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Low status rejection: How status hierarchies influence negative tie formation

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ABSTRACT

Scholarship investigating how social status patterns negative ties has yielded contradictory findings. Three likely sources for these differences are: different measures of social status, measures of negative ties (perceived versus dyadic), and structural factors. This study uses multiple measures of social status, sociometrically-measured negative ties, and multiple analytic approaches – MRQAP to control for structure and within-individual to control for heterogeneity – to help resolve this debate. We find: negative ties travel down status hierarchies and target low status individuals, and a negative tie between two people becomes more likely as their status difference increases. These results suggest a low-status rejection mechanism.

1. Introduction

In the engagement party scene of the opera *Margaret Garner* (Morrison, 2005), Caroline Gaines – the daughter of a southern plantation owner – publicly shows deference to her slave, Margaret Garner, who cared for and loved Caroline for her entire life. In response, the shocked party guests – mostly local elites – abruptly leave the Gaines' home. Caroline's father voices his fear about the negative consequences of this event, lamenting, "You have given my neighbors more reason to gossip and despise me" (Morrison, 2005 in Podolny and Lynn, 2009). Podolny and Lynn (2009) use this scene to show how social status is dynamically constructed through relational behaviors such as deference and exchange, and how social status also plays a role in allocating social rewards. This scene offers additional insights about the inter-relationships between status and social ties. One such insight is that status hierarchies may structure the emergence and formation of negative ties. Relational behavior indeed affects status, as Caroline's public deference towards Margaret lowers Caroline's status in the eyes of the party guests, and through Caroline, the status of the whole Gaines family is reduced. But this change in status also prompts a change in the relationships within this social setting: the previously positive ties from the party guests towards Caroline's family become negative as they opt to socially reject the now lower-status Gaines family by promptly leaving the party. This paper examines empirically whether and how social status influences the formation of negative ties.

The *Margaret Garner* scene depicts both positive and negative ties as being fundamentally inter-related with social status, but in different ways. Positive ties appear to serve as a conduit for the leakage of social status (Podolny, 2005). Caroline's deference to the enslaved Margaret lowers Caroline's status which also lowers the status of her father and family. Negative ties appear to be a tool deployed by the party guests to distance themselves from the Gaines family to avoid the threat of status leakage. The party guests leave the party, likely to gossip about and despise Caroline and her family, possibly in effort to avoid their own status loss via further status leakage. The scene is fictional. Research finds positive empirical evidence supporting Podolny's status leakage hypothesis regarding positive ties (Bothner et al., 2010; Graffin et al., 2008; Liu et al., 2016). What about the relationship between status and negative ties? Is the opera's depiction of negative ties forming to reject lower-status others accurate? Can this low status rejection be observed empirically, or would it be more realistic if the Gaines family also came to view the elites who left more negatively? What is the role of status hierarchies in patterning negative ties?

Social network scholarship is increasingly working to reveal the potentially distinctive dynamics of negative ties (Everett and Borgatti, 2014; Harrigan and Yap, 2017; Labianca and Brass, 2006). Research examining the relationships between social status and negative ties has been particularly active, but has yielded a range of contradictory findings. Some research finds that negative ties and behaviors tend to be directed to lower-status others (Berger and Dijkstra, 2013; DeKlepper et al., 2017; Ellwardt et al., 2012). Other scholars find negative ties tend to be directed towards higher-status others (Faris and Felmlee, 2011, 2014; Fujimoto et al., 2017). This article analyzes and discusses several of these recent contradictory findings. By examining

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the methods, assumptions, and related theories, we offer an explanation for these contradictions and propose an empirical approach for resolving them. The differences in results across studies appear to come from dependencies upon perceived versus direct measures of negative ties, upon specific single measures of social status, and upon statistical approaches that require the anticipation of important structural effects. We perform an empirical analysis of these differences using a large dataset including positive and negative tie network data. Our findings – robustly replicating across three different levels of analysis – are consistent with a *low-status rejection* mechanism for the formation of negative ties. That is, dyadic negative ties (unlike reputational negative ties) tend to be directed down status hierarchies towards the lowest status members. In addition, we show that status measures based on positive ties are distinct from status measures based on negative ties. In doing so, this article contributes both to the understanding of negative ties, and to social status.

2. Negative ties and social status

Early social network scholarship examined both positive and negative relations and recognized the importance of both types of ties in constituting social dynamics (Cartwright and Harary, 1956; Heider, 1958; Thibaut and Kelley, 1959; White, 1961). However, modern social network scholarship has been dominated by studies of positive relationships, leaving negative relationships under-explored (Labianca and Brass, 2006). A recent resurgence of scholarly interest and attention to negative ties is working to address this imbalance. Consistent with earlier scholarship, recent network analytic methods show that negative ties are important for partitioning groups whereas positive relations are important for social cohesion within groups (Bruggeman et al., 2012; Harrigan and Yap, 2017; Leskovec et al., 2010a). As the evidence demonstrating the distinctive importance of negative ties continues to grow, the need for understanding the emergence and the formation of these types of relationships grows commensurately.

Our current focus is the relationship between negative ties and social status. Social status is a fundamental and widely-studied construct in social science research (Bourdieu, 1984; Gould, 2002; Kemper and Collins, 1990; Podolny and Lynn, 2009; Ridgeway, 2014). A large body of research has examined the relationships between social status and positive social ties. The relationships are bi-directional. Status influences positive ties and positive ties influence status. The process of preferential attachment (Barabási and Albert, 1999) with high status others is observed for positive social ties (Ball and Newman, 2013; Dijkstra et al., 2013; Moody, 2004). People preferentially form positive ties to similar-status or higher-status others, and avoid forming positive ties with lower-status others. In the other direction, positive ties affect social status through status leakage (Bothner et al., 2010; Graffin et al., 2008). This inter-relationship is so strong that it is not uncommon for the attraction of positive ties (in-degree) to be used as an indicator for informal social status (e.g., Brass and Burkhardt, 1993; De la Haye et al., 2010; Lazega et al., 2012). Although measures based on one can be used as indicators for the other, social status and positive ties are distinct constructs. Network scholars also document the distinctiveness between positive ties and negative ties (Bruggeman et al., 2012; Everett and Borgatti, 2014; Harrigan and Yap, 2017). What then, is the relationship between social status and negative ties?

We enlist the concept of a status hierarchy (e.g., Lin, 1999) to indicate how social status relates to the patterning of negative ties. We investigate whether the occurrence of negative ties – which travel from the person reporting the negative tie to a particular target individual who is the recipient of the negative tie – is patterned with respect to this status hierarchy in ways beyond what would be expected by chance and controlling for other individual characteristics (e.g., group memberships). Specifically, we ask whether negative ties tend to travel up hierarchies, that is from lower status individuals to higher status targets; travel down, that is from higher status individuals to lower status targets; or even within status strata, occurring among individuals with similar levels of social status? Several recent empirical studies of this and similar questions have yielded inconsistent and contradictory findings. In the following sections, we review these empirical studies, noting the differences causing the contradictory findings. We then develop and apply a framework for resolving the contradictions.

3. Contradictory findings and their resolution

Recent literature examining directly the relationship between social status and negative ties shows contradictory findings. We highlight two papers in particular as exemplars of these differences. On the one hand, when Berger and Dijkstra (BD, 2013) examined social networks of elementary school children in Chile, they found evidence for "the snobbism hypothesis" (2013:586). The snobbism hypothesis is that negative ties tend to be directed from high status individuals to low status individuals. These results, however, are also consistent with a somewhat different interpretation – i.e., *low-status rejection*, wherein negative ties distance an individual from status threats. Negative ties directed towards lower status individuals help to guard against harmful status leakage that might otherwise result from a positive tie with a lower status individual.

On the other hand, Fujimoto, Snijders, and Valente (FSV, 2017) show that high status high school students (those identified more frequently by others as being popular) also tend to have higher reputational dislike (identified more frequently by others as being disliked). FSV conclude that negative peer relations tend to travel up social status hierarchies, not down as BD suggest. FSV note three important differences between their study and the BD study. First, FSV measures reputational dislike – who is perceived by the respondent as being generally disliked – not direct dyadic disliking. Second, FSV accounts for more structural effects than does BD. Third, the two studies measured popularity differently. These three differences provide an useful framework for understanding this debate. We take each element in turn: the nature of the tie, the role of structural effects, and measures of status or popularity. Following this examination of relevant theory and evidence for each element, we articulate the features required of a study seeking to help resolve the question of the role of status hierarchies and negative ties.

Other empirical studies have examined how social status influences the formation of negative ties. We use these two exemplary studies because of their well-communicated measures of both negative ties and social status. Conceptually related but less directly applicable studies may examine factors that are not direct measures of social status, outcomes that are specific behavioral expressions of negative ties, or use a collective rather than individual level of analysis.

For example, a couple of recent studies examined negative ties as an outcome among individuals grouped by status-relevant social categories. Boda and Néray (2015) studied negative ties by ethnic group categories in secondary school students, and Merluzzi (2017) studied negative ties by gender categories among professional managers in two separate firms. Both studies reported the surprising finding that negative ties were significantly more likely to be within-group for the lower-status category members (minority ethnic group, and women, respectively), but not more likely to be within-group for the higher-status category members (majority ethnic group, and men, respectively). Doreian and Mrvar, 2014 re-examine some well-studied signed network data involving both students (Newcomb's dormitory data) and professionals (Sampson's monastery data), and found evidence for differential dislike – the existence of a group of people who are universally disliked – to be the dominant mechanism for negative ties (in comparison to mutual dislike and structural balance). Although Doreian and Mrvar's analysis did examine relationships among subgroups, they did not explicitly evaluate negative ties' relationships with status.

Other scholars have examined how social status plays a role in negative-typed relational behaviors such as targets of gossip among co-

workers (Ellwardt et al., 2012); behavioral control attempts among military trainees (DeKlepper et al., 2017); and aggression, bullying, and other forms of victimization among students (Faris, 2012; Faris and Felmlee, 2011; 2014). As with our two exemplars, the findings regarding how status patterns these behaviors are varied. Gossip and behavioral control attempts are found to be directed down the status hierarchies towards the lowest status members. The aggressive and victimizing behaviors among students studied by Faris and colleagues appear to be directed towards higher levels in the hierarchy, exempting the highest status members. Another study looking at similar dynamics among organizations – gangs – rather than individuals, also found important interdependencies between organization status and a behavioral negative tie – homicide. (Papachristos, 2009). These examples are representative rather than comprehensive, and help to illustrate that questions of how status hierarchies pattern negative ties have been approached from multiple perspectives and have produced varied answers. These examples also demonstrate that the scholarship on this topic extends beyond adolescent behavior and school contexts. While acknowledging a historically rich and currently growing literature on negative ties, we focus concretely on a comparison between BD and FSV because of their explicit examination of the role of status hierarchies in patterning negative ties among individuals, and their opposite conclusions.

3.1. The nature of the tie: Dyadic versus reputational

The first difference FSV notes between its study and that of BD is the nature of the negative tie. BD asked about negative ties using common sociometric methods (i.e., asking participants to name "up to six classmates they disliked" BD, 2013: 589), yielding dyadic binary disliking ties. FSV asked about reputational dislike. The question was not whom the respondent disliked, but the seven students whom the respondent perceived to be "most disliked" generally by and among the students in their grade.

This difference is important, as reputational dislike and direct disliking sociometric ties are distinct. Ego may be like and be friends with an unpopular person, and might thus accurately report their friend as being among the most disliked persons even they do not dislike that person. The reasons for distinguishing between the concepts of reputational dislike and dyadic dislike are directly analogous to the reasons for distinguishing between the concepts of popularity and dyadic friendship. Reporting someone as liked by many is not the same as liking them, and reporting someone as disliked by many is not the same as disliking them.

Unlike the BD measure, the FSV measure of reputational dislike is more conceptually aligned with network perceptions and cognitive social structures (Krackhardt 1987) than direct ties. This alignment represents a potential confounding bias as network perceptions and social status are related. Higher status people are more likely to have accurate perception about who is tied to whom (Krackhardt, 1990). High status members have more opportunities to observe a larger share of organizational networks (Krackhardt, 1990), and show higher levels of interpersonal sensitivity that is associated with more accuracy in network perceptions (Zerubavel et al., 2015). For studies attempting to disentangle the direction of negative peer relationships and social status, the biasing effect that status has on accurate network perceptions would need to be addressed. Evaluating the role of social status on the formation and patterning of negative ties would benefit from less confounded and more proximal sociometric measures of negative ties, rather than perceived relationships.

3.2. The effects of social structure

FSV note that their analysis accounts for more structural effects than did BD. (Specifically, although BD included triadic terms involving positive and negative ties in predicting negative tie formation, those models did not include controls for positive tie degree.) Accounting for structural effects in network analysis is essential when evaluating the role of a nodal characteristic like social status in terms of either individual or dyadic effects. Goodreau et al. (2009) illustrated how failing to account for structural closure would add an upward bias to estimates of homophily, that is, dyadic similarity on a nodal characteristic. Biased estimates are a concern for network models lacking the appropriate structural controls. Recent research, including BD and FSV, has sought to identify some of the potentially distinctive network structural factors associated with negative ties. Harrigan and Yap (2017) find that closure – a nearly ubiquitous feature of positive social ties (Watts and Strogatz, 1998; Jin et al., 2001) – is not a significant feature of negative ties. If the structural factors affecting negative tie formation are novel and distinct from those affecting positive ties, then analytical approaches that require explicit specification of structural terms (e.g., ergm, SIENA) are likely to be problematically biased until the structural antecedents of negative ties are better understood. Both BD and FSV, for example, consistently find that triadic structures involving both positive and negative ties are significantly associated with the formation of new negative ties (ego is likely to form a disliking relationship with an alter whom one of ego's friends already dislikes). Additional research like this to more thoroughly identify the structural antecedents of negative ties is needed.

Some methods of network analysis control for structural features (e.g., MRQAP, Dekker et al., 2007). Although such structure-controlling methods can do little to contribute to understandings of the structural antecedents of negative ties, they can reveal node-level and dyadic antecedents of negative ties while obviating concerns of bias from the omission of important structural terms. For studies examining specifically the role of a node characteristic like social status on negative tie formation, methods that control for all structural effects have the benefit of avoiding the uncertainty of bias from omitted structural features. Employing structure-controlling methods like MRQAP can contribute to the debate about how social status influences negative tie formation.

3.3. Measuring social status

BD and FSV also use different measures of social status in their studies the effects of social status on negative peer relationships. BD follow LaFontana and Cillessen (2002) by subtracting students' unpopular nominations from their popular nominations to arrive at a popularity score (specifically, indegree from "6 most liked" reports minus indegree from "6 most disliked" reports). FSV use indegree from "7 most liked" as popularity, and indegree from "7 most disliked" as reputational negative ties. Rather than preferring one type of measure of social status over another, if social status truly patterns the formation of negative ties, then the association would be expected to be robust across a range of reasonable social status measures. Results that depend (or that have been tested only) on a single social status measure may not characterize a generalizable relationship between social status and negative ties. Rather than focus on a single measure, resolving the question of how status hierarchies pattern negative ties requires investigating multiple measures simultaneously to ensure robust and consistent associations.

Many studies define and measure social status in terms of positive or negative ties. Leskovec et al. (2010a, 2010b) explicitly assume that positive ties tend to go from lower status to higher status, and that negative ties tend to go from higher status to lower status. In these studies, the relationship between social status and negative ties is definitional. One does not cause the other, they are the same thing. DeKlepper et al. (2017) adopt a similar perspective, and have both positive tie and negative tie measures of social status.

In addition to the requirements described above, research examining whether and how status hierarchies pattern negative ties needs to: (a) use multiple measures of status to ensure robust associations, and

(b) establish the distinctiveness of the status and tie concepts and how they are measured.

3.4. Resolving the contradictions

Collecting the implications from the discussion above provides a plan for lessening the ambiguity in these contradictory findings. We take four steps in our research design to reveal the role of status hierarchies in patterning negative ties. First, we focus explicitly on sociometrically-measured negative ties. Second, we use a statistical framework that controls for all network structure effects, rather than one that leaves unanticipated structural factors unconstrained and thus a possible source of bias. Third, we use multiple measures of the social status independent variable, to ensure robust and consistent associations rather than associations sensitive to a particular operationalization of status. Fourth, we use multiple levels of analysis with complementary strengths and weaknesses to demonstrate consistent associations. (We do *not*, however, measure negative ties both directly and reputationally.) We find that across multiple levels of analysis and across multiple measures of social status, sociometrically-measured negative ties tend to be directed down the status hierarchy to lower status individuals. This tendency is identified using network methods that control for all structural factors.

4. Methods

4.1. Data

The data used in this paper are positive and negative network tie data collected in 2008, 2010, 2011 and 2012 from students of a residential fellowship program across fourteen separate large universities predominantly located in the Midwest of the United States. The fourteen residences for four survey years are operationalized into fifty-six distinct sets of both positive and negative social networks. The number of students participating in this fellowship program across the four years was 753, 790, 766, and 771, respectively. The mean number of students per site is 53, with a range from 33 to 119.

Similar to Newcomb's famous dormitory research Newcomb (1961), students in this fellowship program live together in program-owned dormitories all four years in college. Since students in these self-contained dormitories engage in mandatory bi-weekly meetings and social activities, we can examine the dominant part of the students' social milieu. The data were collected from full roster network surveys conducted in the fall semester at each program site for each of the four years. These network surveys were administered over the period from mid-November to early December. The response rate to the network surveys across the four years was over 90%.

These students differ from the general population of typical undergraduate students in a few notable ways. First, as shown in Table 1, they are more white (> 80%) and more male (about three-quarters).

Table 1
Descriptive statistics for our sample and measures, by data year.

	2008	2010	2011	2012
Observations	770	783	757	767
Percent female	21.7	22.7	22.6	22.8
Percent white	84.8	82.4	80.3	75.5
Mean (SD)				
Site Size (14 sites)	53.3 (16.1)	55.2 (19.1)	52.50 (20.3)	53.2 (21.4)
Close Friendship network density	0.177 (0.043)	0.172 (0.033)	0.169 (0.053)	0.170 (0.056)
High Esteem network density	0.307 (0.062)	0.342 (0.067)	0.301 (0.072)	0.327 (0.067)
Negative tie network density	0.066 (0.021)	0.063 (0.026)	0.035 (0.021)	0.047 (0.023)

Second, the scholarship is a means-tested program for high school graduates in low-income families; many of them are the first generation in their families able to attend college. Therefore, students' socioeconomic status (SES) is lower and somewhat homogenous relative to that of the general undergraduate population.

There are several advantages to this setting for our research. In addition to living together in a closed, self-governing (but not self-constituting) community, the subjects tend to work together, go to classes together, eat together, exercise and play sports together, draw romantic partners from among each other, etc. These settings in many ways resemble a kind of total institution (Goffman, 1961) – precisely the kind of setting where the entanglement of individual and social environment is most intimate. The associations between social status and negative ties may be noisier and more confounded by other processes and social opportunities in less immersive settings. If there are status effects on negative ties in any social context, we should expect to see them here.

4.2. Measures

Dependent Variable: Negative Ties. The dependent variable is the network resulting from responses to the sociometric question asking students to identify alters at their site with whom they have difficulties getting along. (The exact wording of the survey prompt was: "Sometimes I do not find it easy to get along with this Scholar.") This wording is similar to other studies of negative ties in organizational and educational contexts (e.g., DeKlepper et al., 2017; Schulte et al., 2012). The intent behind using this mild negative relationship descriptor was to set a low bar for reporting negative ties. Negative ties tend to occur less frequently than positive ties (BD, 2013; Leskovec et al., 2010a), and severely negative ties less frequently than milder negative ties (e.g., Huitsing et al., 2012). Although the milder negative relationship prompt can be expected also to capture more severe negative relationships along with milder ones, the reverse is not true (e.g., Boda and Néray, 2015). In addition, more severe negative relationship prompts can be risky. Research investigating specific more severe negative relationships such as bullying or victimization (versus general disliking) sometimes cannot achieve sufficient response observations to support statistical analysis (e.g., Huitsing et al., 2012). Students' responses represent their self-reported set of alters for this type of negative relationship.

Key Independent Variable: *Social Status.* As noted above, we use several measures of social status to ensure robust associations with negative ties. We have a total of four measures based on two common network-based measures of social status (eigenvector centrality and in-degree centrality) for two positive tie network measures (close friendship and esteem). In the same survey collecting negative tie network data, we also collected positive tie data using the same roster on-line survey format. The prompt for the friendship network was "this scholar is a close friend," and the prompt for the esteem network was "I hold this scholar in especially high esteem." Both networks are directed and unweighted.

Using these networks, we calculate both in-degree centrality and eigenvector centrality (which accounts for the popularity of ego's alters) as indicators for social status. To ensure comparability of the centrality scores across sites and years, these centrality measures are scaled to sum to one (e.g., Kang, 2007; Sparrowe et al., 2001). The centrality scores are calculated from network data from different dormitories of different sizes and network densities. Scaling improves their comparability. In-degree centrality (Holland and Leinhardt, 1976) in a positive tie network is often taken to be a direct indicator of popularity, and has often been used as a network-based measure of social status (e.g., De la Haye et al., 2010; Lazega et al., 2012).

Eigenvector centrality (Bonacich, 1972) is a commonly-used network-based measure of social status (Bonacich and Lloyd, 2001, 2004; Bothner et al., 2010; Burris, 2004; Podolny, 1993; Wasserman and

Faust, 1994). The eigenvector centrality of a node within friendship networks specifically is a commonly-used indicator of social status. For example, Ellwardt et al. (2012) use friendship network eigenvector centrality among 30 employees in a non-profit organization as a measure of employees' social status. Likewise, Hinz et al. (2015) use friendship network eigenvector centrality to measure social status of players in an online-community. Leonard et al. (2008) used friendship network eigenvector centrality as an inverse measure of marginality, where higher eigenvector centrality indicated lower marginality.

In addition to being common measures of status, both in-degree centrality and eigenvector centrality are known to be highly reliable even in the face of missing network data (Costenbader and Valente, 2003). By looking for congruent outcomes in the status-based antecedents of negative ties for four different operational specifications of status, we increase our confidence in the reliability and robustness of our findings.

We investigate the possible individual-level and dyadic effects of status on negative tie formation in four ways. At the individual level, we look at the effect of an individual's status on their likelihood to *generate* negative ties as well as on their likelihood to *receive* negative ties. At the dyad level, we look at the effect of the absolute value of the difference in two individuals' status scores to see if *dissimilarity* is associated with the occurrence of a negative tie. In addition, we take the sign of the difference (positive one, if ego's status is higher than alter's; negative one, if the reverse is true, and 0 if both have identical status scores). This trichotomous sign indicator tests for a distinctive effect from the *direction* of the status difference beyond its magnitude in a way that is not linearly associated with the other status terms.

Controls: As controls in our multivariate analyses, we include terms for gender, race, and school year. Female is a binary variable (1 as female, and 0 as male). Race captured multiple categories, but is here coded as a binary variable (1 as white, and 0 as non-white) because of the relative racial homogeneity of the setting. Finally, we consider school year with the range from 1 (freshman) to 4 (senior). Controls are coded based on self-reporting and progress through the scholarship program. For each control, we include a term for generating effects (e.g., are women disproportionately more likely to generate negative ties?), for receiving effects (e.g., are women disproportionately more likely to receive negative ties?), and similarity effects (e.g., do negative ties occur more frequently between people with the same gender category?).

4.3. Estimation procedures: correlations, MRQAP + meta-regression analysis, and individual-level fixed effects

Three estimation procedures test for status and negative tie associations across three levels of analysis: network, cohort, and within-individual. The procedures are: correlations, meta-regressions of MRQAP (Multiple Regression Quadratic Assignment Procedure) results, and within-individual analyses using individual-level fixed effects. We use correlational analysis both to examine first-order bivariate associations among our data and to perform the cohort-level analysis. The meta-regressions across MRQAP results provide multivariate tests with the negative tie networks as the dependent variable. The within-individual analysis uses individual-level fixed effects to test for associations between within-person changes in status and negative tie outcomes. Each method has strengths and weaknesses that together can complement the others.

Correlations. Correlations are useful for providing first-order bivariate associations among data variables, as presented among the status measures in Table 2. In addition, correlations between individual status measures and negative tie out-degree and in-degree can provide indications of the individual-level generating and receiving effects, respectively. Correlations between dyadic status difference and dissimilarity measures and the negative tie networks can also provide indications of the dyadic-level difference and similarity effects,

Table 2
Correlations among In-degree and eigenvector centrality measures for three networks: Friendship, esteem, and negative ties.

	(1)	(2)	(3)	(4)	(5)
(1) In-Degree, Close Friendship	–	–	–	–	–
(2) Eigenvector, Close Friendship	0.930	–	–	–	–
(3) In-Degree, High Esteem	0.708	0.641	–	–	–
(4) Eigenvector, High Esteem	0.693	0.635	0.986	–	–
(5) In-Degree, Negative	−0.068	−0.057	−0.145	−0.139	–
(6) Eigenvector, Negative	−0.006	−0.004	−0.098	−0.090	0.763

respectively. These correlations can be performed at different levels of aggregation. The individual-level correlations can yield a single correlation coefficient for the entire dataset. The dyadic-level correlations can be done separately for each site and year (56 in all). Both types of correlations can adopt a site-year-cohort aggregation to test for associations within-cohort (224 in all). We perform each of these tests. The full dormitory network includes churn among dorm-mates that are in different cohorts. This churn can be seen as a type of censoring of potential alters. The within-cohort analysis allows for an examination for associations between status and negative ties for the same set of alters without this type of censoring. The correlation results are necessarily bivariate only, so are potentially biased by confounding effects from other variables.

MRQAP. MRQAP is a multivariate method for the statistical estimation of network dependent variables that resolves the non-independence problem of network data (Krackhardt, 1988; Dekker et al., 2007). MRQAP allows for simultaneous estimation of both individual and relational factors associated with network tie formation. MRQAP also has the advantage of controlling for all network structural effects. Other network estimation methods (e.g., exponential random graph models) require correctly anticipating and including relevant structural effects for accurate estimation. Estimates of individual and relational effects on network outcomes can be biased when not controlling for relevant structural effects (e.g., Goodreau et al., 2009). The understudied nature of negative tie networks means little is known about the relevant structural dynamics of these networks (Everett and Borgatti, 2014; Doreian and Mrvar, 2014; Huitsing et al., 2012; for a recent exception, see Harrigan and Yap, 2017). Both BD and FSV contribute to revealing some of the structural antecedents of negative ties, such as triadic effects found to be significant in both papers. Because the current research focuses solely on the individual and relational antecedents of negative ties, MRQAP provides estimates of these effects free from the concerns of possible bias from omitted structural effects. Although this MRQAP analysis will not contribute to understanding the structural antecedents of negative ties, it is well-suited to reveal how node status patterns these ties while controlling for structural factors.

Each MRQAP regression estimates the parameters of the specified model for a single network. We used the "netlogit" command as implemented in the "sna" package of R (Butts, 2008) with the semi-partialling method recommended by Dekker et al. (2007), and Tortoriello et al. (2011). We therefore estimate the same model for each of the fifty-six networks in our dataset, and use meta-analysis (meta-regression with year fixed effects, clustered by site, and weighted by the number of network members at each site) to evaluate the aggregated results across these estimates based on the z-scores of the fifty-six sets of parameter estimates. We use meta-regression because the networks are not all independent observations. The fourteen networks in a single year are putatively independent, but their results need to be weighted by the size of the site. Once we use data from multiple years, we need to account for the fact that many of the students in a dormitory in one data year will also be present in the same dormitory in another data year. The meta-regression approach enables us statistically to adjust for these factors (Van Houwelingen et al., 2002; Stanley and Jarrell, 1989).

Individual-level fixed effects. The challenge of adjusting for multiple observations involving the same subjects is also an opportunity. We can perform a within-individual analysis using individual-level fixed effects. This approach controls for all static characteristics of an individual, whether observed or unobserved. Factors such as ability, personality, socio-economic status, and the like do not affect a within-individual analysis where within-individual changes in the independent variable (here, our four status measures) are tested for associations with within-individual changes in the dependent variable (here, generating or receiving negative ties). Not all students in our dataset are observed over multiple years. Juniors and seniors in the 2008 data, and first-year students in the 2012 data are each observed only once. In addition, although response rates were very high for this study, not all students responded each year. Our within-individual analysis includes 2368 observations of 939 unique students. Although this within-individual approach does not evaluate dyadic associations, it goes far towards addressing questions of unobserved heterogeneity in the results from the other methods (e.g., Obukhova and Lan, 2013). In this way, the three methods provide results that complement each other.

5. Results

5.1. Distinctiveness of status and negative ties

To ensure our findings are robust across multiple operational definitions of social status, we examine the role of status hierarchies on negative tie formation using four status measures: in-degree centrality and eigenvector centrality using both friendship and esteem ties. Table 2 illustrates the correlations among these four status measures. In addition to those four measures, Table 2 also includes the same two network measures (in-degree and eigenvector centrality) for our negative tie measure. If positive-tie status measures and negative-tie status measures were simply two views of the same underlying phenomenon, then our positive-tie status measures would be expected to be strongly and negatively correlated with the negative-tie status measures. The correlations in Table 2 allow us to evaluate that proposition as well.

Table 2 replicates prior findings (e.g. He and Meghanathan, 2016; Valente et al., 2008) that in-degree and eigenvector centralities for positive-tie networks are very highly correlated (> 0.90). The major differences in status measures come from the type of tie. Network measures of status based on friendship ties are still very highly correlated with network measures of status based on esteem ties (> 0.60). These high correlations support the view that these measures are indicators for the same underlying status hierarchy. In contrast, the correlations between these positive tie measures and their negative-tie counterparts are negative and much closer to zero (< -0.15). This pattern is inconsistent with the idea that nodes with high positive tie centrality will necessarily have low negative tie centrality, or vice versa. If negative ties, and status indicators from negative ties, provided merely an additional measure of the same underlying status structure, then we would expect much larger magnitude (though negative) correlations between the negative-tie centrality measures and their comparable positive-tie centrality measures. Instead, we found only small-magnitude correlations. This evidence is consistent with the idea that network centrality measures based on negative ties are not indicative of the same status structure as revealed by the common social status measures based on positive tie centrality. Negative ties likely are relevant for understanding status structures, but they are not simply mirror-image indicators of positive-tie-based status measures.

Table 2 helps to illustrate that status measures based on our two positive ties appear to capture a common underlying status structure, and that this status structure is actually quite distinct from one that might be inferred from negative tie measures of status. Our project uses these positive tie measures of status. Eigenvector centrality is commonly seen as useful in providing a status ordering (Bonacich, 2007; Burris, 2004; Ellwardt et al., 2012; FSV, 2017; Moody et al., 2011), while in-degree centrality is more often seen as reflecting popularity. Our analyses use both network measures for two types of positive ties (friendship and esteem) to identify effects that are robust to different measures of social status.

Table 3A
Correlations testing individual-level effects: Status measures and negative ties.

	Ego Effect Negative Tie Out-degree				Alter Effect Negative Tie In-Degree			
All Observations								
In-Degree, Friendship	−0.007				−0.167***			
Eigenvector, Friendship	−0.010				−0.143***			
In-Degree, Esteem	−0.021				−0.255***			
Eigenvector, Esteem	−0.017				−0.247***			
	Pos.	Neg.	*p*	x^- (sd)	Pos.	Neg.	*P*	x^- (sd)
Within Cohorts (211)[a]								
In-Degree, Friendship	94	117	0.07	−0.04 (0.31)	61	150	0.000	−0.21 (0.34)
Eigenvector, Friendship	91	120	0.03	−0.05 (0.29)	56	155	0.000	−0.18 (0.35)
In-Degree, Esteem	98	113	0.17	−0.06 (0.33)	34	177	0.000	−0.29 (0.31)
Eigenvector, Esteem	101	110	0.29	−0.04 (0.34)	37	174	0.000	−0.26 (0.33)

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
[a] 13 of the 224 site-year-cohorts reported zero within-cohort negative ties.

5.2. First-order correlation estimates

Individual-level effects. The individual-level associations between social status and negative ties can be tested directly simply by correlating social status with individuals' outdegree (for generating negative ties) and indegree (for receiving negative ties) in the negative tie network. Outdegree and indegree are counts of the number of ties generated by and received by an individual, respectively (Holland and Leinhardt, 1976). The results of these correlations are shown in Table 3A. The pattern across these results is clear. All of the correlations between the four positive-tie status measures and negative-tie out-degree (ego effects – generating negative ties) are negative but insignificantly small. In contrast, all of the correlations between the four positive-tie status measures and negative-tie in-degree (alter effects – receiving negative ties) are negative and strongly significant. Although these are just bivariate correlations and a multivariate analysis is needed, these initial results suggest against an association between ego's status and generating negative ties, while being suggestive for an association between ego's status and receiving negative ties. We also performed this analysis within-cohort (4 years, 14 sites per year, 4 cohorts per site-year) to address possible concerns about the right and left censoring of the network data associated with student replacement. This analysis, shown in the bottom half of Table 3A, reveals the same relative pattern of significance: strongly significant negative associations between status and receiving negative ties, and weakly negative associations between status and generating negative ties. The nature of this association is that the higher a person's status, the *less* likely they are to receive a negative tie (as reported by others), and the lower a person's status the *more* likely they are to receive a negative tie, but that a person's status is *not* consistently significantly related with their likelihood of generating a negative tie.

Dyadic effects. In addition to testing the individual-level associations, we can also use correlations to test some of the dyadic associations. We correlate the matrix representation of the negative tie network with: (a) the *dissimilarity matrix* of individual social status measures, and (b) the *difference matrix* of individual social status measures. The status dissimilarity matrix for a group of N people is the

Table 3B
Correlations testing dyadic-level effects: Status measures and negative ties.

	Status Dissimilarity				Status Difference			
	Pos.	Neg.	*p*	x^- (sd)	Pos.	Neg.	*p*	x^- (sd)
56 Networks								
In-Degree, Friendship	29	27	0.45	0.001 (0.03)	41	15	0.0003	0.04 (0.06)
Eigenvector, Friendship	30	26	0.34	0.004 (0.04)	38	18	0.005	0.03 (0.06)
In-Degree, Esteem	27	29	0.66	−0.006 (0.04)	51	5	0.000	0.06 (0.06)
Eigenvector, Esteem	29	27	0.45	0.0003 (0.04)	50	6	0.000	0.06 (0.06)
Within Cohorts (211)[a]								
In-Degree, Friendship	101	110	0.75	0.010 (0.12)	142	69	0.000	0.056 (0.13)
Eigenvector, Friendship	120	91	0.03	0.021 (0.13)	131	80	0.0003	0.043 (0.13)
In-Degree, Esteem	104	107	0.61	0.008 (0.13)	155	56	0.000	0.075 (0.13)
Eigenvector, Esteem	108	103	0.39	0.013 (0.14)	154	57	0.000	0.074 (0.13)

N x N matrix where the *i,j* matrix entry is the *absolute value* of the difference between the status of individual *i* and the status of individual *j*. The status difference matrix for a group of N people is the N x N matrix where the *i,j* matrix entry is the *signed* difference between the status of individual *i* and the status of individual *j*. The dissimilarity matrix neglects the direction of the effect, while the difference matrix preserves the direction.

Note that these correlations are among network variables. That is, for a single dormitory in a single year with the average of 53 students, there are 2756 (53*52) dyads (excluding the diagonal, which would represent students' relationships with themselves), each with their own status differences. This status difference network is being correlated with the negative tie network. The average density among the negative tie networks is 0.05, meaning that only 5% of the possible 2756 negative ties are present. The other 95% are zeros. As a result, correlations between ties and similarity networks can both be small and significant. Because each of the 56 site-years yields its own correlation, Table 3B presents the results of a sign-test of the correlation coefficients across the fourteen sites and the four years.

A positive correlation between negative ties and the dissimilarity matrix indicates that negative ties are more common among individuals with larger status differences – that is, evidence for status heterophily in negative ties. A negative correlation indicates that negative ties are more common among individual with smaller status differences – that is, evidence for homophily in social status among negative ties. The mean correlation between the negative tie networks and their corresponding friendship-based eigenvector (in-degree) status dissimilarity matrices is 0.004 (0.001). As summarized in Table 3B, thirty (twenty-nine) of the correlations are positive and twenty-six (twenty-seven) are negative. For esteem-based eigenvector (in-degree) status dissimilarity, the mean correlation with negative ties is 0.0003 (-0.006), with twenty-nine (twenty-seven) positive and twenty-seven (twenty-nine) negative correlations. This distribution of correlations does not support a significant overall association between absolute status distance and negative ties based upon a simple sign test. That is, if there were no association between absolute status distance and negative ties, then positive and negative correlations should appear with equal frequency. The chance of observing at least thirty positive correlation estimates out of fifty-six measures if the true correlation were zero (and thus equally as likely to be positive as to be negative) is $p = 0.34$ for eigenvector ($p = 0.45$ for in-degree) friendship status and $p = 0.45$ for eigenvector ($p = 0.66$ for indegree) esteem status. In short, we observe no significant bivariate association.

We can also use network correlations to examine whether a directional status difference effect may be associated with negative ties. Evaluating these directional hypotheses requires using the correlation between the negative tie network and the *difference matrix*. The difference matrix is like the dissimilarity matrix, but the raw difference is used rather than the absolute value of the same. A positive difference in the status difference matrix means that individual *i* is of higher status than individual *j*, and a negative difference of equal magnitude appears in the *j, i* cell of the same matrix. A positive correlation between the negative tie network and this status difference matrix means that negative ties are more likely to be reported by people of higher status towards people of lower status. A negative correlation indicates that negative ties are more likely to be reported by people of lower status towards people of higher status. The mean correlation between friendship-based eigenvector (in-degree) status differences and negative ties across the 56 networks is 0.03 (0.04). As summarized in Table 3B, of the 56 correlations, 38 (41) are positive and 18 (15) are negative. The same sign test as above shows these results to be significant, with $p = 0.005$ ($p = 0.0003$). In the case of esteem-based eigenvector (in-degree) status, the mean status difference-negative tie correlation is 0.06 (0.06), with 50 (51) positive correlations and 6 (5) negative correlations, with $p = 0.000$ ($p = 0.000$). This evidence in support of a positive difference association at the dyadic level suggests a directional tendency where negative ties are more frequently reported by higher status individuals towards lower status individuals.

In addition to conducting these correlations across the 56 site-years, we also examine the correlations across the 224 site-year-cohorts. Of these 224 site-year-cohorts, 13 reported zero within-cohort negative ties, and had to be excluded. Sign tests for the remaining 211 correlations mirror the findings above. We find a consistent strongly significant positive correlation between status differences and negative ties, but no consistently significant correlation between status dissimilarity and negative ties.

These bivariate results all support the traveling down hierarchies perspective for the pattern of negative tie formation in relationship to a social status hierarchy. At the individual level, the consistent significant negative association between an individual's status and receiving negative ties is directly contrary to the traveling up perspective. At the dyadic level, we find a strong and significant positive directional effect, consistent with negative ties traveling down the status hierarchy. The larger the status difference, the more likely a negative tie that goes from a higher status individual to the lower status individual. These effects are robust across multiple measures of social status and multiple levels of data aggregation.

These correlational findings are first-order effects. Because individual and relational processes interact simultaneously, we need to test for each while controlling for the other, as well as controlling for other potentially confounding factors. Our MRQAP analysis achieves this goal while simultaneously controlling for all network structure effects. Our meta-regression analysis across the MRQAP results enables a single analysis of our dataset of fifty-six social networks.

5.3. Meta-regression analysis of simultaneous estimation using MRQAP

The results of the MRQAP analyses and the meta-regression across them are presented in Table 4. At the individual level, we find strong support for the idea that an individual's status by itself is negatively associated with the likelihood of *receiving* a negative tie. This finding means that the lower an individual's status, the higher the likelihood of receiving a negative tie, and the higher an individual's status, the lower the likelihood of receiving a negative tie. When accounting for other effects, we do not find a consistently significant effect of an individual's status on their likelihood of *generating* a negative tie.

We also find significant and robust evidence for the relational effect of dissimilarity. The likelihood of a negative tie between two people is directly associated with the difference in status between them. The

Table 4
Meta-regression analysis of z-scores for parameter estimates from Multiple Regression Quadratic Assignment Procedure (MRQAP) analysis of 56 distinct networks and 1600 unique individuals examining the role of status hierarchies in the formation of negative ties. Status was measured two ways for two networks: eigenvector centrality and indegree centrality from the friendship and esteem networks. Eigenvector centrality results are shown in black. Indegree centrality is highly correlated (> 0.90) with eigenvector centrality, and results are in gray. Meta-regressions include fixed effects for year, weights by number of students at each site, and robust standard errors clustered by site. Reported t-statistics are from the intercepts of the predictor-specific meta-regressions.

	Predicting Negative Ties from friendship-based status		Predicting Negative Ties from esteem-based status	
	Meta-t via eigenvector	Meta-t via in-degree	Meta-t via Eigenvector	Meta-t via in-degree
Status				
Generating (ego effect)	−1.71†	−0.13	−4.87***	−4.24***
Receiving (alter effect)	−3.44***	−4.10***	−16.4***	−15.5***
Dissimilarity (|ego – alter|)	3.40***	1.72†	6.06***	5.22***
Direction (sign(ego-alter))	1.28	−0.40	3.13**	3.16**
Controls				
Female, Generating	0.83	1.01	0.80	0.75
Female, Receiving	−0.75	0.08	0.24	1.05
Same Gender	0.62	0.37	0.58	0.21
White, Generating	0.91	0.02	0.88	0.05
White, Receiving	0.86	−0.01	1.16	0.28
Same Racial/Ethnic Category	−1.53	−0.65	−1.48	−0.71
Sophomore, Generating[a]	1.21	1.05	1.35	1.28
Sophomore, Receiving[a]	2.28*	2.91**	3.50***	3.44***
Junior, Generating	3.29**	3.34***	3.37***	3.40***
Junior, Receiving	1.83†	2.12*	3.53***	3.85***
Senior, Generating	1.06	1.44	1.66†	2.22
Senior, Receiving	3.53**	4.15***	6.69***	7.85***
Same School Year	7.83***	7.64***	8.13***	8.10***

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
[a] The baseline category is first year students.

greater the status difference, the more likely a negative tie will be reported. In terms of the direction of these ties, we find an inconsistent positive effect significant only for status measures based on esteem ties. We do not observe a significant (or even consistently positive) direction effect for status based on friendship. However, the notion of esteem seems to be more closely related to the concept of social status, so it is not entirely surprising that the two patterns should diverge.

Among the control variables, the absence of any significant findings associated with gender is notable. We find neither individual nor relational gender controls to be significant. Any “mean girls” (Dellasega, 2005; Fey, 2004) type phenomenon relating status to negative ties that may be at work here operates similarly for both men and women. Racial category controls are similarly insignificant. We do observe multiple effects from the year-in-school controls. Sophomores, less-consistently juniors, and seniors receive more negative ties than first-year students (the reference category). Juniors are more likely to generate negative ties than first-year students (perhaps because of the larger risk set of exposure to more cohorts in front of and behind them). Same-cohort members are much more likely to report negative ties than students in different cohorts.

The absence of gender and racial effects and the presence of year-in-school effects add confidence to our within-cohort correlational analysis results. The observed year-in-school effects are unlikely to compromise the within-cohort correlations as they are stratified by year-in-school, and the other controls show no associations. The strong year-in-school effects do motivate the need for the within-cohort analysis. We could not perform a multivariate MRQAP analysis within cohorts as there were too few negative ties per site-year-cohort (median: 7 negative ties) to support a reliable multivariate analysis.

Taken together, we find negative ties tend to be both an individual and a relational phenomenon. Lower status individuals are likely to receive negative ties from all others, and as status differences increase, the probability of a negative tie also increases. These multivariate analysis results are wholly consistent with the bivariate analyses, and support the pattern of negative ties traveling down status hierarchies.

5.4. Within-individual analysis

In addition to the MRQAP and bivariate analyses, we took advantage of the fact that we observe many of the students over multiple years to conduct a robustness check in the form of a within-individual (student fixed effects) analysis across individual-year observations. This within-individual approach controls for all static individual characteristics, whether observed or unobserved. This analysis is necessarily an individual-level or node-level analysis, and thus cannot have the negative tie network as the dependent variable. We use individual negative tie in-degree and negative tie out-degree as the dependent variables. We include a year-in-school control term, as that varies within-student over time. Our results, shown in Panel A of Table 5, estimate how within-individual changes in status indicators are associated with within-individual changes in negative tie degree, and are fully consistent with those reported above. All four measures of status are negatively associated both with receiving (in-degree) and generating (out-degree) negative ties, but the effects are larger and more strongly significant ($p < 0.001$) for receiving (in-degree) negative ties. We also observe a significant positive effect for year-in-school, suggesting that as students become more senior, they also become more likely to receive negative ties. We find no such effect for generating negative ties. This individual fixed effect analysis cannot evaluate the dissimilarity or directional effects. This supplemental analysis also provides a straightforward way to evaluate the possibility of curvilinear relationships between status and negative ties. These results are shown in Panel B of Table 5, and reveal no significant curvilinear effects for any of the four status measures on either receiving or generating negative ties.

Social status clearly plays an important role in the formation of negative ties by ordering those ties down the status hierarchy towards lower status individuals. Our data reveal this patterning of negative ties significantly and robustly in analyses aggregated over fifty-six distinct networks, for multiple measures of social status, and using network analytic methods that control for all network-structure effects on a dependent variable network of directly-reported dyadic negative ties.

6. Discussion and conclusion

6.1. Summary

Recent network scholarship has sought to understand the role of social status on the occurrence and patterning of negative ties. These efforts have yielded contradictory findings. For example, Berger and Dijkstra (BD, 2013) find that negative ties tend to travel down social status hierarchies from higher status individuals to lower status individuals. In contrast, Fujimoto, Snijders, and Valente (FSV, 2017) find that higher status individuals are more likely to be perceived as being disliked. In reviewing these and other related studies, we identified three likely sources for these contradictory findings: (1) different measures of social status; (2) use of perceptions of others’ relationships versus direct sociometrically-measured dyadic ties; and (3) sensitivities to structural factors. We described and conducted multiple complementary analyses to address these issues. Rather than use a single measure of social status, we used multiple measures. Rather than use

Table 5
Within-individual analysis of associations between changes in status and changes in the receipt (in-degree) or generation (out-degree) of negative ties (N = 2368 observations from 939 unique individuals).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A: Linear	**Negative Tie In-degree**				**Negative Tie Out-degree**			
Esteem in-degree	−0.62***				−0.21*			
	(0.07)				(0.11)			
Esteem eigenvector		−0.57***				−0.18†		
		(0.07)				(0.10)		
Friend in-degree			−0.35***				−0.16†	
			(0.06)				(0.08)	
Friend eigenvector				−0.25***				−0.14†
				(0.05)				(0.07)
Year in school	0.002***	0.002***	0.002**	0.002***	−0.001	−0.001	−0.001	−0.001
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.001)	(0.001)	(0.001)	(0.001)
Adjusted R^2	0.35	0.35	0.34	0.33	0.18	0.18	0.18	0.18
B: Curvilinear	**Negative Tie In-degree**				**Negative Tie Out-degree**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Esteem in-degree	−0.36*				−0.35			
	(0.17)				(0.25)			
Esteem in-degree^2	−5.45+				2.95			
	(3.15)				(4.65)			
Esteem eigenvector		−0.42**				−0.33		
		(0.16)				(0.24)		
Esteem eigenvector^2		−2.92				2.94		
		(2.99)				(4.40)		
Friend in-degree			−0.34**				−0.28	
			(0.13)				(0.18)	
Friend in-degree^2			−0.27				2.29	
			(2.07)				(3.01)	
Friend eigenvector				−0.25*				−0.28†
				(0.11)				(0.16)
Friend eigenvector^2				−0.12				2.57
				(1.67)				(2.42)
Year in school	0.003***	0.002***	0.002**	0.002***	−0.001	−0.001	−0.001	−0.001
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.001)	(0.001)	(0.001)	(0.001)
Adjusted R^2	0.35	0.35	0.34	0.33	0.18	0.18	0.18	0.18

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

perceptions of others' relationships – which are likely confounded with status as suggested by research finding status to be associated with accuracy in network perceptions – we use sociometrically-measured dyadic negative ties. Rather than using network estimation methods that can be biased when important structural factors are omitted from the model, we use a method that controls for all structural features. In addition to these, we implement this approach over multiple empirical settings, at multiple levels of analyses including a within-individual analysis that addresses concerns of individual heterogeneity, and perform meta-regressions to identify the role of social status in patterning the occurrence of negative ties. We find that negative ties travel down status hierarchies and tend to target low-status individuals. Also, a negative tie is more likely to occur as the status difference in a dyad increases. Net of these two dynamics, higher status individuals are not more likely than others to generate negative ties. Our analysis provides strong, consistent, and robust evidence favoring the view that negative ties are patterned as traveling down status hierarchies.

6.2. Low-status rejection

Our findings, in conjunction with other empirical and theoretical scholarship, reveal a common social mechanism of *low-status rejection*. Status and positive ties are related via a mechanism of status leakage, where status diffuses through positive ties. Negative ties play a different role in status work. Negative ties distance an individual from status threats. Negative ties directed towards lower status individuals help to guard against harmful status leakage that might otherwise result from a positive tie with a lower status individual.

This low-status rejection mechanism has been observed and documented in other social contexts. Sociological research in the cultural consumption literature (Peterson and Anand, 2004; Lizardo and Skiles, 2008), has not found strong evidence of a high-status cultural elite who rejects lower-status cultural activities (music, art, etc.). Instead, this scholarship reveals a boundary created by the generalized rejection of particular low-status segments of cultural consumers (Bryson, 1996). In the case of music, higher status is associated with greater musical genre tolerance generally, but "those genres whose fans have the least education - gospel, country, rap, and heavy metal - are also the most likely to be rejected by the musically tolerant" (Bryson, 1996: 884). The rejection of musical genres is done not solely by an elite, but by many, and targets specifically the lowest-status genres.

Social psychological research has long known that negative ties are a tool for group boundary maintenance and identification (Sherif et al., 1961). More recently, Fiske (2011) shows that in cases of classism, ageism, and anti-immigrant prejudices, privileged groups respond to stigmatized groups with pity, distancing, and dehumanization. Fiske's synthesis of this research posits that people of lower social status tend to be viewed by others with scorn (Fiske, 2011). Boda and Néray (2015)'s study of 420 secondary school students in Hungary finds that students in the higher-status non-roma majority are significantly more likely to direct their negative ties to those they perceive as being members of the lower-status roma minority. Importantly, the lower-status roma minority students were not more likely to direct negative ties towards those they perceived as being in the non-roma majority. (Their estimate was negative and not significant.) They describe their negative ties as a tool for social rejection.

6.3. Limitations

Several of this study's limitations have been noted above. Our use of

a mild definition of a negative tie is designed to be encompassing, but replication using other, ideally multiple, negative tie definitions would be helpful. In addition, since our focus was direct, dyadic, and sociometrically-measured negative ties rather than reputational negative ties, our study resembles BD more than FSV. The FSV finding that reputational negative ties travel up status hierarchies may be wholly accurate. If so, then reputational negative ties operate differently than sociometrically-measured dyadic negative ties, which travel down status hierarchies. Also, we focus on status position within informal hierarchies since we examine peer networks of residential organizations. However, negative ties driven by status from more formal hierarchies may be differently developed and patterned. Moreover, although our tests involve 14 distinctive sites across multiple years, our empirical context is distinctive, which may raise questions about the generalizability of our findings.

Importantly, our cross-sectional analysis entails uncertainty regarding the causal direction. Our titular mechanism is low-status rejection, where status hierarchies and differences lead to negative tie formation. Another possibility is low-status relegation, where the receipt of a negative tie leads to lower status. We found fewer examples of scholarship describing this direction. As in the case of positive ties and status – where there is evidence both of positive ties contributing to status and of status contributing to positive ties – both mechanisms may be occurring simultaneously for negative ties and status. We note that DeKlepper and colleagues described the status hierarchies they studied as "develop[ing] early in the organization's life and remain remarkably stable" (DeKlepper et al., 2017). This stability in status hierarchy is in contrast to the instability of negative ties (FSV show reputational negative ties had less than half the Jaccard coefficient – a measure of longitudinal tie stability – relative to positive ties: 0.1 compared to 0.27, respectively), and is suggestive that although bi-directional associations are possible, negative ties may be more likely to be a response to rather than a cause of status hierarchies. The annual nature of our data in a context where there is substantial annual turnover among network members makes longitudinal network analysis challenging. Future research with more frequent longitudinal observations of both negative tie networks and status may be able to identify the conditions where one or the other mechanism dominates. Until then, our understanding of the relationship between negative ties and status can mirror that of positive ties as status – an entwined dynamic where both directional processes are likely to occur.

6.4. Implications

Beyond helping to identify and resolve prior contradictory findings regarding the question of how status hierarchies pattern the occurrence of negative ties, this article makes several additional contributions to understandings of both status and negative ties. First, our finding that negative ties tend to travel down status hierarchies also informs the nascent scholarship seeking to create a useful taxonomy for negative ties. Specifically, that the negative sentiments associated with envy, jealousy, and bitterness – which are seen as going up status hierarchies – are likely to be sociometrically distinct from those associated with scorn, disgust, and rejection, and that the latter are more related to generic reports of even mild negative dyadic relationships. Susan Fiske's *Envy up, scorn down* (Fiske, 2011) revealed how these two classes of sentiments relate to status hierarchies. Given the contrary prior findings of BD (2013) and FSV (2017), it was neither clear which classes of sentiments are more closely associated with sociometric measures of dyadic negative ties, nor which negative tie relationship with status is dominant. Our mild negative tie definition could have as easily been associated with negative feelings of envy as negative feelings of scorn. Still, we found a clear, consistent, and unambiguous pattern of these direct ties traveling down the status hierarchy. Integrating our findings with Fiske's, when peers are asked about their direct negative relationships, they are more likely to report relationships involving sentiments of scorn and rejection than envy or jealousy. And these relationships show consistent associations with status. Conversely, measures of negative ties explicitly involving sentiments relating to envy or jealousy may yield very different dynamics and associations compared to more generically-defined negative ties.

Given our finding in both our MRQAP and within-individual analyses that more senior students attract more negative ties, our mild negative tie measure may also have encompassed some of these envy-like negative relationships. Of these two tendencies, the negative ties that travel down status hierarchies clearly dominate in our data. Our seniority effect bears some resemblance to FSV's finding that popular students are also seen as having higher reputational dislike. Controlling for our network measures of status, more senior students are still more likely to receive negative ties than first year students. Both processes are operating simultaneously. We observed the same low-status rejection pattern of negative ties in our within-cohort correlation analysis where no year-in-school effects were possible. If the seniority effect is not a status effect, then our findings may point to a mechanism involving more the visibility and recognizability aspects of popularity and seniority (e.g., Labianca et al., 1998) rather than social status as an explanation for both our senior effect and FSV's empirical settings.

The similarity between the patterns we observe in our sociometric negative ties and other behaviors also provides useful tools for scholars seeking to understand negative ties, relationships and behaviors. Behaviors that involve expressions of distancing or scorn are likely to have similar status associations as we observe for negative ties. In their study of workplace gossip, Ellwardt et al. (2012) find that negative gossip is much more narrowly targeted towards lower-status colleagues. Similarly, DeKlepper et al. (2017) find that lower status peers are the ones most frequently targeted by others for behavioral control attempts. These behaviors could be telling manifestations of low-status rejection. Gossip told to a peer about a low-status colleague is a direct communication between the teller and the listener. This behavior can be an attempt by the teller to signal to the listener that the teller is distancing themselves from the low-status colleague, and to provide an opportunity to the listener to verify and/or join the teller in that distancing. The military context of the DeKlepper et al. (2017) may be a setting where distancing is not an option, as the midshipmen cohorts are collectively responsible for compliance. In such a context, behavioral control attempts may play the inverse role of distancing. Importantly, they find that although low-status leads to more control attempts, these control attempts (both in enactment and receipt) do not lead to changes in status.

Another contribution concerns the methods used for studying negative ties. Scholarship revealing the nature of negative ties is rapidly growing. One area of needed attention is the structural antecedents of negative ties (e.g., Harrigan and Yap, 2017). Until the structural antecedents of negative ties are more fully understood, it will be difficult to be confident that important structural factors are controlled for in methods that require their explicit inclusion in the model specification (e.g., ergm, SIENA). For research primarily concerned with associations between negative ties and node characteristics, whether individually or relationally, methods that control for all network structural features (e.g., MRQAP) are not affected by this concern.

A third contribution is identifying the importance of considering both status and group membership dynamics for understanding negative ties. Although our primary focus has been the role of status hierarchies, our group membership controls revealed outcomes that can be instructive for future work. Our results reveal null and positive associations for negative ties within groups that relate to status. The null effects are for the gender and racial/ethnic group categories. The positive effect is the more-within/fewer-between pattern of negative ties and school cohort. All three grouping types are associated with status, yet show different patterns for within-group versus between-group negative ties. Notably, the recent Boda and Néray (2015) paper finding inter-ethnic negative tie effects also found no between-gender negative

tie effects. Merluzzi's (2017) study of negative ties among managers at two professional firms does show important gender dependencies in the formation of negative ties. Further research is needed to describe why and when negative ties are more likely to form within or between status-relevant social groups.

This article also has implications for research involving status. Specifically, prior studies have used directed negative ties as a status indicator assuming that a negative tie tends to travel down status hierarchies (e.g., Leskovec et al., 2010a). If the tie definition is generic or based on sentiments like scorn or rejection, then this choice is reasonable. If the tie definition is based on sentiments like envy or jealousy, the choice may be less reasonable. Importantly, we find that status measures based on negative ties are consistently distinct from status measures based on positive ties. Other studies show similar distinctiveness (e.g., DeKlepper et al., 2017). Additional research examining which aspects of social status are most associated with positive versus negative tie measures (as Smith et al., 2014 have done for power) is needed.

6.5. Conclusion

Returning to our initial questions concerning the *Margaret Garner* scene described at the beginning, was the fictional account accurate? We do find that negative ties tend to be directed towards low-status peers in a manner wholly consistent with a low-status rejection mechanism. Organizational members of all status levels tend to direct negative ties to low-status members. This finding comes from an analysis that uses sociometrically measured negative ties, multiple measures of social status, and a variety of statistical methods that control for network structure effects and individual-level heterogeneity. Our approach and findings help to resolve prior contradictory findings about how status hierarchies pattern negative ties. Our study could not evaluate the temporal hypothesis that reductions in status yield increases in the receipt of negative ties. This temporal implication of the low-status rejection mechanism requires additional research.

While our findings support the view that dyadic negative ties travel down status hierarchies as low-status rejection, our research also raises puzzles that are informed by the research that suggested that other types of negative ties (e.g., reputational dislike) may travel up status hierarchies. FSV (2017) found higher status peers were more likely to be perceived as being disliked. They found evidence that these negative reputation perceptions diffuse, and that positive ties and group memberships (possibly via the friendship ties co-membership fosters) are important conduits for this diffusion. While we raised the concern about status-associated biases in accurate perceptions of networks, FSV's findings regarding the diffusion of status (and possibly network) perceptions via positive ties is an important insight for informing future studies of both status and negative ties. Status is collectively constructed and relies heavily upon perceptions. The ethnic group membership and negative tie effects documented by Boda and Néray (2015) depended upon the negative tie sender's *perception* of the target's group membership more than the target's self-declared membership. These status perceptions diffuse across positive ties, and these positive ties occur more frequently within groups. The role of group membership in moderating the relationship between status and negative ties is likely complex. Part of this complexity may involve the extent to which status perceptions diffuse and are shared among group members. As negative tie research develops, the interplay between diffusion of perceptions, social influence, and group membership merits greater scrutiny and study.

The current article reveals a consistent pattern of negative ties traveling down status hierarchies in a manner suggesting a low-status rejection mechanism. Although this conclusion helps to resolve one aspect of the debate regarding social status and negative ties, several questions, such as the temporal dynamics of this association and how more reputational types of negative relationships relate to status hierarchies remain. Emerging from this work are new questions about the interplay among influence, perceptions, and group membership on these negative tie and status associations. The evidence that negative ties play an important and distinctive role in structuring our social world prompts continued careful scholarly attention.

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