Social Networks 77 (2024) 139–150

Contents lists available at ScienceDirect

Social Networks

journal homepage: www.elsevier.com/locate/socnet

How do youth choose activities? Assessing the relative importance of the micro-selection mechanisms behind adolescent extracurricular activity participation

David R. Schaefer[a,*,1], Thoa V. Khuu[a], J. Ashwin Rambaran[b,d], Deborah Rivas-Drake[b], Adriana J. Umaña-Taylor[c]

[a] University of California, Irvine, United States
[b] University of Michigan, United States
[c] Harvard Graduate School of Education, United States
[d] Utrecht University, The Netherlands

ARTICLE INFO

Keywords:
Race/ethnicity
Homophily
Segregation
Two-mode network
Extracurricular activities
Stochastic actor-oriented model

ABSTRACT

We investigate the network micro-selection mechanisms responsible for patterns of high school student extracurricular activity (ECA) participation, with a particular focus on those that can lead to ethnoracial segregation. We identify six types of mechanisms by which students select into activities (e.g., peer influence, homophily), which we test using a unique longitudinal dataset that combines student surveys with yearbook data on ECA involvement. These contexts represent two ethnoracially diverse U.S. high schools involving 2403 students and over 200 different activities spanning two school years. Using a stochastic actor-oriented model for two-mode networks, we find support for the hypothesized activity selection mechanisms. Follow-up analyses convey the relative importance of different mechanisms and inform our discussion of how ECA participation patterns develop and possible sources of segregation. Whereas selection is driven by mechanisms that include influence from friends and co-participants and similarity to fellow participants, no single overarching mechanism appears strong enough to fully account for ECA segregation

1. Introduction

Social networks are inextricably linked to contexts that support and sustain interactions between individuals (Blau, 1977; Simmel, 1955). Feld used the term *foci* to describe such contexts that “actively bring people together or passively constrain them to interact” (1981:1018). Foci have received sustained attention from network scholars for their roles in stimulating relationships (Kossinets and Watts, 2009; Schaefer et al., 2011), but also constraining which relationships develop by promoting some relationships over others. For example, gender-segregated groups promote gender homophily (McPherson et al., 1987) and ethnoracial diversity in schools shapes the diversity of student friendships (Moody, 2001). More broadly, ecologies with more opportunities to exercise choice in foci membership promote greater clustering (McFarland et al., 2014). These arguments about the homogenizing effects of foci on interpersonal relations are based on the premise that individuals select into foci based on some form of similarity. However, little work has gone beyond documenting that foci have relatively homogeneous memberships to actually test the processes by which this occurs. How strongly do individuals choose activities because current members are similar to themselves, as network ecology theory argues (McFarland et al., 2014), versus through other mechanisms that can also lead to segregated contexts?

The social networks literature offers some guidance as to why individuals may join particular foci. One prominent explanation has been that information passed through social networks leads individuals to particular organizations (Granovetter, 1973). This argument is supported by research finding peer influence on activity involvement among adolescents (Fujimoto et al., 2018) and children (Martin et al., 2013). Indeed, the assumption of network influence is at the core of McPherson’s (2004) ecological argument that organizations are situated in regions of socio-demographic space (i.e., “Blau space”), where they

* Corresponding author.
E-mail address: drschaef@uci.edu (D.R. Schaefer).
1 Department of Sociology, 3151 Social Science Plaza, Irvine, CA 92697.

https://doi.org/10.1016/j.socnet.2021.12.008

Available online 15 January 2022

compete with neighboring organizations for members. People also learn about new activities from within their current activities (Feld, 1981), making activity participation endogenous to itself. Outside of these network processes, people systematically differ in their proclivity and capacity to join activities, and characteristics of an activity can make it more or less attractive to potential members. Hence, multiple forces are likely to be jointly and simultaneously responsible for activity participation patterns.

Our goal is to advance understanding of how individuals choose into their contexts. We conceptualize individual memberships in foci as a two-mode network (e.g., Breiger, 1974) and frame this as a network selection question: how strongly do various micro-mechanisms affect selection into particular activities? Taking advantage of methods developed to model affiliation (i.e., two-mode, actor by event) network structures (Agneessens et al., 2004; Pattison and Robins, 2004; Skvoretz and Faust, 1999; Snijders et al., 2013), we articulate several classes of selection mechanisms. These include structural mechanisms, in the form of univariate network processes (endogenous to the activity network) and multivariate effects of friendship on foci membership, as well as selection mechanisms based on individual and activity attributes.

Our empirical focus is extracurricular activity involvement among high school students. Extracurricular activities (ECAs) allow students to meet in an organized and supervised setting in pursuit of a common interest (e.g., sports, arts). If ECAs attract participants from diverse backgrounds, then the friendships they support can reduce outgroup prejudices. However, as a form of “elective differentiation” ECAs can also promote segregation if students sort themselves based on common backgrounds or identity (McFarland et al., 2014). Studies have shown that ECAs often exhibit ethnoracial segregation that exceeds chance levels (Clotfelter, 2002; Glennie and Stearns, 2012; Schaefer et al., 2018) – understanding why requires better understanding the processes driving ECA membership.

Our study uses novel data, combined with a relatively new and under-utilized method, to offer the first glimpse of the relative importance of various selection mechanisms assumed responsible for adolescent ECA participation choices. We take an exploratory approach that tests several selection mechanisms and then measures their importance relative to one another in shaping overall participation patterns. In particular, we analyze two waves of ECA data from two ethnoracially diverse U.S. high schools with a stochastic actor-oriented model (SAOM) for two-mode (or bipartite) networks (Koskinen and Edling, 2012; Snijders et al., 2013). From the fitted SAOM, we estimated the relative importance of effects in each school (Indlekofer and Brandes, 2013). We discuss the implications of these results for the capacity of different classes of selection mechanisms to contribute to ethnoracial segregation within activities.

2. Background

In investigating the proposed selection mechanisms that give rise to an affiliation network (as described below), we conceptualize student-activity memberships as a two-mode network with students as one mode and ECAs as the second mode. Several advancements contribute to our ability to model two-mode networks. Early work focused on modeling a single network at one time point, with an emphasis on forms of dependence (Skvoretz and Faust, 1999; Pattison and Robins, 2004) and attributes of actors and events (Agneessens et al., 2004). More recent work has turned its attention to modeling change in two-mode networks over time (Koskinen and Edling, 2012), and the co-evolution of one-mode and two-mode networks (e.g., Snijders et al., 2013; Lomi and Stadtfeld, 2014). An example of this, and closely related to our approach, is a study of the co-evolution of friendship and sports participation by Fujimoto et al. (2018). Consistent with this work, we focus on micro-level mechanisms in the form of local actor decisions regarding activity participation that can be modeled over time. We depart from this earlier work by examining a much broader set of activities and evaluating the relative importance of six classes of selection mechanisms that are expected to affect ECA participation, described next. To increase tractability, we make the simplifying assumption that friendships are exogeneous.[2]

2.1. Attribute-based selection mechanisms

2.1.1. Individual attributes

Prior research has found that ECA participation rates tend to differ based on students’ backgrounds (McNeal, 1998; Meier et al., 2018). For instance, White students and students with higher academic achievement are the most likely, and Latinos least likely, to participate in ECAs (Meier et al., 2018; Vandell et al., 2015). Frequent participation in activities is also associated with higher socioeconomic status (Dumais, 2006; Lareau and Weininger, 2008; Covay and Carbonaro, 2010), which could be attributable to cost and logistical constraints (Bennett et al., 2012), cultural repertoires (Lareau, 2011), or resources at the school-level (Glennie and Stearns, 2012). For instance, among Latinos, factors such as nativity, acculturation, and ethnic identity influence their participation in ECAs (Camacho and Fuligni, 2015; Davalos et al., 1999; Lin et al., 2018; Peguero, 2010).

Fig. 1a illustrates how one might capture the effect of individual attributes on activity selection within the two-mode SAOM framework that we use. It shows selection whereby an individual’s attribute affects the likelihood of choosing any activity. This type of effect was suggested by Skvoretz and Faust (1999) and discussed in detail by Agneessens et al. (2004). Using such an effect, Fujimoto et al. (2018) found sports participation rates were lower for Hispanic compared to White students, increased with grade in school, and did not differ between boys and girls.

2.1.2. Activity characteristics

Activity participation rates may also differ based on characteristics of particular activities. Some activities may only allow a fixed number of members, such as student governments with pre-defined roles. Other activities have membership criteria that only a select subset of students can meet. Examples include recommendations and grade-point averages for honor societies and athletic prowess for sports. And, activities have different missions, with goals ranging from community service to providing a forum for more specialized athletic or academic development. These and other characteristics are likely to affect the overall popularity and attractiveness of certain activities within a given school context. This type of selection mechanism was discussed by Agneessens et al. (2004) and is illustrated in Fig. 1b. Fujimoto et al. (2018) analyzed this type of effect and found that sports participation was more likely among students in higher grades, less likely among Hispanic students (compared to non-Hispanics), and did not differ by gender.

2.1.3. Member similarity

Students may also choose activities in order to be around peers who are similar to themselves. There are many possible underlying reasons for this: the explanations behind homophilous friendship preferences extend to groups, including ease of communication, greater trust, reduced risk and uncertainty, and identity reinforcement (McPherson et al., 2001). Moreover, activities with similar others can provide a supportive environment for individuals from marginalized groups with common difficulties or challenges to face (e.g., collective trauma or injustice; Vandell et al., 2015). This mechanism is illustrated in Fig. 1c. This pattern has been referred to as “homosociality” (Koskinen and Edling, 2012), while the process underlying it has been described as “a version of homophily” (Fujimoto et al., 2018). Analyzing such an effect, Fujimoto et al. (2018) found that students were more drawn to sports

[2] Supplementary analyses evaluate the robustness of the results to this assumption (see Online Appendix, Table A1).

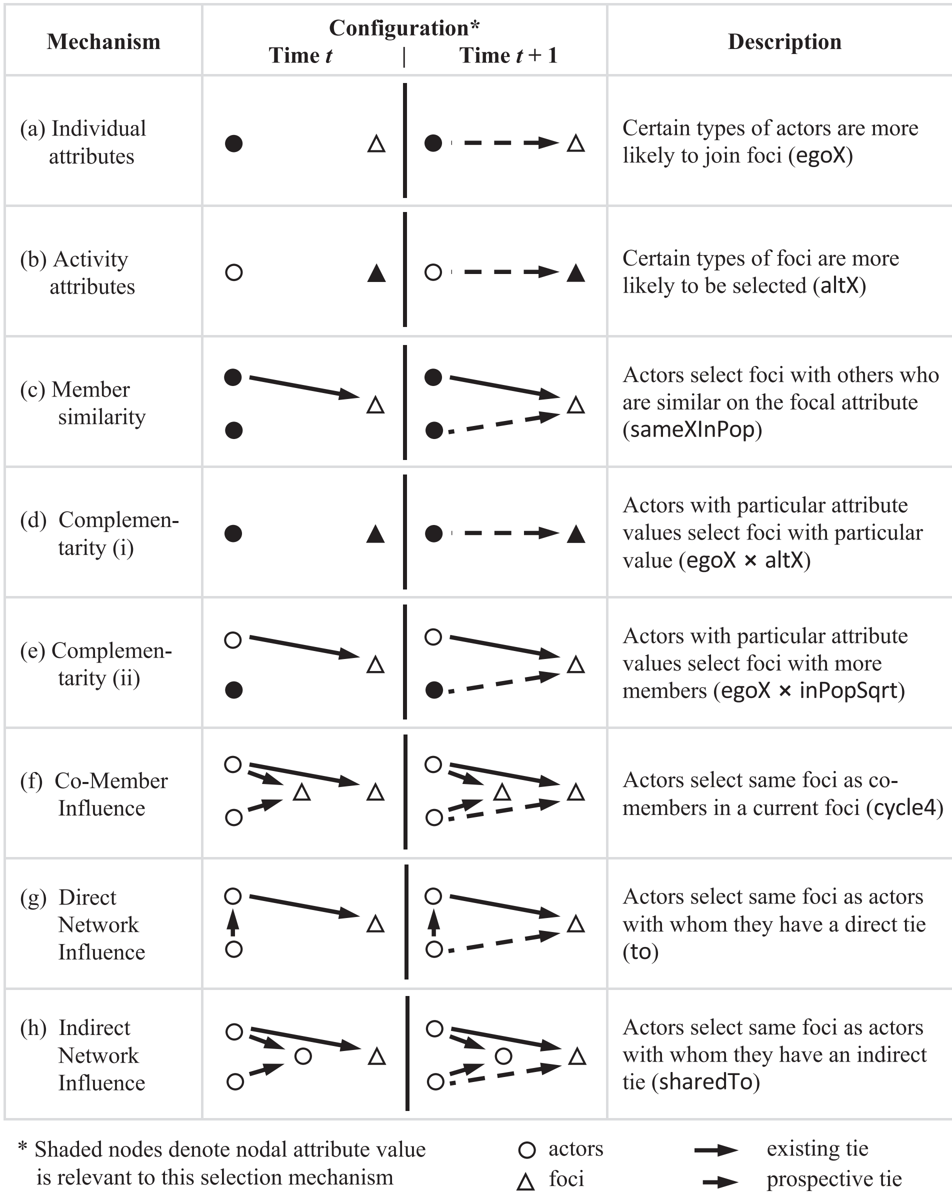

Fig. 1. Select two-mode micro-selection mechanisms.

that had higher numbers of same-sex participants.

2.1.4. *Individual-activity complementarity*

People often join activities because the content of the activity aligns with their intrinsic interests or meets another personal need (Akiva and Horner, 2016; Fredricks et al., 2002). This form of selection is illustrated in Fig. 1d. Agneessens et al. (2004) introduced this effect in a study of theater-going, finding tastes in theater form (conventional or experimental) predicted which type of theater events people attended (see also Agneessens and Roose, 2008). With this form of selection, the person and the foci are each denoted by an attribute that is specific to the nature of their mode (i.e., an individual versus a collective). It is the alignment between a particular attribute of the foci and a particular attribute of the person that drives selection. In the case of ECAs, sports teams are traditionally distinguished between male and female variants. Hence, an interaction between participant gender and type of sport is needed. Additionally, there may be activities that are limited to people who meet certain membership requirements. For instance, some activities may require participants to meet a minimum grade point average (GPA), whereas other activities, like travel sports, may require financial investments that are prohibitive for students from lower socioeconomic status (SES) families. Formal or informal constraints such as these necessitate an interaction between the attribute of the individual student (SES or GPA) and the attribute of the activity (cost or minimum GPA required) when modeling the ECA participation network.

Another example relates to our underlying interest in ethnoracial segregation. Activities play an important role in adolescent identity exploration and development, which is particularly salient for ethnoracial minority youth (Umaña-Taylor et al., 2014). Activities can be characterized as “mainstream” or as having content specific to particular ethnic cultures. According to Ettekal and colleagues, “ethnic cultural features of activities can be overt, such as explicitly teaching about ethnic minority cultural content in the activity, or covert, such as opportunities to explore ethnic minority culture by being around same-ethnic minority individuals or speaking the native language” (2020:398). Many ECAs have an explicit focus either related to race or that can disproportionately attract students of a given ethnoracial background. Examples are a Black or Latino Student Union, or programs such as Advancement Via Individual Determination (AVID) that focus on enhancing educational opportunities for underrepresented groups.

Students may be drawn to such groups as a means to explore or enact their ethnic-racial identity or meet needs that are more prevalent among their group.

Activities can also acquire a racialized identity even without an explicit ethnoracial focus (Bopp et al., 2017). Racialized activities exist when local norms dictate which activities are appropriate for given ethnoracial groups. For example, Dhingra (2020) explains how academic activities, spelling bees in particular, have become intertwined with Asian culture. As such, youth, parents, and teachers view academic enrichment activities as places for Asian students, rather than sports and other non-academic activities. Racialized activity norms compel individuals from the relevant background to participate and discourage individuals from other backgrounds from joining (Goldsmith, 2003). Atypical students who do participate can face hostility and microaggressions and fail to develop a sense of relatedness or belonging, either of which can dissuade participation (Carter Andrews et al., 2019; McReady, 2001; Torres, 2018). Thus, students' selection into activities can also be informed by a pre-existing racialization of activities.

Complementarity may also be based on an activity's structural position. For instance, people may systematically differ in whether they prefer larger or smaller activities. Fig. 1e represents an individual with a given attribute selecting an activity based on how many others have joined that same activity (i.e., the *indegree* of the activity). Agneessens and Roose (2008) found such an effect whereby theatergoers with experimental tastes chose theaters with larger audiences, resulting in segregation on audience tastes. We do not hypothesize that ethnoracial groups necessarily differ in the size of ECAs they prefer. Rather, we posit that such an effect is plausible and thus an important possibility to consider (with consequences for segregation).

2.2. Network-based selection mechanisms

2.2.1. Influence

2.2.1.1. Co-members. Activity participants may provide each other information about another activity that increases their chances of joining their co-member's activity. Feld described how "ties associated with one focus may serve as links in a chain between individuals associated with other foci" (1981:1021). Similarly, McPherson's ecological theory (1983; 2004) argues that individuals are more likely to belong to multiple entities with overlapping Blau space niches. However, to the extent that membership capacity is limited (e.g., time, resources) multiple comemberships become less likely (Mark, 1998). This form of selection was discussed by Pattison and Robins (2004) and is represented by the *four-cycle* effect and illustrated in Fig. 1f. Evidence for its operation has been found for employment preferences (Snijders et al., 2013), theater attendance (Agneessens and Roose, 2008), and boards of directors (Koskinen and Edling, 2012). However, Fujimoto et al. (2018) found no evidence of such four-cycles in their study of sports participation. When interpreting this effect, it is important to keep in mind that, in addition to peer influence, this pattern could arise due to individuals with unobserved shared attributes choosing the same activities (Snijders et al., 2013).

2.2.1.2. Direct network influence. As with many behaviors, friend influence can be an important source of change. Among adolescents, friends in an activity are one of the key reasons they join and maintain their participation (Fredricks et al., 2002). Adolescents recruit their friends to activities (Loder and Hirsch, 2003) and tend to join and leave activities in tandem (Simpkins et al., 2012). Such peer-network influences begins as early as preschool (Martin et al., 2013) and continues through high school (Fujimoto et al., 2018). The two-mode version of influence on activity participation is illustrated in Fig. 1g. Snijders et al. (2013) introduced this effect, finding that MBA students tended to prefer the same employers as the peers whom they sought for advice. Lomi and Stadtfeld (2014) refer to this as "association-based" closure and find evidence of its operation on music preferences. Other research used this effect to clarify peer influence on patterns of religious attitudes and behaviors (i.e., "religious mosaics"; Adams et al., 2020). Most pertinent, Fujimoto et al. (2018) found that friends tended to join the same sports in high school.

2.2.1.3. Indirect network influence. People are also influenced by others who are part of their broader friendship circles, outside their direct friends. For instance, Kreager and Haynie (2011) found that adolescent alcohol use was influenced by the drinking behavior of their dating partners' friends. Indirect connections through one's friends can provide additional exposure or information about an activity. In addition, indirect friends share some degree of equivalence, which may allow for imitation or legitimization of activity participation to occur (Borgatti and Everett, 1992). Thus, we expect that individuals will be more likely to join the activities that their friends' friends have already joined. This form of selection is depicted in Fig. 1h and, to our knowledge, has not been investigated within two-mode networks.

2.2.2. Structural controls

As with one-mode networks, there are a host of structural network processes that should be considered when modeling two-mode networks, even if they are not of substantive interest. For instance, some people are "joiners," which will result in a higher outdegree for these particular individuals in an ECA participation network. And, phenomena such as the "Matthew Effect" can operate for activity participation, with activities disproportionately attracting new members because many people already participate in them. With multiple networks, there is also the potential for cross-network dependencies beyond the influence mechanisms described above. For example, more sociable or popular students within a friendship network may be more likely to join activities as a way to maintain their visibility (or status) and friendships. Such cross-network dependencies have been discussed in-depth elsewhere (Snijders et al., 2013; Pattison and Robins, 2004).

2.3. Current study

We test how strongly the aforementioned selection mechanisms drive high school student extracurricular activity participation. This is an important context because as youths' attention shifts away from family, school and peers take on added import in shaping their individual development (Rubin et al., 2006). Adolescents have limited freedom in choosing many aspects of their environment, such as neighborhoods, schools, and classrooms (Parke et al., 2003). A notable exception is school-based extracurricular activities, where adolescents have flexibility in pursuing those activities they find engaging or rewarding. Such agency is necessary to test our hypothesized selection mechanisms. We are particularly interested in selection decisions that have the potential to create ethnoracial segregation. Unlike other dimensions where segregation is imposed by school organizational factors (e.g., gender, academic achievement), ECA membership is not predicated upon race/ethnicity. Almost without exception, ECAs are open to students of any ethnoracial background (though there may be indirect constraints via membership requirements). The open and elective nature of ECAs means they have the potential for diverse memberships that can improve intergroup contact attitudes and reduce prejudice among participants (Allport, 1954).

3. Methods

3.1. Sample

Data for the current study were drawn from the Teen Identity Development and Education Study (TIDES), a larger project focused on the role of adolescents' peer networks in ethnic-racial identity development and psychosocial functioning. Survey data were collected from the entire student body of two ethnically/racially diverse high schools (9–12th grade) at three waves over a 12-month period (separated by approximately 6-month intervals: Spring 2017, Fall 2017, and Spring 2018). Extracurricular activity (ECA) data were collected from school yearbooks released each spring. The schools were located in a mid-sized suburban area of the Midwestern U.S. (MW) and a large suburban area of the Southwestern U.S. (SW) that served about an equal number of students from suburban and urban areas, respectively. Wave 1 response rates were 74% (MW) and 88% (SW). Of the 1242 Midwest and 2297 Southwest students who were on the school roster at Wave 1, we excluded from the analytic sample the students who left the school due to graduation (i.e., the 12th-grade cohort) or moved to another school. The final sample consists of 886 Midwest students and 1517 Southwest students. We present descriptive information on the sample in Table 1.

3.2. Procedure

Two weeks prior to survey administration, opt-out consent forms in English and Spanish were delivered to each school and distributed by teachers. This letter explained to parents that their child's participation in the study was voluntary and that they could refuse to have their child participate at any time before or during survey administration. Teachers were instructed to retain any completed opt-out forms that were returned by students. These forms were collected by the research team on the day of survey administration (i.e., during data collection). The research team distributed paper-and-pencil surveys in envelopes to teachers (a day before the data collection), and after providing assent, students completed the 45 min survey and returned them in sealed envelopes. Yearbooks were obtained from each school at the end of each academic year. The study was approved by Institutional Review Boards at the University of Michigan, Harvard University, and the University of California, Irvine.

Table 1
Descriptive statistics for students and extracurricular activities.

	Midwest	Southwest
Student Characteristics		
SES (college-educated)	71%	51%
Mean GPA	3.1	2.7
Gender (girl)	46%	53%
Ethnoracial Background		
Latino/a	7%	26%
Black	22%	27%
Asian	25%	4%
White	43%	36%
Other Minority	4%	6%
Mean memberships (W1)	1.65	0.89
Mean memberships (W2)	1.84	1.01
At least one membership (W1)	75%	54%
At least one membership (W2)	74%	54%
Total students	886	1517
ECA Characteristics		
Activity Type		
Sports/Athletics	39%	39%
Service/Activism	6%	7%
Leadership/Honor	9%	9%
Arts/Performance	13%	17%
Special Interest	33%	28%
Ethnoracial focus	8%	8%
Gender-Designation		
Girl	23%	21%
Boy	17%	17%
Mean members (W1)	11.5	13.3
Mean members (W2)	12.7	15.0
Jaccard index[a]	.27	.25
Total activities	127	102

[a] Jaccard index is calculated as the proportion of ties (memberships) observed at either time point that are present at both time points. Greater values indicate more stability in memberships.

3.3. Measures

3.3.1. Activity participation

Each school provided a copy of its annual yearbook for the two survey years. Yearbooks are mementos that commemorate the past school year. Their contents include photos of every student and teacher, pictures and recaps of notable school events, and chronicles of ECA-based activities during the school year (e.g., sports, clubs). Important for our study purposes is that yearbooks traditionally include a group photo of each school-sponsored ECA, along with a caption listing participant names. The research team reviewed the obtained yearbooks and identified all ECA group member photos. Activity participation was coded by matching the list of student participants accompanying each photo to those listed on the official school roster, and later matched to the survey. For a given activity, the procedure was as follows: in a first step, the participant list was coded independently by either one or two coders; in a second step, two coders worked together to verify that the students coded as participants in each activity matched the list in the yearbook. Third, participant lists were matched to the school roster. In some cases, a name in the participant list did not exactly match a name on the roster (e.g., due to either a typo or a nickname in the activity list). In such cases, the student's picture in the group photo was compared to the individual yearbook headshots of probable matches to verify the student's correct identity.[3]

A total of 127 ECAs were enumerated in the Midwest school and 102 in the Southwest school (81 and 78, respectively, were present both years). We created two-mode ECA networks for each school and year. A tie was coded as 1 = present from student i to activity j if i was listed as a participant in activity j; otherwise student-ECA dyads were coded 0. Memberships in ECAs that did not exist in one of the two years were coded as structural zeros (i.e., "10″").[4] There was no known missing student data in the ECA network given our archival design.

3.3.2. Friendships

At each observation wave, study participants were asked to nominate up to ten of their closest friends in their school. Networks consisting of directed friendship nominations were constructed for each school (1 = present, 0 = absent). In these friendship networks, the focal student (ego i) sends a directed friendship nomination to the target network member (alter j). Our primary analysis uses only the Wave 1 friendship networks.[5] Missing friendship data was relatively low: 144 (16%) of students in the Midwest school and 132 (9%) of students in the Southwest school had missing outgoing friendship nominations and were coded as "NA" (regular missing).

3.3.3. Demographic and control variables

Gender was coded 1 = girl, 0 = boy. Grade was included as a categorical variable (9, 10, and 11). Socioeconomic status (SES) was based on either parents' highest obtained educational level, coded 1 = at least

[3] This was not always possible as the order of students in the photo occasionally differed from the list of names (e.g., alphabetical), and some listed members were not present in the photo.

[4] The absence of an ECA in a particular year would occur if the ECA did not exist that year as an official school-sponsored activity or, in the case of an ECA that truly existed, there were problems with the group photo or assembling the yearbook.

[5] To check the robustness of our results to assuming an exogenous friendship network, we estimated additional models that introduced friendship network data from Wave 3 (one year after Wave 1) and allowed the friendship network to change endogenously (i.e., friendship networks co-evolved with the activity networks to model the effect of activity participation on friendship development). These results offer substantively similar conclusions (see Online Appendix, Table A1).

one parent graduated from four years of college (high SES), 0 = otherwise (low SES). Academic achievement (GPA) was coded on a 4-point scale (e.g., 1 = *Less than C average*, 4 = *A average*) based on self-reported grades. Rates of missingness for individual attributes are low (0–6%) with the exception of academic achievement which was reported in Wave 2 retrospectively for the past year (24% missing in Midwest and 29% missing in Southwest).

Using school descriptions and expert consultation, the research team coded activities along several dimensions to serve as covariates (see Table 1). Consistent with research on youth extracurricular activities (Eccles and Barber, 1999), we assigned activities into five overarching types: sports/athletic (e.g., basketball), community service/activism (e.g., Gay Straight Alliance), leadership/honors society (e.g., National Honors Society), art/performance (e.g., choir), and special interest (e.g., Robotics).[6] We identified the activities that were gender-specific (e.g., girls' softball and boys' baseball). We also differentiated activities in terms of whether or not they had an ethnoracial focus (e.g., Black Student Union, Chinese Club). In both schools, 8% of activities were given such a designation. We later used this information to calculate the alignment between each activity and each student's ethnoracial background (Asian, Latino/a, Black, Other Minority, and White) as shown in Fig. 1d. A dyadic covariate coded student-activity pairs as 1 = matching when the explicit focus of the activity aligned with the student's ethnoracial background (*ethnocultural alignment*).

3.4. Analytical strategy

Analyses use a stochastic actor-oriented model (SAOM) implemented in the Simulation Investigation for Empirical Network Analysis software package (RSiena version 1.2–23; Ripley et al., 2020). Estimation is driven by an actor-oriented simulation algorithm (Snijders, 2001). Key modeling assumptions are that 1) change in the activity network between the two observed time points is the result of a continuous-time process; 2) within this process only one membership tie may change at any given time (i.e., "microstep"); and, 3) students "control" their membership ties (Snijders et al., 2010). In a given microstep, one student is chosen at random and allowed to make one change to their outgoing network ties (i.e., join an activity, quit an activity, or keep their activities unchanged). Student's choices are based on the state of the ECA network at the time of their decision-making, including the memberships of friends, their own attributes, and activity characteristics. The timing/frequency and the choice of membership changes are represented by a rate function (indicating the average number of membership change opportunities) and a network selection (evaluation) function, respectively. We use the network selection function to test the mechanisms that are hypothesized to drive changes in the ECA membership network.

Our main focus is to model change in the ECA membership network while treating the friendship network as an exogenous predictor. We used the methodology proposed by Snijders and Steglich (2015) to fix the friendship network at its Wave 1 observation.[7] Because the contexts and demographic compositions of the two schools are distinct, we conducted separate but parallel analyses for each school, with identical model specifications. Convergence statistics for final models adhered to the standard criteria for convergence: all individual model parameters had t ratios < 0.10; overall maximum convergence ratio < 0.25 (Ripley et al., 2020).

Model specification included an *outdegree* effect, which controlled for the overall membership probability (the formula defining each italicized "shortname" is available in Ripley et al., 2020). To account for the role of attributes in ECA choices, we include *egoX* effects (Fig. 1a) to represent differences in membership rates based on student background (i.e., their gender, grade level, GPA, SES, race/ethnicity) and *altX* effects for ECA attributes (Fig. 1b) to represent differential membership rates (i.e., based on type and gender-specificity). We included two interaction terms to account for students being unlikely to join activities designated for the opposite gender. This is expressed through girl *egoX* × boy-specific activity *altX* and boy *egoX* × girl-specific activity *altX* interactions.[8] Finally, to test for the effect of member similarity we use the *sameXinPop* term (Fig. 1c) for each student-level attribute. For a student considering a particular activity, this effect counts the number of members in an activity who match the student on a given attribute.

Univariate network effects represent how membership ties are affected by a student's current number of ECA memberships (*outActSqrt*), the number of students in a prospective activity (*inPopSqrt*), and the association between student's activity volume and the size of activities they join (*outInAss*). Other structural mechanisms may operate across networks, for instance from friendship to ECA, and are represented with suitable cross-network terms. These include the extent to which choices are affected by a student's volume of incoming (*inActIntn*) and outgoing (*outActIntn*) friendship ties.

The univariate network effect for co-member influence (Fig. 1f) was specified with the four-cycle (*cycle4*) effect. Multivariate network effects of friend influence were specified using the *to* effect (Fig. 1g) for direct friendships and the *sharedTo* effect (Fig. 1h) for friendships at geodesic distance 2 (indirect connections through at least one intermediary). For the complementarity effect in Fig. 1d, we constructed a two-mode network that indicated alignment (1 = yes, 0 = no) for each student by activity combination and included it with a dyadic covariate (*X* effect). Given our interest in ethnoracial segregation, we calculated interactions between ethnoracial background (*egoX*) and the square-root of the indegree of each activity (*inPopSqrt*) to represent complementarity based on ECA size (Fig. 1e).

After model estimation was complete, we calculated the relative importance (RI) of each of the six hypothesized selection mechanisms. We follow the procedure outlined in Indlekofer and Brandes (2013), which estimates the importance of each included effect based on how much ECA choices would have differed if an effect were to be omitted. This is accomplished by calculating the probability of all possible membership changes from each student's perspective using the fitted model parameters, then sequentially setting each parameter to 0 and recalculating membership probabilities. The magnitude of the difference in the distribution of membership probabilities with an effect present versus absent is a sign of that particular effect's influence on students' ECA choices. Calculated differences across effects are scaled to sum to 1 within each student, then averaged across students. We use the *sienaRI* function implemented in RSiena, which we applied to a one-mode reformulation of our data that combined the friendship and ECA

[6] The categories of "sport," "arts," and "community service" align directly with Eccles and Barber (1999). Given the nature of activities in the observed schools, we depart from their coding by restricting their "school involvement" category to school leadership activities, and by expanding "academic clubs" to include activities that appealed to a specific academic or other interest.

[7] To estimate direct or indirect influence from friends, RSiena requires that the friendship network be endogenous. We navigated this constraint by using the Wave 1 network as both the time 1 and time 2 networks in our model. We made a small change to the existing friendship network – by adding and dropping one tie at random – such that the simulation algorithm in RSiena would recognize the network as endogenous (see Snijders and Steglich, 2015).

[8] We could have used structural zeros to constrain the model to prohibit girls from joining boys' activities and vice versa. However, though rare, there were enough instances of such memberships that we chose to allow the model to estimate their likelihood. We ended up fixing three of the four effects prohibiting these memberships at −5 due to convergence difficulties during estimation (arising because they are so rare).

networks.[9]

4. Results

4.1. Descriptives

Descriptive information on activities and memberships is presented in Table 1. In the Midwest school, a greater proportion of students participated in activities (74–75% in Midwest versus 54% in Southwest), and students participated in nearly twice as many activities, on average, compared to the Southwest school (1.65–1.84 in Midwest versus .89–1.01 in Southwest). Given that family SES is positively associated with activity participation (Meier et al., 2018), these differences may have been due to the Midwest school having a higher SES student body (college-educated parent: MW=71%, SW=51%).

We also calculated statistics representing important notions of overlap for ECAs and Wave 1 friendships. In the Midwest school, 74.6% of ECAs had at least one member who belonged to another activity; in the Southwest school this rate was somewhat lower at 53.9%. On average, students in the Midwest school had .77 and .80 friends as a co-member in each activity at the two waves respectively, while students in the Southwest school had .86 and .66 friends as a co-member in each activity.

4.2. SAOM estimates

4.2.1. Student characteristics

We begin by reporting how student attributes affected the likelihood of participating in activities, net of other model effects. All model estimates are reported in Table 2. In both schools, girls and students from higher SES backgrounds were more likely to join activities compared to boys and students from lower SES backgrounds. In addition, Black and Latino/a students joined fewer activities, relative to White students. In the Southwest school only, students with higher GPA were more likely to participate in activities than students with lower GPA.

4.2.2. ECA characteristics

Turning to effects of ECA characteristics, we find that boy-specific activities were more likely to be chosen by students (i.e., attracted more members) than gender-neutral activities in both schools, while there was no difference in attractiveness between girl-specific and gender-neutral activities. The popularity of various types of ECAs differed between the two schools. In the Midwest school, marginally significant effects suggest activities related to sports and art attracted fewer members than special interest activities, whereas activities related to leadership attracted more members (all *ps* < 0.10). By contrast, in the Southwest school, sports, leadership, and art activities were all significantly more attractive than special interest activities. Community service activities showed no difference from special interest activities in terms of their attractiveness in both schools.

[9] The *sienaRI* function is not compatible with a two-mode network object. Hence, for the *M* students and *N* ECAs in a school, we reformulated each wave's *M* x *M* friendship network and *M* x *N* ECA network into a $M + N$ x $M + N$ one-mode network (note, this is *not* a one-mode projection). We used structural zeros to exclude from analysis ties from students to students, ECAs to students, and from ECAs to ECAs, leaving the model to only consider ties from students to ECAs. Attributes were specified using vectors of length $M + N$, with 'NA' used to represent non-sensical scores (i.e., the vector for grade level included the *M* valid student scores followed by *N* 'NA' scores). Effects based on the friendship network were re-specified as *ego* or *alter* covariates (e.g., representing indegree and outdegree) or as dyadic covariates (e.g., number of friends in an activity) using the Wave 1 data. Because the *sienaRI* function does not accommodate interaction effects, interactions between student and ECA attributes were respecified as dyadic covariates.

Table 2
Estimates from stochastic actor-oriented model of students choosing ECAs.

	Midwest Est.	*SE*	Southwest Est.	*SE*
Student Characteristics				
Higher SES (Ref. lower SES)	.281*	.136	.530***	.125
GPA	.036	.067	.284***	.080
Girl (Ref. Boy)	.313**	.099	.419**	.136
Ethnoracial Background (Ref. White)				
Latino/a	−1.143*	.453	−0.914*	.361
Black	−0.611*	.239	−1.593***	.357
Asian	.244	.226	−0.345	.520
Other	−0.668†	.400	−0.081	.635
ECA Characteristics				
Gender (Ref. gender-neutral)				
Girl-specific	.161	.184	−0.225	.154
Boy-specific	.595**	.191	.715**	.224
Type (Ref. special interest)				
Sports	−0.296†	.170	.548**	.176
Community service	.219	.149	.270	.165
Leadership	.289†	.153	1.096***	.138
Arts	−0.259†	.153	.985***	.146
Member Similarity				
SES	−0.002	.004	−0.012	.008
GPA	.027***	.006	.021†	.013
Gender	−0.003	.009	.012	.009
Ethnoracial background	.029***	.007	.035***	.010
Grade cohort	.006	.004	.027***	.007
Complementarity				
Ethnocultural alignment	.903***	.169	.463	.292
Latino/a ego × indegree-popularity (√)	.261**	.080	.213*	.087
Black ego × indegree-popularity (√)	.192***	.052	.377***	.082
Asian ego × indegree-popularity (√)	−0.046	.046	.167	.121
Other ego × indegree-popularity (√)	.212**	.081	.012	.161
Influence				
Co-member	.053***	.014	.093***	.019
Friend (direct)	1.351***	.110	2.252***	.127
Friend (indirect)	−0.104***	.029	−0.312***	.033
Essential Effects & Structural Controls				
Rate	3.081	.126	2.47	.098
Outdegree	−3.062***	.440	−5.592***	.524
Boy ego × Girl-specific ECA	-5	–	-5	–
Girl ego × Boy-specific ECA	−2.748***	.500	-5	–
Indegree-popularity (√)	−0.091	.108	−0.135	.137
Outdegree-activity (√)	.165	.231	1.397***	.297
Outdegree-indegree assortativity (√)	−0.035	.050	−0.196**	.069
Friendship indegree activity (√)	.302***	.051	.201***	.058
Friendship outdegree activity (√)	−0.267***	.053	−0.363***	.059

† $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$ (two-tailed tests).

4.2.3. Member similarity

In both schools, students were more likely to join those activities with more members who shared their ethnoracial background, had similar academic performance, and, in the Southwest school, were in their grade cohort. In the Midwest school, each additional activity member of the same ethnoracial background increased a student's odds of selecting the activity by 1.029 (exp[.029]), or 2.9%, all else being equal. The estimate for the Southwest school equates to odds that are 3.6% (exp[.035]) greater. Each additional member with the same GPA status increased a student's odds of joining the activity by 2.7% (exp[.027]) in the Midwest and 2.1% (exp[.021]) in the Southwest school ($p < .10$). In the Southwest school, each additional member in one's grade cohort increased a student's odds of joining the activity by 2.7% (exp[.027]). We observed no tendencies for students to choose activities based on the number of participants with similar SES or gender, controlling for everything else in the model.

4.2.4. Complementarity

Alignment between student ethnoracial background and activity content significantly predicted activity membership in the Midwest school but not in the Southwest school. Odds of joining an activity in the Midwest school were 2.5 (exp[.903]) times greater if an activity matched one's ethnoracial background.

In both schools, we found several significant interactions between student ethnoracial background and activity size. To help interpret these joint effects, we present the predicted contributions to the selection function based on ethnoracial background and activity size in Fig. 2. Here, the y-axis refers to how a given combination of a student's ethnoracial background and the activity size contributed to the likelihood of membership, all else being equal. The ethnoracial pattern is largely consistent across schools, with White students more likely to join smaller activities, and less likely to join larger activities, relative to most of the ethnic minority groups. Exceptions are Asian students in the Midwest school and students classified as "Other" in the Southwest school, who both followed the same pattern as White students. Hence, we see that students were drawn to activities of different sizes and that this depended, in part, on their ethnoracial backgrounds.

4.2.5. *Influence*

When considering a prospective activity, students in both schools were more likely to join or remain in an activity if a co-member from another activity already participated in that same activity. We interpret this as an indication of co-member influence. The odds of participation were 1.05 (exp[.053]) times greater in the Midwest school and 1.10 (exp [.093]) times greater in the Southwest school for each current co-member in the prospective activity.

We also found that students who were friends were more likely to participate in the same activities together relative to students who were not friends, which is indicative of influence of direct friends. Students were 3.9 (exp[1.351]) times more likely in the Midwest school and 9.5 (exp[2.252]) times more likely in the Southwest school to participate in an activity for each friend who already participated in that same activity.

In contrast to this direct friend influence effect, having a friend at distance two (to whom students were indirectly tied to via a friend) decreased the likelihood of participating in an activity, in both schools, an indication of the absence of influence of indirect friends. Students were 0.9 (exp[−.104]) times as likely and 0.7 (exp[−.312]) times as likely in the Midwest school and Southwest school, respectively, to participate in an activity for each indirect friend who participated in that activity. This effect is counterintuitive, but may be a result of students being less likely to participate in an activity with an indirect friend unless their shared friend also participated in the activity.[10]

4.2.6. *Essential effects and structural controls*

The positive friendship indegree activity effect in both schools indicates that students who were named as friends more often by schoolmates were more likely to join activities. The friendship outdegree activity effect is negative in both schools. This indicates that students who named more friends were less likely to join activities, net of other model effects. In combination with the direct friend influence effect, these results suggest that naming more friends led students to participate in fewer activities, unless friends belonged to ECAs, in which case friends exerted influence on a student to also participate in that activity.

In the Southwest school, the outdegree-activity and outdegree-indegree assortativity effects were both significant. The former effect, which is positive, implies a tendency for students engaged in more activities to have a higher likelihood of future ECA participation. The negative valence of the latter effect suggests that, on average, students who joined more activities preferred smaller activities, while students who joined fewer activities chose larger activities.

4.3. *Relative importance*

We now turn to our analysis of the relative importance (RI) of these selection mechanisms for ECA participation. Table 3 presents the RI percentage scores calculated for each effect in our estimated SAOMs. In both schools, the greatest RI coincided with the outdegree effect, which controls for the overall density of the networks (MW = 19.2% and SW = 17.6%). This effect is not of theoretical interest and its magnitude obscures comparisons of other effects, hence we rescaled RI scores excluding the outdegree effect. We also excluded the effects restricting membership in gender-specific ECAs since these reflected organizational constraints, not student choices, and three of the four effects had arbitrarily fixed parameter values (RI scores: MW = 8.5% and SW = 3.5%).

Fig. 3 presents the rescaled RI scores for the 6 classes of effects of substantive interest. We find that the largest RI scores in each school were associated with the effects of structural controls (MW = 29.7% and SW = 41.1%). This conveys the importance of these effects, which serve to preserve the observed degree distributions (i.e., number of memberships per student and number of members per ECA) and the correlations between friendship degree and ECA participation rate, as reflected in the overall network structure.

The relative importance of student and ECA characteristics were fairly similar in size, ranging from 14% to 18% each across schools. These were on par with the effect of influence from (direct and indirect) friends and co-members (MW = 17.8% and SW = 12.4%), and slightly greater than the effects of member similarity (MW = 12.8% and SW = 12.3%). The smallest RI scores were associated with complementarity, which reflected ECA's appeal to particular ethnoracial groups (MW = 8% and SW = 6.6%). Follow-up models that permitted friendship to be endogenous produced similar patterns of RI across effect classes, with the exception that the RI of ECA characteristics decreased approximately by half to levels similar to complementarity, with the structural effects absorbing the bulk of the relative increase in importance (see Online Appendix, Table A2).

Returning to Table 3, we gain additional insight by examining the relative importance of effects within each effect class. We comment on those patterns that were fairly consistent across schools and our robustness check. We see that SES was among the strongest individual determinants of ECA participation relative to other student attributes. Considering the effects of member similarity, ethnoracial background was clearly most influential, while SES and gender similarity, which were not significant in the SAOM, had quite low RI scores. However, the RI of gender similarity imposed by gender-specific activities was comparable to the RI for ethnoracial similarity in the Southwest school (3.5% vs. 2.8%, respectively), and twice as large in the Midwest school (8.5% vs. 4.1%). Direct friend influence was consistently more important than influence from indirect friends (at distance two) or co-members.

5. Discussion

Our goal was to better understand the selection mechanisms behind patterns of membership in extracurricular activities. For students, these are common, developmentally-salient contexts that they can freely select into as a means to pursue their goals (Fujimoto et al., 2018). For network scholars, these are an example of "elective differentiation," with consequences for group development, hierarchy, and segregation (McFarland et al., 2014) that complement embeddedness in contexts such as neighborhoods, schools, and classrooms. We identified six

[10] As the basis for this inference, we estimated a model that included the indirect friend influence effect but omitted the effect measuring direct friend influence. The effect of indirect friend influence was positive and statistically significant, suggesting an overall tendency to join activities with indirect friends. The valence of this effect became negative with the introduction of direct friend influence to the model, which leads us to conclude that students were more likely to join activities with their friends' friends, but only when their common friend was also a member (and unlikely to join when that common friend did not belong).

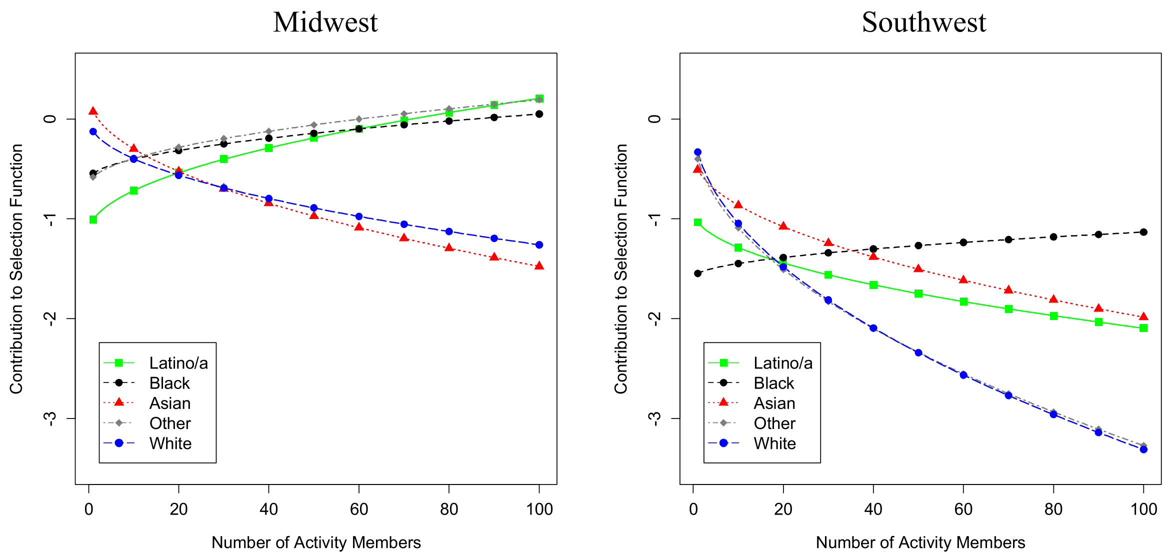

Fig. 2. Predicted contribution to the network function. Predictions considered the ethnoracial ego and ego × indegree-popularity interaction effects, indegree-popularity (√), and outdegree-indegree assortativity (√) effects (8 effects total). Higher predicted contributions to the selection function correspond to the greater likelihood of a membership tie.

classes of selection mechanisms based on different combinations of student background, ECA characteristics, friendship patterns, and participation in other ECAs. While we found support for the majority of the hypothesized mechanisms, it is the analysis of relative importance that answers our ultimate question of how much each of these mechanisms shape ECA participation choices.

5.1. Summary of key mechanisms

Ideally, we would compare our results to prior studies as a way to offer contextualization. However, few studies have modeled ECA choices, in particular, or used scores of relative importance (RI) to compare selection mechanisms in any type of network. Nonetheless, we will make what comparisons we can in an attempt to draw more general conclusions where possible and offer direction for future study. Because RI scores will change based on model specification, this exercise is worthwhile only to the extent that models are well-specified.

To begin, as in several studies of one-mode networks (e.g., friendship, collaboration), we found that the density effect consistently had the greatest RI, with structural effects occasionally equivalent in magnitude (e.g., Indlekofer and Brandes, 2013; Palacios et al., 2019; Rambaran et al., 2020; Stark et al., 2020). This reinforces the essential nature of these types of effects for being able to represent evolving network structures.

5.1.1. Influence

Our SAOMs offered evidence of the influence of friends and co-members on ECA choices, which is consistent with prior research finding that adolescent behaviors are shaped by their peers (Henneberger et al., 2021; Prinstein and Dodge, 2008). However, our results depart from a similar study of ECA network evolution (Fujimoto et al., 2018) that found influence only from friends, not co-members. It should be noted that their study examined 16 different “sports” activities and did not differentiate between participation on teams at different levels (e.g., varsity versus freshman) or gender-specific teams within the same sport. Our focus on ECA data from school yearbooks allowed for a much more fine-grained analysis, as well as provided information on a wider range of activity types. The additional effect of co-membership in our analysis compared to Fujimoto et al.’s analysis could have been due to co-member influence linking sports to other activity types (e.g., teammates joining the same academic club). This contrast in findings also raises the question of whether there are dependencies within and between activities of different types worth considering in greater detail. For instance, high school sports have designated seasons, with those in the same season competing for players from the same pool of students. The outcome of such competition and capacity for co-member influence depend on how readily students can belong to multiple activities at the same time (McPherson, 2004). We would expect co-member influence to be weaker for activities that place greater constraints on activity participation, such as time requirements (Mark, 1998) or overlapping meeting times. There may also be complementarities between groups based on the emphasis given to competition versus socializing (Simmel, 1955:156). In this vein, we expect that sports and other activities that emphasize internal competition will be more likely to share membership overlap with activities that bring people together (e.g., community service or special interest activities). More detailed data on ECA mission, culture, and internal activities would allow for such investigations.

Comparing the two sources of peer-network influences, (direct and indirect) friends were a more potent referent than co-members (whose RI scores were ~ 1/10th the magnitude of friend influence). We are not aware of prior studies that used RI scores to compare peer influence with other predictors of adolescent behavior. However, one reference point is Block and Heyes’ (2020) study of emotional contagion, which found that 14–23% of mood change was attributable to influence processes. This is slightly greater than our observed range of 10–13% (before rescaling, Table 3). It is interesting to also consider these results in light of Fujimoto and colleagues’ (2018) decomposition of the association between friendship and ECA co-participation. They found that more than half of the overlap between friendships and sports co-participation was due to friend influence (compared to all other predictors of sports participation and effects of co-participation on friendship). A tentative inference across studies is that when friends participate in activities together, their friendship likely contributed to them choosing the same activity (versus the friendship developing in the activity); however, friendships play a relatively small role in determining which activities adolescents ultimately select.

5.1.2. Complementarity

Complementarity effects were significant, indicating students were more drawn to activities that aligned with their ethnoracial background. We found complementarity based on activity size in both schools, with complementarity based on ethnoracial content only in the Midwest

Table 3
Relative importance scores for all effects and effect classes.

		Effect MW	Effect SW	Effect Class MW	Effect Class SW
Density & Constraints	Outdegree	19.2%	17.6%	27.7%	21.1%
	Boy ego × Girl-specific ECA	4.6%	1.0%		
	Girl ego × Boy-specific ECA	3.9%	2.5%		
Student Characteristics	SES	3.0%	2.2%	9.2%	10.5%
	GPA	.3%	1.3%		
	Gender	2.2%	1.8%		
	Latino/a	.8%	2.1%		
	Black	1.7%	2.9%		
	Asian	.9%	.1%		
	Other Minority	.3%	.1%		
ECA Characteristics	Girl-specific	.9%	.5%	13.5%	11.3%
	Boy-specific	3.3%	1.8%		
	Sports	3.7%	2.6%		
	Community service	2.3%	1.0%		
	Leadership	2.4%	4.1%		
	Arts	.9%	1.3%		
Member Similarity	SES	.4%	1.4%	9.3%	9.7%
	GPA	3.1%	1.3%		
	Gender	.7%	1.8%		
	Ethnoracial background	4.1%	2.8%		
	Grade cohort	1.0%	2.4%		
Complementarity	Ethnocultural alignment	1.0%	.2%	5.8%	5.2%
	Latino/a ego × indegree-popularity (√)	2.5%	2.9%		
	Black ego × indegree-popularity (√)	.8%	.3%		
	Asian ego × indegree-popularity (√)	1.0%	1.8%		
	Other ego × indegree-popularity (√)	.5%	.0%		
Influence	Co-member	1.6%	.6%	12.9%	9.8%
	Friend (direct)	10.4%	8.4%		
	Friend (indirect)	.9%	.8%		
Structural Controls	Indegree-popularity (√)	6.3%	5.6%	21.5%	32.4%
	Outdegree-activity (√)	4.1%	12.0%		
	Outdegree-indegree assortativity (√)	3.9%	10.9%		
	Friendship indegree activity (√)	3.7%	1.3%		
	Friendship outdegree activity (√)	3.5%	2.6%		

Note. Scores in each column sum to 100% (except for cases of rounding error).

school. Nonetheless, these effects had the lowest RI of any effect class considered. Such a contrast can occur when an effect is potent, but the number of opportunities actors have to act on it are limited. In our case, only two forms of ethnoracial alignment were considered: based on ECA size and a single indicator of the cultural focus within activities. In reality, complementarity is far more complex than we were able to capture. There are undoubtedly additional unmeasured ECA features that appeal to students based on their background and some activities may have become racialized within their specific school context. Moreover, while activities often reflect associations with particular ethnoracial groups in the broader culture (e.g., music, art, sports), these associations are not clear-cut. Some groups may draw members from outside the presumptive ethnoracial focus area who are interested in learning about a new cultural form. For example, in one of our schools only 17% of the members in the K-Pop club (focused on Korean pop music) had an Asian background. Complementarity is not limited to race and culture, but is likely present based on other salient aspects of background and identity, such as SES, academic achievement, and gender (e.g., students reliant on a school bus for transportation face challenges participating in activities

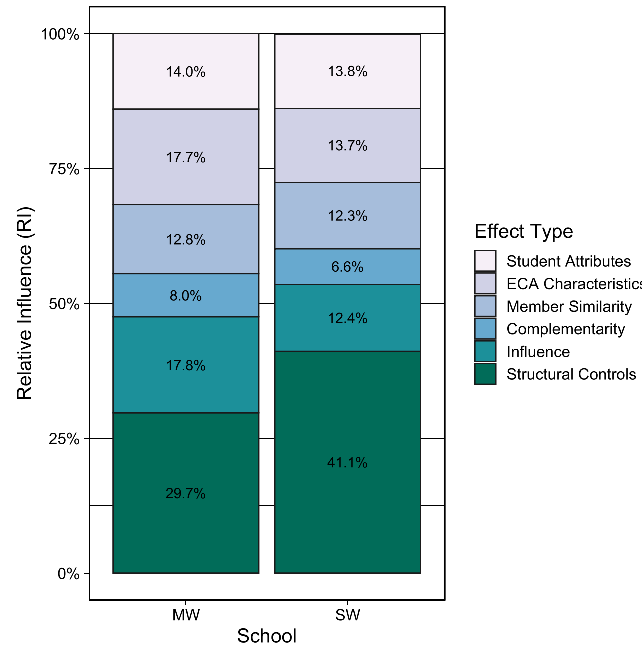

Fig. 3. Relative importance by selection mechanism. Estimates rescaled after excluding RI scores for density and constraints for gender-specific activities.

that meet before or after school; college applications emphasize breadth, excellence, and leadership in activity participation). Given a wide range of student motivations and cultural tastes, this may be the most elusive aspect of the ECA choice process to represent.

5.1.3. Member similarity

As expected, we found students preferred activities with more members who were similar to themselves in terms of ethnoracial background, academic performance, and grade level (in one school). The lack of an effect of member similarity on gender was surprising and suggests that outside of gender-specific activities, primarily sports, students in the two schools were indifferent about the gender composition of activities when joining them. The non-significant effect of member similarity on SES is also noteworthy. Despite higher SES students being more likely to participate in ECAs, there was no evidence that participants congregated into distinct activities based on SES.

We were somewhat surprised that the relative importance of member similarity effects was among the lowest of any effect class. These effects capture individuals choosing to be with similar peers, which is a form of homophily, itself one of the strongest, most robust social network patterns observed (McPherson et al., 2001). Prior studies have consistently documented homophilous selection in social networks, though corresponding RI scores vary from quite high (~50% in Schaefer and Kreager, 2020) to moderate (Stark et al., 2020) to relatively low (Hollway, 2015). Moreover, member similarity effects not only represent a preference for similar co-members, but also capture any unmeasured complementarity effects related to the attributes modeled. For instance, a member similarity effect for race will also capture instances where something about an ECA leads people of a certain race to join (e.g., racialization). Hence, this type of effect is expected to be stronger than what would be expected solely through a member similarity "preference." The relatively small RI we found suggests that ECA composition along the dimensions we measured was not at the forefront of student's minds when choosing activities relative to other selection mechanisms.

Beyond measurement issues, it is worth asking: how strong would we expect the member similarity mechanism to be, relative to a homophily preference in relationships like friendship? Several factors suggest a weaker effect. Group-based interactions are more diffuse than within friendships. People are more willing to tolerate difference within foci compared to their dyadic relationships (Bogardus, 1933). And, the barriers to joining a diverse group may be lower than forming a heterophilous friendship. Indeed, there are people who join groups to meet people of diverse backgrounds. Diversity has benefits, and some youth respect and appreciate the capacity of diverse activities to help them learn about others and how to work together (Ettekal et al., 2020). Though the overall effect of member similarity we observed is relatively small, there are likely to be differences across activity types. For instance, whether an organization is oriented more toward expressive or instrumental purposes has been found to affect gender homogeneity in voluntary organizations (McPherson et al., 1986). And, research on teams in organizations has found that diversity is often sought, suggesting that the motives that drive task-related groups can de-emphasize the primacy of homophily (Rivera et al., 2010).

5.2. Implications for segregation

Of the mechanisms we considered, segregation can arise directly or through processes that operate indirectly or amplify tendencies toward segregation (Wimmer and Lewis, 2010). For instance, the effects of member similarity we found can lead to segregation directly. Indirect segregation can occur through influence mechanisms in the presence of homophily. As one example, because friendships tend to be homophilous, friend influence will lead to more of the same types of people in the same activities. Support for this sequence comes from research on entrepreneurial teams, where ethnoracial homogeneity within teams is partially attributable to incorporating kin as team members (Ruef et al., 2003), as well as McPherson's (1983, 2004) ecological argument that competition from other organizations impedes the diversification of niches, preserving relative segregation. Likewise, influence from co-members can promulgate segregation, for instance, if members of a segregated activity create or join another activity together, they can perpetuate segregation in the new activity. And, segregated activities can arise indirectly through differential participation rates or if individuals from a particular background flock to the same activities. As Feld described it, "the interests of organizations and individuals lead similar people to the same places at the same time" (1982:798). For instance, adolescents differ in their needs and reasons for joining groups. Borden et al. (2005) found race/ethnic and gender differences in the extent to which activity participation was driven by staying out of trouble, learning new things, or developing confidence. If students choose activities based on these or other aspects, then differences in ethnoracial composition across activities can emerge.

Our SAOMs found significant effects representing each of these mechanisms. However, the relative importance of member similarity and friends were rather small, and co-member influence had amongst the lowest relative importance of any effect tested. Hence, no single, overarching mechanism appears responsible for ECA segregation. Instead, segregation is more likely a cumulative product of multiple selection processes. In our case, member attributes, member similarity, and complementary combined to account for around one-third of the relative importance, suggesting that member attributes may matter more across multiple classes of effects than through any singular route. Thus, our findings lend support to arguments that foci attract similar members, but raise the possibility that similarity is but a relatively small impetus for participation.

5.3. Limitations and future directions

There are several important aspects to activity selection that were not captured by our analysis. For instance, our modeling approach was unable to account for foci emergence (such as students forming a club). Such a possibility would evince itself in a strong friend influence effect (and if friends are similar then it would explain part of the member similarity effect). We also did not consider peer processes that occur within activities. Friend influence may be sufficient to try out an activity, but (dis)continuing one's participation may depend on other factors (Fredricks and Simpkins, 2013). Adolescents may have positive or negative experiences in activities (Patrick et al., 1999), for example, they might come to realize that the activity is more or less rewarding than they expected, or they might come into conflict with other members (Simpkins et al., 2013). We also assume that students had agency in determining their memberships. However, research has shown that parents can play a decisive role in determining which activities their children participate in (Lin et al., 2020), raising the importance of family background factors.

In conclusion, we investigated the mechanisms by which a particular system of organizational differentiation came into being. We found that ECA participation patterns were driven by several mechanisms, including ecological factors (i.e., student population), but also characteristics of ECAs and the structure of the ECA and friendship networks. Our results point to a complex set of interrelated processes, with additional complexity likely to come from developing identities (Umaña-Taylor et al., 2014), friendship evolution, and negative forces such as antipathies (Palacios et al., 2019). Our future efforts will take some steps in this direction by incorporating friendship endogeneity (e.g., Fujimoto et al., 2018) and their cumulative implications for segregation. We hope our work encourages future investigations in this area.

Acknowledgments

This research was supported by grants from the National Science Foundation (SES No. 1918162, PI: Schaefer; BCS No. 1625277, PI: Umaña-Taylor; BCS No. 1625196, PI: Rivas-Drake). We express our appreciation to Chelsea Cypress, Stephanie Pullés, Ethan Schaefer, and Jonathan Ware for their assistance with collecting the extracurricular activity data, to Sandi Simpkins for advice on coding activities, and to helpful comments from the attendees of Duisterbelt 2020.

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.socnet.2021.12.008.

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