity, which is one of the most basic endogenous tie formation processes, the presence of a friendship tie between Ego and Alter is dependent on the presence of the friendship tie between Alter and Ego (see Figure 1). In an actor-oriented framework (like that used in SOMAs) the same dependence occurs, because Ego's consideration of Alter as friend is affected by whether Alter thinks about Ego the same way. If we go one step further, the presence of the reciprocated friendship tie between Ego and Alter is dependent on whether they have friends in common; that is, they are embedded in transitive reciprocated triplets (see Figure 2).

However, if we inspect the transitive reciprocated triplet (see Figure 2) carefully, we realise that within this configuration three additional sub-configurations can be identified (see Figure 4), and these sub-configurations refer to the degree effects in the model (see Figure 3); for example, as earlier described by the term preferential attachment.

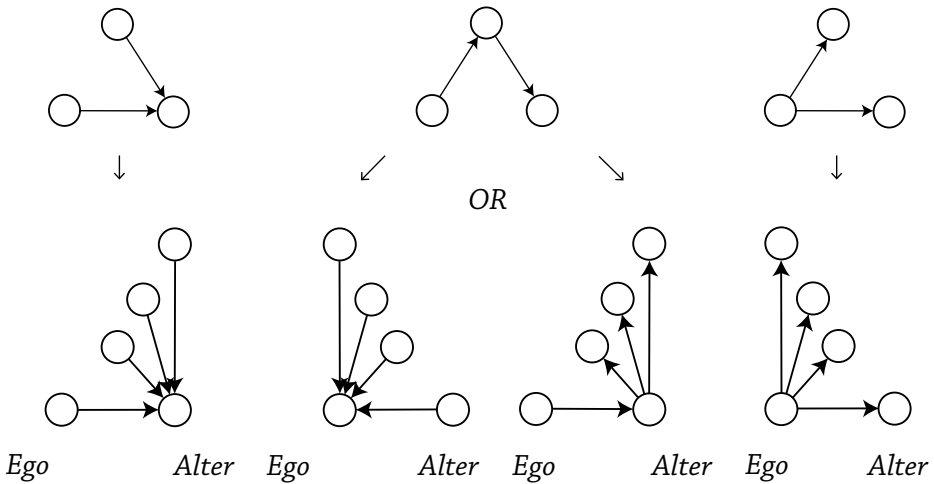
Figure 3: Degree effects: Popularity of Alter, Popularity of Ago, Activity of Alter, Activity of Ego



One consequence of not including these reciprocity and degree effects in the analysis when modelling transitive triplets is that it makes it impossible to distinguish between these more embedded degree processes and the actually modelled transitivity when interpreting the estimated parameters. This occurs in this situation not only because of closure processes; it is also possible that one of the substructures is overrepresented in the data, and therefore the analysis results in more triangles than would be expected by chance (even if the other ties contributing to the triangles are not more common than they would be by chance). Since the underlying sub-process is not controlled for, the transitive triplets variably “absorb” its effect, leading to false interpretation as tendency to transitive closure.

When considering individual attributes, similar considerations apply. For example, personal characteristics that are likely to increase the probability of a friendship connection between two people, such as similarity along certain dimensions (homophily), apply to dyads instead of just one individual. As mentioned earlier, the characteristics of the individual gain meaning only through reference to interpersonal relations. Hence, it is likely that both actors are affected by the same exogenous matching characteristics, which may result in the same network formation process as endogenous reciprocity (see Figure 1) Therefore, disentangling these two mechanisms is essential for understanding social network formation processes (Steglich et al., 2010).

Figure 4: Effects embedded in the Transitive Triplets effect



All of these considerations require meticulous and precise model-building efforts involving an iterative process in which theory and empirical experience must be jointly developed. This is because the network configurations under analysis serve at least two purposes: First, they have to provide convincing theoretical arguments about how the given network structure may have evolved; and secondly, they have to be suitable for modelling the empirical network structure. However, it is also important to note that the research aim (just as with other empirical studies) might shift the primary focus of attention from network configurations to individual attributes. If the substantial interest of the investigation concerns individual traits, attributes or behaviour, then, from an interpretative point of view, the micro structures serve as “control variables” in the model.

## Observing social networks

### *Data requirements*

The data requirements of a piece of empirical research within a relational framework will be described through the example of a project (anonymised). The longitudinal data for the research effort were collected by a research group (anonymised), have several unique features, and provide the researcher with an abundance of opportunities for studying different social phenomena in terms of relational frameworks. Because these opportunities have not been fully exploited, and because research design using an SNA framework might not be self-evident, we hereby invite the reader to learn about the unique features of these data and to think about their further analysis.

The main research aim of the project was to observe the evolution of student networks over time, starting from the very first, initial relationships. Since in Hungary

secondary school usually starts in 9<sup>th</sup> grade, the research group started collecting data among 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, the research team regularly repeated the measurement to capture changes in social ties as well as individual attributes and attitudes. Because changes in interpersonal relationships are usually much more frequent in the first couple of months after the first relationships are formed, before students know each other well, it is advantageous to make more frequent observations early on. Therefore, the second wave of data was collected when the first academic year was still in progress; after that, there was one more period of data collection in the second academic year, and one during the third. Questionnaires mostly contained the same questions across data waves, albeit with some variation: some questions were not used in every case.

Students in the same cohort are sorted into distinct school classes of 30 students (sometimes more, or less) with whom they attend most of their classes. Hence, the group boundaries (that is, the units of data-collection), are relatively well-defined and stable. This is important if the research aim relates to understanding social processes both on the individual and group level. Additionally, because of the well-defined nature of the group boundary, we can more realistically assume that we will be able to observe the majority of relevant processes.

Before the data collection process, an information sheet and a consent form were sent to the parents, in cooperation with the schools. In this information sheet parents were informed about the research group (anonymised) that planned to collect the data, the aim of the data collection process and research, and how data would be treated. Parents' passive consent for their children's participation was requested, and only children with valid consent were asked to fill out our questionnaire

Students were asked to fill in a printed questionnaire under the supervision of at least one trained research assistant. Students were also informed at the beginning of the questionnaire about the organisation that planned to collect the data, the aim of the data collection process and research, and how the data would be used. They were assured that their answers would be kept confidential and would be used for research purposes exclusively. Participants took part in the research on a voluntary basis. They were allowed to refuse to participate in the study or to refuse to answer some of the questions. In order to ensure anonymity, each student was given a unique, four-digit code. The questionnaires did not contain any other information through which students could be identified. In order to obtain additional information about students and classes, questionnaires with form teachers were also filled in by a trained interviewer.

### *The (anonymised) data*

Our research design in this project was based on the assumption that ethnic integration, the integration of Roma in Hungary in particular, can be best understood

by investigating the positive as well as negative relations students form with each other over time. The formation and dynamics of social networks in in school settings, however, are strongly interrelated with other aspects of school life such as academic achievement and status competition (Moody, 2001). Hence, data on academic performance, motivation, aspirations, socio-economic status and ethnicity, combined with self-reported social network data, was collected.

The research design, following years of data collection and data management, resulted in a unique dataset that allows us to pose research questions related to the association between individual characteristics and declared or perceived interpersonal relations. The main goal of the project was to analyse ethnic segregation within school classes from a relational point of view. For this reason, particularly detailed data was collected to describe relations among students, as well as different components of ethnic identity. First, the self-declared ethnic identification of the students was recorded by asking students to classify themselves as “Hungarian”, “Roma”, “both Hungarian and Roma”, or “other ethnicity”. Roma students were also asked to indicate to which Roma subgroup they belonged (“Lover”, “Boyash”, “Romungro” or “other”). Second, we collected data about the ethnic classification of peers (by measuring perceived ethnicity with a network roster). Students were provided with a list of all their classmates and asked to nominate the individuals whom they considered to be Roma. Third, teachers were also asked to classify every student in the class as Roma or non-Roma. These data allowed us to compare the different kinds of measurements of ethnicity and their effect on ethnic integration.

This data is unique, furthermore, because not only ethnicity but also positive and negative relations were assessed in different ways. Friendship and negative relations were measured by asking each student to appraise 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’. Everyone judged everyone else in the community along this scale, instead of making lists of their best friends. We also know whom the students respect and dislike, as we asked them: “Who do you look up to?”, “Who do you look down on?” and whom students think their classmates respect or disdain: “Who do your classmates look up to?”, “Who do your classmates look down on?”



Table 1: Distribution of schools and number of school classes in analysis

Name of school	Grammar-school class	Technical-school class	Vocational-school class	Sum
Capital (1)	4	0	0	4
Capital (2)	0	4	3	7
Big town(1)	5	0	0	5
Big town(2)	0	5	5	10
Small town (1)	3	1	0	4
Small town (2)	0	3	3	6
Small town (3)	3	1	3	7
Sum	15	14	14	43

Moreover, we also measured students' perceptions of several of their peers' characteristics. For instance, we asked them whom they considered clever, pretty/handsome, gossipy, charitable, funny, quarrelsome, studious, reserved, and so on. We also collected information about shared activities by asking students with whom they usually go home, have private classes or do sports with, spend their spare time, and study. We inquired into whom they trust, on whom they could count if they needed help, whom they bully, and/or by whom they are being bullied. With regard to questions about students' social networks and opinions about the characteristics of their classmates, pupils were allowed to nominate as many classmates as they wanted to by using an alphabetic roster. On average, 44 different social networks were identified per wave.

The sample contains school classes from three different secondary-education level training programmes in Hungary (Table 1). These programmes have distinct academic criteria and outputs, and have different prestige in society. One school is not necessarily limited to only one programme, and some of them (including a few in our sample) offer classes of different types of training. 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, even though they might offer some academic subjects, mostly focus on vocational training, and do not prepare students for the exams that are given at the end of the secondary studies which are a prerequisite for entering higher education in Hungary.

The four-wave survey started in November 2010 and ended in April 2013. At the beginning,

Table 2: Descriptive statistics for the (anonymised) sample

	wave 1	wave 2	wave 3	wave 4
N of groups	44	44	41	38
N of students	1425	1378	1154	980
N in different types of training				
grammar school	487	483	469	449
technical school	390	374	316	409
vocational school	548	521	369	122
male (%)	38.9	40.0	38.8	40.3
N in self-declared ethnic groups				
Hungarian	800	816	808	689
Roma	172	131	80	40
Roma and Hungarian	136	131	102	62
other	15	22	12	9
mother's highest level education (%)				
less than 8 years	3.2	3.1	2.1	1.1
primary school	18.1	18.9	16.8	14.9
vocational school	19.9	20.3	21.3	20.1
technical school	8.8	8.5	13.6	12.3
grammar school	8.6	10.5	10.9	13.5
BA / BSc	12.8	12.6	13.4	13.5
MA / MSc	4.5	4.8	6.5	7.1
missing	24.1	21.3	15.4	17.5
father's highest level of education (%)				
less than 8 years	2.3	1.7	1.0	0.8
primary school	14.0	14.5	13.0	9.6
vocational school	30.0	32.4	34.5	34.5
technical school	10.9	11.0	13.7	16.8
grammar school	4.0	4.6	5.3	4.7
BA / BSc	6.9	6.2	7.5	6.9
MA / MSc	5.1	4.9	6.3	6.9
missing	26.8	24.7	18.7	19.8
Network statistics for 20 classes with more than 10% of non-Hungarians				
Density (%)				
friendship network	16.2	13.6	12.2	12.1
negative networks	8.0	10.2	10.3	10.9

	wave 1	wave 2	wave 3	wave 4
roma perception network	12.8	17.3	16.8	16.3
Av. N of mutual nominations				
friendship network	71.3	59.5	43.2	41
negative networks	40.6	41.3	39.8	41.3
roma perception network	46.3	49.3	47.8	49.1
Av. N of triads				
friendship network	188.8	88.85	82.9	79.3
combined negative networks	39.4	39.75	40.5	38.6
roma perception network	250.5	311.6	323.6	317.8

*Note: Networks statistics were calculated based on average values within classrooms. The density of the network is the number of ties present in the overall network divided by the overall amount of possible ties. The average number of mutual nominations refers to reciprocation within each network, whereas the average number of triads account for clustering within the networks.*

The total of 1425 students were distributed among 7 secondary schools and 44 school classes in the sample; in total, approximately 1750 students participated in at least one wave of data collection. All students were attending the 9th grade of school during the first period of data collection which means that they had been freshly brought together and barely knew each other at that time. Hence, starting the analyses with the first wave made it possible to examine the development of interethnic attitudes and interpersonal relations from a “neutral” situation.

During the 4 waves, a relatively large number of students dropped out of the sample. While there were 1425 students in the sample for Wave 1, the number was only 980 for Wave 4 (Table 2). Because the dropout rate was largest for the vocational training schools with a high number of Roma students, the ethnic heterogeneity of the sample substantially decreased from Wave 1 to Wave 4. If anyone is interested in interethnic relations within school classes, they should bear in mind that this change in composition makes the third and especially the fourth wave of data collection less useful in such research.

## Conclusion

In this paper we have argued that the empirical investigation of social relations is often a necessary and fruitful element of research into a large variety of social phenomena. Even though the relational approach has existed in theoretical thinking for a long time, its more precise formalisation, as well as empirical application, is relatively recent and unfocused. Hence, we decided to draw up an analytical framework in which the aims of such empirical research can be articulated and analysed.

Our point of departure was the notion of dependence, both in theoretical and empirical terms. Theoretically speaking, dependence arises through the evolution of relations among individuals. Such individuals come to depend up on each other as their attributes are influenced by their relations, relations are selected as a result of the difference (or similarity) in their attributes, and finally, relations evolve as a consequence of other relations within a given context or social group. Once we accept these arguments, we can further reason that interpersonal relations evolve and operate on the meso-level of scientific inquiry, connecting individual attributes or outcomes (e.g. ethnic identification) on the micro-level to outcomes at the group or macro-level (e.g. segregation).

We have argued that the social mechanisms that are responsible for the evolution of these interpersonal relations have long been described theoretically and can be empirically operationalized within the right methodological framework. We referred to ERGMs and SAOMs as theory-driven methodological tools that allow the researcher to acknowledge the lack of independence of observations and model them according to statistical inferences. We showed that, even though these models are very well suited to answering substantive research questions, the interpretation of network evolution processes requires some caution due their endogenous and embedded nature.

Finally, we introduced a longitudinal project conducted by an (anonymised) research group that was carried out in a relational framework and which resulted in a unique and rich data set that has a lot of unexploited potential, and which will be soon publicly available. With this being said, the author of this paper would like to encourage scholars to apply a relational framework in empirical research more often, and to design data collection processes in which individuals and their interpersonal relations are considered equally important.

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