Peer Effects in Academic Cheating[1]

Oct 28, 2005

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Abstract: Using self-reported academic honor violations from the classes of 1959 through 2002 at the three major U.S. military service academies (Air Force, Army, and Navy), we measure how peer honesty influences individual cheating behavior. All else equal, we find higher levels of peer cheating result in a substantially increased probability that an individual will cheat. We identify through separate estimation procedures an exogenous (contextual or pre-treatment) peer effect and an endogenous (during treatment) peer effect. Results for the (first-order) exogenous peer effect indicate that one additional high school cheater creates 0.33 to 0.48 new college cheaters. Results for the (first-order) endogenous peer effect indicate that one additional college cheater creates 0.61 to 0.86 new college cheaters. These results imply, in equilibrium, the social multiplier for academic cheating ranges between 2.56 to 3.97. We also find evidence that the peer effect should be thought of as an evolving social norm of toleration versus congestion in enforcement of honor codes.

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the United States Air Force, Department of Defense, or the US Government.

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JEL Classifications: Z13, D71, C42
Key Words: Peer Effects, Honor Code, Survey

[1] We would like to thank Bruce Sacerdote and Doug Staiger as well as all participants at the Dartmouth College seminar and the Western Economic Association annual meetings for their numerous helpful comments.

I. Introduction

As far back as 1948, Solomon Asch reported that persons in social settings – for whatever reasons – will subscribe to the perceptions of the "erroneous majority" with a high degree of conformity, and these group perceptions will persist for many generations (Crutchfield, 1955). More recently, the question of whether peers influence individual behavior has been widely studied in the economics literature. Most studies have focused on peer effects in neighborhoods, crime, primary education, or college educational outcomes. Our study measures peer influence in academic cheating.

Although not explicitly mentioned, the academic cheating literature has hinted at possible peer influence in cheating. For example, Stanard & Bowers (1970) found cheating higher among members of a fraternity or sorority and Bowers (1964) found cheating higher among intercollegiate athletes. We are aware of only one other study attempting to measure peer influence in academic cheating. McCabe & Trevino (1993) found that academic cheating is highly correlated with peer behavior. Their measure of peer behavior consisted of 1) "…student perceptions of how frequently either plagiarism or test cheating occurred…and… 2) the actual number of times the respondent had observed another student cheating...." Specifically, they reported that, "Peer's behavior had by far the strongest influence on academic dishonesty." (McCabe & Trevino, 1993 p. 530-532) On the surface, their results are quite compelling; however, the statistical methods used in their study did not correct for endogeneity of the peer measure or self-selection of individuals into peer groups. That is, their measure of peer influence is likely endogenous to individual cheating, rendering it impossible to distinguish the individual effects from the peer effects.

Using self-reported academic honor violations from the classes of 1959 through 2002 at the three major U.S. military service academies (Air Force, Army, and Navy), we measure how peer honesty influences individual cheating behavior. Correcting for endogeneity and by exploiting academy admissions policy to minimize selection bias, we find strong positive peer effects (or social interactions) in academic cheating. That is, all else equal, higher levels of peer cheaters result in an increased probability that an individual will cheat. The peer effect remains substantial and statistically significant when including academy (school) fixed effects, time fixed effects, and academy specific time trends, providing strong evidence of the existence of peer influence in academic cheating.

We identify through separate estimation procedures an exogenous (contextual or pre-treatment) peer effect and an endogenous (during treatment) peer effect.[2] The magnitudes of the peer effects are substantial. Results for the (first-order) exogenous peer effect indicate that one additional high school cheater creates 0.33 to 0.48 new college cheaters. Results for the (first-order) endogenous peer effect indicate that one additional college cheater creates 0.61 to 0.86 new college cheaters. These results imply, in equilibrium, the social multiplier for academic cheating ranges between 2.56 to 3.97, which we consider an upper bound of the peer effects we measure.

We also find different magnitudes of peer effects from occasional versus frequent cheaters. We find evidence that the peer effect may weaken as peer reporting and confronting of honor code violations increase. In various specifications of our empirical

[2] In identifying separate exogenous and endogenous peer effects our models assume the peer effect is completely driven through either pre-academy characteristics or completely through peer behavior while at the academy. In actuality, the underlying peer effect is likely some combination of the two, which we can't identify in a single model.

models, the academies with the lowest level of cheating have the highest level of peer reporting of violations. These results lead us to believe the peer effect may be that of an evolving social norm of toleration.

II. Service Academy Honor Policies

All three major service academies have honor policies that strictly prohibit lying, cheating or stealing. At the US Air Force Academy, the honor code states, "We will not lie, steal, or cheat, nor tolerate among us anyone who does." At the US Military Academy, the honor code similarly states, "A cadet will not lie, cheat, steal or tolerate those who do". Finally, the US Naval Academy has an honor concept which says, "Midshipmen are persons of integrity: They stand for that which is right. They tell the truth and ensure that the full truth is known. *They do not lie.* They embrace fairness in all actions. They ensure that work submitted as their own is their own, and that assistance received from any source is authorized and properly documented. *They do not cheat.* They respect property of others and ensure that others are able to benefit from use of their own property. *They do not steal*." (Italics added to highlight similarity to USAFA and USMA honor codes.)

To uphold these ideals, each academy has an elaborate "honor system" run primarily by cadets/midshipman. All three academies thoroughly investigate accusations of honor violations and convene an "honor board" of cadets/midshipmen to determine if an infraction has occurred. If a cadet/midshipman is found to have committed an honor violation, sanctions up to and including removal from the academy are possible.

Survey data show the academy honor systems are likely good deterrents of academic cheating when comparing levels of cheating to other college campuses. Our data from the classes of 1959 through 2002 shows that approximately 17% of cadets/midshipmen sampled admit to committing at least one academic honor violation. However, cheating occurrences, on average, have risen over time with a sample average of 27% admitting to cheating at least once in the classes of 1995-2002. This compares to 75% of students across 21 campuses admitting to cheating in a 1999 survey (CAI, 2005).

III. Literature Review

Types of Peer Influence

Manski (1993) defines three distinct types of peer influence: 1) exogenous effects, 2) endogenous effects, and 3) correlated effects. Exogenous or contextual effects occur when individual behavior "varies with the exogenous characteristics of the group" (Manski, 1993 p. 532). Endogenous effects occur when individual behavior varies with the (during treatment) behavior of the group. Finally, "correlated effects are driven by selection of individuals with similar backgrounds in to a group" (Sacerdote, 2002 p.3).

Our study seeks to identify through separate estimation procedures an exogenous and an endogenous peer effect. In doing so, we implicitly assume there are no selection effects in the data.

Measuring Peer Influence

Although social psychologists have long believed in the concept of peer influence, actual measurement of such effects is quite arduous. Two main challenges exist in measuring peer influence. First, it is difficult to separate the "group's influence on an individual's outcome from the individual's influence on the group." (Vidgor & Nechyba, 2004 p.5) This problem is often referred to as the endogeneity problem (Sacerdote, 2001) or the reflection problem (Manski, 1993). The second issue in measuring peer influence occurs because individuals tend to self select into peer groups. Self-selection makes it "difficult to separate out the selection effect from any actual peer (treatment) effect." (Sacerdote, 2001)

Resolving the first issue is typically handled by finding a suitable instrument for peer behavior that is exogenous with respect to the stochastic error component of the dependent variable. The dependent variable in our paper is the choice of whether or not to cheat while in college. For example, Figlio (2005) uses a strategy of instrumenting for classroom misbehavior using boy's names. Other studies have used the average behavior of parents as an instrument (Case & Katz, 1991; Gaviria & Raphael, 1999). Finally, a more recent strategy in the education peer effects literature has used lagged peer achievement as a (exogenous) proxy for current achievement (Betts & Zau, 2004; Burke & Sass, 2004; Hanushek, et al., 2003; Vidgor & Nechyba, 2004).

Next, the selection problem has typically been resolved using situations in which a "natural experiment" occurs and individuals are randomly assigned to peer groups (Boozer & Cacciola, 2001; Sacerdote, 2001; Zimmerman, 2003). Another strategy, widely used in the primary education peer effects literature, is to "use idiosyncratic variation in the composition of peer groups - such as the differences between successive cohorts within a school, or across classrooms in an elementary school." (Vidgor & Nechyba, 2004 p.5; Betts & Zau, 2004; Burke & Sass, 2004; Hanushek, et al., 2003) This has typically been accomplished using large administrative panel data sets while employing a series of fixed effects models.

Identification Strategy

To address these estimation problems, we use two separate approaches. In the first approach, we identify the (exogenous) peer effect by specifying the frequency of college academic cheating as a function of own honesty, the honesty of one's cohorts, and several other exogenous variables. Honesty is presumed to be exogenous with respect to academic cheating while enrolled at a service academy, but is unobservable. Self-admitted incidents of high school cheating should a-priori be negatively correlated with honesty, and by virtue of occurring prior to service academy enrollment, be exogenous with respect to academic cheating while enrolled at a service academy. Reduced form coefficients, as developed below, can be consistently estimated using least squares estimation techniques. In the second approach, we identify the (endogenous) peer effect by specifying the frequency of college academic cheating as a function of peer college cheating and other exogenous variables, including own high school cheating. We estimate this equation using 2 stage least squares (2SLS) with peer high school cheating and other exogenous explanatory variables used as first stage regressors.

To address issues regarding selection bias, we employ empirical techniques and refer to institutional admission procedures that mitigate selection bias. Empirically, we isolate the changes in peer cheating across cohorts over time at the three service academies from the graduating classes of 1959-2002 using a series of fixed effects models to control for systematic variation between academies and through time.

The congressional nomination process for admittance to the three service academies provides some safeguard against systematic selection bias in our sample. For admittance to a service academy, an individual must not only meet the admissions requirements of the academy, but also receive a nomination from their congressional representative or senator.[3] Members of congress are allotted five total vacancies at each service academy, with vacancies available only through graduation or withdrawal/expulsion. Therefore, the probability of admittance to any service academy in a given year is directly proportional to the number of available slots in one's congressional district/state. In an informal survey of congressional staff offices, we found that the typical congressional office handles the nomination process for all three academies in one application, with applicants rank-ordering their service academy preferences.

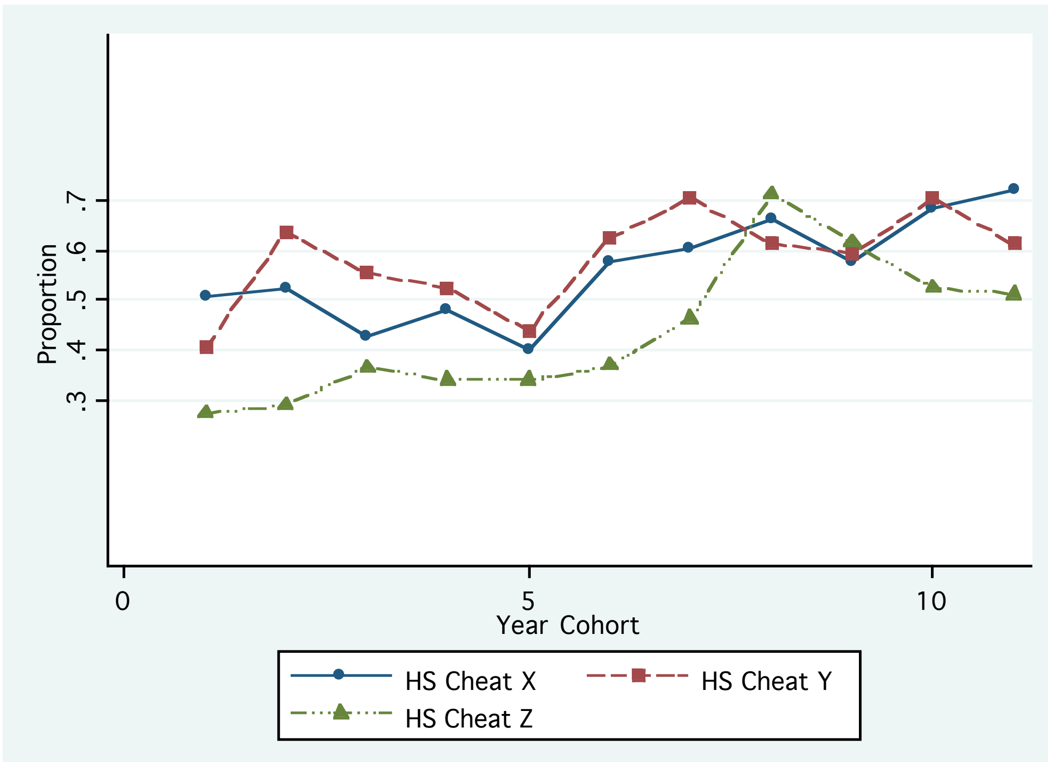
The application process protects against selection bias in our sample in two ways. First, it ensures geographical diversity, with each service academy admitting students from every state and every congressional district in the United States. This prevents any given service academy from admitting a large proportion of students from areas in the country which are more or less likely to cheat. Second, the probability of admittance, regardless of qualifications, is a function of a random element – the number of available slots in one's district. Hence, for students who apply to more than one academy, they may be randomly placed into one of the three academies depending on the number of available slots in their given district in a given year.

An indication of systematic selection bias would be one academy consistently admitting more or less cheaters over time relative to the other academies. To assess the likelihood of this, Figure 1 plots the proportion of high school cheaters by cohort over time for each academy. Note that each academy has at one point in the sample admitted the largest number of high school cheaters and at another point admitted the lowest number of high school cheaters. However, there appears to be some systematic

[3] In addition, there are a limited number of Presidential and Vice-Presidential nominations.

differences across the service academies in cohorts 2-6. As a safeguard, our models were also estimated using only data from cohorts 7-11, with results broadly consistent with those of the entire sample.[4]

Figure 1. Proportion of High School Cheaters by Service Academy



V. Data and Methods

Data for our study were gathered by Frederick Malmstrom, from 1988 to 2005 with numerous mail surveys to a random sample of US Military Academy, US Naval Academy, and US Air Force Academy alumni listed in the *Register of Graduates*.[5] Participants were asked to identify which service academy they graduated from, and

[4] For brevity, results for these specifications are not shown, but are available on request.
[5] As Malmstrom's survey was only sent to service academy graduates, the data should be viewed as descriptive only of academy graduates, and not the academy population as a whole, since those who did not graduate for various reasons are not represented in the survey respondents. We do not have any feasible way of conducting a random sample of non-graduates after they have departed their respective service academy.

which cohort (four-year) of graduating classes they belonged to. Four-year cohorts were used instead of the actual graduating class-year with the hope of eliciting more honest survey responses from alumni not wanting to diminish the reputation of their graduating class, yet preserving the ability to identify peer-group influences in the data through time. The use of four-year cohorts as the applicable peer group is, in essence, measuring the peer "culture" of cheating within the respective academy at a given time.

Respondents were asked the frequency of their own violations of academic and nonacademic aspects of the honor code as cadets/midshipmen, and their own attitudes and actions during their high school and academy years, attitudes which might help explain their individual behaviors. See Appendix B for a copy of the survey and Appendix A for a list of summary statistics used in the study.

In the spirit of Zimmerman (2003) and Glaeser, Sacerdote and Scheinkman (2003), we first specify the frequency of academic honor violations (college cheating) as dependent upon an individual cadet/midshipman's honesty, the honesty of other cadet/midshipman in the same service academy and 4 year graduation cohort and academic aptitude. We estimate models in various functional forms with the following explanatory variables:

$$CollegeCheat_{ayi} = f(\beta_{0ay} + \beta_1 Honesty_{ayi} + \beta_2 Honesty_{ay-i} + \beta_3 SAT_{ay} + \beta_4 OM_{ayi} + \varepsilon_{ayi}) \quad (1)$$

where $College\ Cheat_{ayi}$ is the frequency with which respondent *i* at academy *a* in cohort *y* violated academic aspects of the honor code as a cadet/midshipman (see Q.15 in Appendix B). *Honesty* is defined in equations 2-4 below. β_2, the main coefficient of interest in this specification, measures the effect of peer honesty (or peer effect) on each individuals decision to cheat. SAT_{ay} is the percentage of the population academy/class cohort who scored in the top 25% of the SAT math.[6] OM_{ayi} is the quartile order of merit the respondent graduated in (see Q.4 in Appendix B). Question 16 of our survey asks respondents the frequency with which they committed acts of academic cheating while in high school, $HSCheat_{ayi}$. Since the decision of whether or not to cheat in high school was made prior to entering a service academy, it is exogenous with respect to any decision made while a cadet/midshipman. As such, we use it as the explanatory variable for the unobserved regressor $Honesty_{ayi}$.

$$(2)\qquad Honesty_{ayi} = \alpha_0 + \alpha_1 HSCheat_{ayi} + \upsilon_{ayi}$$

In a like manner, $Honesty_{ay-i}$, our peer measure of honesty, is the average honesty of all cadet/midshipman in the same academy and graduation cohort excluding cadet/midshipman *i*. When measured as a binary variable (cheater or non-cheater), this variable represents the proportion of one's academy/gradation-cohort who cheated in high school.

$$(3)\qquad \begin{aligned} Honesty_{ay-i} &= \frac{1}{n_{ay}-1}\sum_{j\neq i}(\alpha_0 + \alpha_1 HSCheat_{ayj} + \upsilon_{ayj}) \\ &= \alpha_0 + \frac{\alpha_1}{n_{ay}-1}\sum_{j\neq i} HSCheat_{ayj} + \frac{1}{n_{ay}-1}\sum_{j\neq i}\upsilon_{ayj} \end{aligned}$$

Substituting (2) and (3) into (1)

[6] Currently we only have admissions data on SAT scores from 1986 to the present as reported by the college board. However, we are in the process of requesting detailed admissions data from the three service academies to ad robustness to the model.

$$CollegeCheat_{ayi} = f\left(\begin{array}{l} \beta_{0ay} + \beta_1(\alpha_0 + \alpha_1 HSCheat_{ayi} + \upsilon_{ayi}) + \\ \beta_2\left(\alpha_0 + \frac{\alpha_1}{n_{ay}-1}\sum_{j\neq i} HSCheat_{ayj} + \frac{1}{n_{ay}-1}\sum_{j\neq i}\upsilon_{ayj}\right) + \\ \beta_3 SAT_{ay} + \beta_4 OM_{ayi} + \varepsilon_{ayi} \end{array} \right)$$

$$= f\left(\begin{array}{l} \beta_{0ay} + (\beta_1 + \beta_2)\alpha_0 + \beta_1\alpha_1 HSCheat_{ayi} + \beta_2\alpha_1 \frac{\sum_{j\neq i} HSCheat_{ayj}}{n_{ay}-1} \\ + \beta_3 SAT_{ay} + \beta_4 OM_{ayi} + \varepsilon_{ayi} + \beta_1\upsilon_{ayi} + \beta_2 \frac{\sum_{j\neq i}\upsilon_{ayj}}{n_{ay}-1} \end{array} \right)$$

(4)

$$CollegeCheat_{ayi} = f\left(\gamma_{0ay} + \gamma_1 HSCheat_{ayi} + \gamma_2 \frac{\sum_{j\neq i} HSCheat_{ayj}}{n_{ay}-1} + \beta_3 SAT_{ay} + \beta_4 OM_{ayi} + \omega_{ayi} \right)$$

We empirically estimate models based on (4) using various functional forms. Additionally, our models employ service academy fixed effects, time (graduation class cohort) fixed effects, and academy specific time trends. The fixed effects and time trends are used to control for all unobserved differences across academies and time and; therefore, isolate the effects on academic cheating from changes in the within-academy/cohort peer variable. Given the potential for error correlation across individuals and across time within a given service academy and cohort, we correct all standard errors to reflect clustering at the academy by graduation-cohort level.

In accordance with economic theory and the works cited in the literature review, we expect the following signs on estimated coefficients. If a pattern of academic cheating were established in high school, we would expect a higher likelihood of cheating while enrolled at a service academy. Hence we expect γ_1 to be positive. If we were able to directly estimate β_2, the marginal effect of peer honesty on frequency of service academy academic cheating, we would expect it to be negative. In like manner, α_1, the marginal effect of high school cheating frequency on honesty, should also be negative. Therefore, γ_2, the reduced form coefficient of peer cheating while in high school on the frequency of service academy academic cheating, is expected to be positive, being the product of β_2 and α_1. In the language of Manski (2003), γ_2 represents an exogenous peer effect. If positive, this would be consistent with peers influencing individual behavior and hence, cadets/midshipmen are more likely to behave honorably when their compatriots behave honorably.

We expect that β_3, the coefficient on the proportion of the academy/graduation-cohort who score in the top 25% of the SAT math, should be negative, as individuals with higher aptitude, all else equal, have less to gain from cheating. Finally, β_4, the coefficient on the order of merit variable should be positively correlated with cheating. Cadets/midshipmen who finish in the upper quartile within their class should have less incentive to cheat compared to those finishing in a lower quartile.[7] Due to the potential endogeneity of this variable all specifications are estimated with and without the inclusion of this variable.

To estimate the endogenous peer effect on cheating, we measure the direct effect of *peer-college cheating* on an individual's decision to cheat. We estimate models in various functional forms of equation (5).

[7] Alternatively, better grades could be the result of more aggressive cheating. We believe this to be less likely than our previous argument.

$$(5)\ Academic_{ayi} = \alpha_{0ay} + \alpha_1 HSCheat_{ayi} + \alpha_2 \frac{\sum_{j \neq i} CollCheat_{ayj}}{n_{ay} - 1} + \alpha_3 SAT_{ay} + \alpha_4 OM_{ayi} + \omega_{ayi}$$

$\frac{\sum_{j \neq i} CollCheat_{ayj}}{n_{ay} - 1}$ is the predicted proportion of peer college cheaters for respondent *i* at academy *a* in cohort *y*. A priori, we expect to find estimated coefficients of the same signs as in the previous reduced form specification.

IV. Empirical Estimation and Results

We estimate various specifications of our initial model using a linear probability model (LPM)[8] to predict the probability of whether an individual cheated while at a service academy. For our second specification, we use 2 Stage Least Squares (2SLS) estimation to measure the direct effect of peer-college cheating on the individual decision to cheat (endogenous peer effect) using peer high school cheating and all other exogenous explanatory variables as instruments in the first stage of the regression. Finally, we conduct an analysis on the probability of reporting and tolerating a violation to provide further evidence of the factors influencing cheating.

Tables 1-5 present results of our analysis. Tables 1-3 show results for the linear probability model, which predicts the probability that an individual is a college cheater. Table 4 shows results for the 2SLS estimation and Table 5 presents results for the analysis on reporting and tolerating of violations. All specifications include service academy fixed effects and all standard errors are clustered by academy by graduating class cohort.

Estimation of the Exogenous Peer Effect in Academic Cheating

Table 1, Specification 1 estimates the basic model, while excluding the potentially endogenous variable, graduation order of merit. Note the signs of all estimated parameters conform to a-priori expectations. The positive and significant coefficient (0.131) for the *High School Cheater* (dummy) variable indicates that high school cheaters have a 13.1 percentage point higher probability of cheating while in college. The estimated coefficient on the peer variable is positive and significant (0.320). Due to the statistical significance of the estimate, we believe it likely that β_2, the unobserved coefficient on peer *Honesty* is also significant with the expected sign (negative).

The estimated effect of *peer high school cheating* on the frequency of college cheating is substantial, with the admittance of one more high school cheater having the net estimated effect of producing 0.474 new college cheaters.[9] That is, for every 2.1 new high school cheaters admitted to a service academy, one new college cheater will be "created". Following Glaeser, Sacerdote and Sheinkman (2003), we believe this estimate to be the first-order effect and a lower bound of the total social influence. In full equilibrium, the creation of new cheaters is likely to create additional new cheaters, implying the existence of an endogenous "social multiplier".[10] Finally, significant differences in the level of cheating are shown between the three service academies.[11] The negative and significant results for the dummy variables on Academy X and Academy Y indicate less cheating at these academies compared to Academy Z.

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[8] For consistency, Appendix C shows results for all specification in Table 1 when using a logit model. In an earlier version of the paper we also estimated our model using an ordered logit model to exploit the categorical data in the survey, with results broadly consistent with those presented in this version.
[9] This effect is calculated by adding the coefficients on the High School Cheater and the Peer variables.
[10] Empirical estimation of the social multiplier is discussed extensively in Glaeser, Sacerdote and Sheinkman (2003). We estimate the social multiplier and discuss its estimation later in the text.

In specification 2 we add the graduation order of merit of the surveyed respondent as an explanatory variable. Results for this specification remain consistent with Specification 1, while the order of merit variable is shown to be positive and significant (0.033). This result indicates that cadets/midshipmen who perform better academically are less likely to cheat.

Might these effects simply be the result of unobserved difference across graduating class cohorts or academy-specific trends in cheating over time? If the peer variable is correlated with unobserved serial factors or with time-specific trends in cheating within each academy, the previously presented results could be spurious. To control for this possibility, Specifications 3 and 4 add time (graduation year cohort) fixed effects and academy-specific time trends to the model. Results remain statistically significant for all variables with the expected signs. The magnitude of the peer effect diminishes moderately. The positive and significant result for both the high school cheater variable (0.129) and the peer variable (0.199) in Specification 4 indicates that one new cheater is created for every 3.05 new cheaters admitted to a service academy. Of note are the increases in magnitude and high statistical significance for the negative coefficients on the Academy X and Academy Y dummy variables. These coefficients indicate that cadets at Academies X and Y have a 0.211 and 0.200 lower probability of committing an academic violation relative to Academy Z, holding the effects of all other explanatory variables constant.

[11] The names of the three service academies have been masked and are referred to as Academy X, Academy Y and Academy Z.

Finally, Specification 5 adds the percentage of the population cohort scoring in the top 25 percent of the SAT Math.[12] Due to current data availability, this specification only includes the final 4 cohorts in the sample. Results show that the magnitude of the High School Cheater variable (0.178) and the peer effect (0.324) increase relative to the previous specification. The model predicts that one new college cheater is "created" with every 1.99 additional high school cheaters admitted to a service academy. The coefficient on the SAT variable has the opposite sign than expected but is statistically insignificant. Removing the academy specific time trend, this variable then exhibits the expected negative sign, but is still insignificant (t-statistic = -1.53).

Non-linearities in the Peer Effect

Table 2 reports results of additional specifications allowing for different marginal effects of *frequent* versus *occasional* high school cheaters. Specifications 6 and 7 exploit the categorical data available in the High School Cheater variable by adding separate dummy variables for *occasional* high school cheaters and *frequent* high school cheaters.[13] Specification 6 includes service academy dummy variables, while Specification 7 includes the time fixed effect and the academy-specific time trends. The positive and significant results for both High School Cheater variables (in both specifications) indicates that occasional and frequent high school cheaters are both more likely to cheat in college when compared to non-cheaters. Additionally, in Specification 7, the probability of cheating in college for frequent high school cheaters (0.192) is nearly 2.5

[12] Results are similar when using SAT Verbal data. Data are currently available for the entering classes of 1986 through 2001 (graduating class of 1990-2005). Therefore, the percentage used for cohort 8 is solely based on data for the graduation class of 1990.

[13] An occasional high school cheater is defined as someone giving a #2 response to question 16 of the survey, indicating 1-3 total cheating incidents while in high school. A frequent high school cheater is defined as someone who reported cheated at least 1-4 times per year or greater.

times greater than that of one-time high school cheaters (0.078), with the difference in coefficients statistically significant at the 0.01-level.

Next, Specifications 8 and 9 add separate peer variables for the proportion of one's peers who are *occasional* and *frequent* high school cheaters. Again, results show statistically significant differences in college cheating between high school non-cheaters, occasional cheaters and frequent cheaters. Additionally, results for Specification 8 show significant differences between the magnitudes of the two peer variables. The *occasiona*l cheater peer effect variable is positive and insignificant (0.059), while the *frequent* cheater peer effect variable is positive and highly significant (0.450), with the difference in the two coefficients significant at the 0.05-level. This result provides some evidence of non-linearity in the peer effect across high school cheater types. The model predicts that 1.54 additional *frequent* high school cheaters create one new college cheater. However, these differences are no longer evident in Specification 9, which includes the time fixed effects and time trends. Results for this specification show a positive and significant result for both peer variables (0.209 and 0.207 respectively) with no statistically significant difference in the coefficients.

Peer Enforcement of Suspected Cheating

Next, Table 3 reports the effect of peer reporting and confronting of suspected honor violations on college cheating. Although the reporting of and confronting of suspected violations are likely endogenous to our dependent variable, it is of interest to know if higher levels of student enforcement influences cheating behavior and/or the magnitude of the peer effect. Therefore, the proportion of one's peers who either reported or confronted an honor violation, conditional on knowledge of a suspected violation, is added to the model as an explanatory variable. In Specifications 11 and 13, we add an interaction between the peer high school cheating variable and the peer reporting/confronting variable to test whether increased enforcement influences the magnitude of the peer effect.

Results for Specification 10, which exclude the cohort fixed effect and time trends, show a negative and significant (-0.228) result for the peer reporting/confronting variable. This result indicates that increased levels of peer enforcement decrease the probability that an individual will cheat. Specifically, the model predicts that the addition of one more reporter/confronter at a service academy will result in 0.228 fewer cheaters. That is, it takes the addition of 4.39 new reporters/confronters to prevent one additional person from cheating. In Specification 11 we add an interaction term between the peer reporting/confronting variable and the peer high school cheating variable. The negative and significant result (-1.275) for the interaction term indicates that an increase in the proportion of peer reporters/confronters, all else equal, diminishes the magnitude of the peer effect. The model predicts a 10 percent increase from the mean in the peer reporting/confronting variable results in a 36 percent decrease in the peer effect (0.271 to 0.173). We consider this evidence that the informal peer effect and formal reporting of violations are behavioral substitutes. However, these results no longer hold in Specifications 12 and 13, when adding the graduation year cohort fixed effect and the academy specific time trends. In fact, the results are not only insignificant, but the coefficients exhibit the opposite signs.

Estimation of the Endogenous Peer Effect in Academic Cheating

Table 4 presents results for the 2SLS estimations of college cheating as a function of peer college cheating as specified in equation (5). As with the previous results, we believe these estimates to be a lower bound of the total social influence. The social multiplier, an upper bound of the total social influence is calculated in the next section. In all specifications the (endogenous) peer effect exhibits the expected signs and is highly significant. For Specification 15, the estimated peer coefficient of 0.748 indicates that for every 1.34 new college cheaters added to a service academy, one new cheater will be created. Specification 16 adds the time fixed effect and the academy specific time trends to the model. Results remain statistically significant for all explanatory variables with a small decrease in the magnitude for the estimated peer effect (0.609). This model predicts one cheater is created for every 1.64 new college cheaters added to a service academy. Finally, Specification 17 adds the percentage of the population cohort scoring in the top 25 percent of the SAT Math as an explanatory variable. The SAT variable exhibits the expected negative sign (-0.100), but is statistically insignificant at standard confidence levels (t-statistic of 1.50). The result for the peer effect remains positive and highly significant.

Results in Specifications 14-17, using 2SLS estimation, are consistent with those presented in the previous sections using OLS on reduced form equations. Together, these equations provide strong evidence of positive peer effects in academic cheating.

The Social Multiplier

Becker & Murphy, Glaeser, Sacerdote, & Sheinkman (2003), and Graham (2004) discuss the existence and estimation of a social multiplier in the "presence of positive spillovers or strategic complementarities" (Glaeser, Sacerdote, & Sheinkman, 2003). In the context of our paper, the social multiplier exists as newly created cheaters exert peer influence, which create additional cheaters. Multiple rounds of expansion could occur as new cheaters are being created. If infinite rounds of this process occurred, and the creation of partial cheaters were possible, the social multiplier would approach $1/(1-\alpha_2)$ as group size grows large, where α_2 is the estimated coefficient on peer college cheating, or the (endogenous) social interaction term. Estimates of the social multiplier using Specifications 14-16 are 3.69, 3.97, and 2.56, respectively. Hence, the addition of one college cheater creates 2.56 to 3.69 new college cheaters.

As an alternative approach for estimating the social multiplier, Glaeser, Sacerdote & Sheinkman (2003) "define the social multiplier as the ratio of the group level coefficient to the individual level coefficient, or the amount that the coefficient rises as one move[s] from individual to group level regressions." This methodology is implemented using the coefficients on exogenous variables, when the endogenous social interaction term cannot be directly estimated. Using this methodology, we compute the social multiplier using the ratio of the coefficients for the high school cheater variable. With comparable control variables to Specifications 14-16, we compute social multipliers of 3.13, 3.02 and 2.59, respectively. These estimates are not statistically different from those estimated above.

Our estimates of the social multiplier are in-line with those estimated by Glaeser, Sacerdote & Sheinkman (2003). In using Dartmouth roommate data, the social multiplier for fraternity membership approached 2.8 as group size grows large. For crime data, estimates at the county, state and national-level, estimates for the multiplier were 1.72, 2.8 and 8.16 respectively.

Mechanisms Driving the Peer Effect

Having found statistical evidence of peer effects in academic cheating at service academies, we turn our attention to an inquiry into possible mechanisms that could drive peer effects. Academic cheating could be viewed in the context of an enforcement problem where the rising level of academic cheating could be seen as evidence of a congestion problem in enforcement activity. Alternatively, peer effects could represent changing or different social norms regarding toleration of cheating. We noted above the negative coefficient on the cross product of the peer effect and level of peer reporting, meaning that the magnitude of the peer effect is reduced as peer reporting increases. This result is consistent with the latter hypothesis of peer influences being driven by evolving social norms of toleration of cheating. To investigate this further, we examine differences across the service academies in the attitudes and actions regarding peers violating the honor code. McCabe, Trevino & Butterfield, 2001, hypothesize that, 1) "Peer reporting behavior will increase as role responsibility for peer reporting increases", 2) "Increased role responsibility for peer reporting will be positively associated with the perception that cheaters will be caught", and 3) "Cheating will be lower where there is a stronger perception that cheaters will be caught."

Given their hypotheses, we examine whether peer reporting of suspected violations is in fact greatest at the academy(s) with less cheating. We also examine whether toleration of known cheating is different across the three academies. Although, one would think that peer reporting and toleration of known cheating would be inversely correlated, we found individuals in our data set who indicated that they knew of but didn't report others violating the honor code, yet also reported others who were violating the honor code. (Q.8 and Q.11, Appendix B) Our survey did not ask for the precise circumstances under which this happened, but we find it of interest that a number of individuals both tolerated and turned in violations of the honor code.

Specification 18 and 19 in Table 5 predict the probability of tolerating an honor violation, conditional on having knowledge of a suspected violation. Specification 18 uses a logit model to predict the probability of tolerating any violation, while Specification 19 implements an Ordered Logit to predict the level of toleration. Results from both specifications show that both graduation order of merit and the level of high school cheating are strong predictors of toleration. Note that the negative and significant estimated coefficients for the Academy X and Academy Y dummy variables indicate that these respective academies have less toleration of known violations, compared to Academy Z. We find cadets/midshipmen at Academy X are the least likely to tolerate a known violation. The estimated coefficient for Academy X is significantly different than the coefficient for Academy Y.

Specifications 20 and 21 predict the probability of reporting a violation of the honor code, given knowledge of a violation. Results in both models indicate that graduation order of merit is a good predictor of reporting, but the coefficient on high school cheating is positive and statistically insignificant, opposite the a-prior expected sign. In addition, the positive and significant results for the academy dummy variables shows that the level of reporting is greatest at Academy X and Academy Y compared to Academy Z.

The results in Specifications 18-21 show that, conditional on knowledge of an honor violation, cadets/midshipman at Academy X and Academy Y are more likely to report and least likely to tolerate such violations compared to Academy Z. Recall from previous analysis, Academy X and Academy Y were also were shown to have lower probabilities of cheating compared to Academy Z. We find this to be further evidence that the peer effect is that of an evolving social norm in cheating versus congestion in enforcement. This result follows McCabe & Trevino's (1993) hypothesis that, "Academic dishonesty will be inversely related to the perceived certainty of being reported by a peer."

VI. Conclusion

This paper investigates peer influence in academic cheating using survey data gathered from the US Military Academy, the US Naval Academy, and the US Air Force Academy from 1959 through 2002. We measure the effects on individual cheating from changes in the honesty of peers. Our results provide evidence of large positive peer effects in academic cheating. The model predicts that one new college cheater is "created" for every 2-3 additional high school cheaters admitted to a service academy.

We find different magnitudes of peer effects from occasional versus frequent cheaters. We find evidence that the peer effect may weaken as peer reporting and confronting of honor code violations increase. The academies with the lowest level of cheating have the highest level of peer reporting of violations. We find the previous two points consistent with peer effects in academic cheating being an evolving social norm of toleration as opposed to congestion in enforcement.

Based on the findings of this paper, we believe institutions of higher education could reduce academic cheating by fostering a culture that increases the likelihood of peer reporting of suspected cheating.

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Table 1: Exogenous Peer Effect in Academic Cheating: Linear Probability Model

Variable	1	2	3	4	5
High School Cheater (dummy variable)	0.132*** (6.68)	0.131*** (6.83)	0.130*** (6.38)	0.129*** (6.50)	0.178*** (5.98)
Proportion of one's *Peers* who are High School Cheaters	0.342*** (3.69)	0.350*** (3.74)	0.198** (2.25)	0.199** (2.22)	0.324** (2.39)
Academy X Dummy	-0.173*** (-8.46)	-0.176*** (-8.79)	-0.208*** (-6.34)	-0.211*** (-6.37)	-0.130 (-1.15)
Academy Y Dummy	-0.081** (-2.48)	-0.082** (-2.46)	-0.198** (-4.38)	-0.200** (-4.20)	-0.448*** (-4.54)
Graduation Order of Merit		0.033*** (3.82)		0.035*** (3.88)	0.077*** (4.21)
Percent of population cohort in Top 25% of *SAT Math*					0.113 (1.14)
Observations	2,060	2,060	2,060	2,060	741
R-Sqr	0.065	0.074	0.082	0.093	0.110
Control Variables			Graduating Year Cohort, Academy Specific Time Trend	Graduating Year Cohort, Academy Specific Time Trend	Graduating Year Cohort, Academy Specific Time Trend

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level. t-statistic in parentheses, robust standard errors are clustered by service academy and graduating cohort.

Table 2: Non-linearities in the Peer Effect

Variable	6	7	8	9
Occasional High School Cheater (dummy variable)	0.074*** (3.90)	0.078*** (3.98)	0.076*** (3.96)	0.078*** (3.97)
Frequent High School Cheater (dummy variable)	0.202*** (7.98)	0.192*** (7.47)	0.197*** (7.82)	0.192*** (7.47)
Proportion of one's *Peers* who are High School Cheaters	0.321*** (3.77)	0.205** (2.35)		
Proportion of *Peers* who are **Occasional** High School Cheaters			0.059 (0.44)	0.209** (2.11)
Proportion of *Peers* who are **Frequent** High School Cheaters			0.450*** (4.67)	0.207* (1.95)
Academy X Dummy	-0.175*** (-7.98)	-0.211*** (-6.79)	-0.171*** (-8.18)	-0.211*** (-6.78)
Academy Y Dummy	-0.079** (-2.56)	-0.199*** (-4.34)	-0.071** (-2.49)	-0.199** (-4.33)
Graduation Order of Merit	0.032*** (3.85)	0.034*** (3.90)	0.032*** (3.79)	0.034*** (3.91)
Observations	2,060	2,060	2,060	2,060
R-Sqr	0.088	0.105	0.093	0.105
Control Variables		Graduating Year Cohort, Academy Specific Time Trend		Graduating Year Cohort, Academy Specific Time Trend

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level. t-statistic in parentheses, robust standard errors are clustered by service academy and graduating cohort.

Table 3: Influence of Peer Reporting/Confronting of Suspected Violations

Variable	10	11	12	13
High School Cheater (dummy variable)	0.131*** (6.82)	0.130*** (6.79)	0.128*** (6.50)	0.128*** (6.47)
Proportion of one's *Peers* who are High School Cheaters	0.320*** (4.20)	1.245*** (3.15)	0.194** (2.28)	-0.203 (-0.46)
Proportion of Peers who *report* or *confront* a suspected violation	-0.228*** (-3.00)	0.438* (-1.77)	0.120 (0.96)	-0.101 (-0.34)
Interaction between *Peer Cheaters* and *Peer Reporters*		-1.275*** (-2.39)		0.501 (0.86)
Academy X Dummy	-0.168*** (-8.47)	-0.179*** (-10.18)	-0.2398*** (-4.76)	-0.243*** (-4.71)
Academy Y Dummy	-0.083*** (-3.03)	-0.086*** (-3.54)	-0.227*** (-3.59)	-0.233*** (-3.50)
Graduation Order of Merit	0.033*** (3.79)	0.034*** (3.86)	0.035*** (3.87)	0.035*** (3.85)
Observations	2,060	2,060	2,060	2,060
R-Sqr	0.079	0.082	0.093	0.093
Control Variables			Graduating Year Cohort, Academy Specific Time Trend	Graduating Year Cohort, Academy Specific Time Trend

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level. t-statistic in parentheses, robust standard errors are clustered by service academy and graduating cohort.

Table 4: Endogenous Peer Effect in Academic Cheating: 2SLS Estimation

Variable	14	15	16	17
High School Cheater (dummy variable)	0.128*** (6.31)	0.127*** (6.44)	0.127*** (6.41)	0.175*** (5.87)
Proportion of one's *Peers* who are College Cheaters	0.729*** (10.44)	0.748*** (10.89)	0.609*** (5.34)	0.863*** (6.10)
Academy X Dummy	-0.047*** (-4.77)	-0.047*** (-4.57)	-0.084*** (-4.09)	-0.077 (-0.73)
Academy Y Dummy	-0.022** (-2.55)	-0.021** (-2.35)	-0.079*** (-4.35)	0.0001 (0.00)
Graduation Order of Merit		0.035*** (3.94)	0.035*** (3.91)	0.077*** (4.19)
Percent of population cohort in Top 25% of *SAT Math*				-0.100 (-1.50)
Observations	2,060	2,060	2,060	740
R-Sqr	0.065	0.075	0.080	0.086
Control Variables			Graduating Year Cohort, Academy Specific Time Trend	Graduating Year Cohort, Academy Specific Time Trend

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level. t-statistic in parentheses, robust standard errors are clustered by service academy and graduating cohort.

Note: First stage results are not shown where Peer College Cheating is regressesd on Peer HS Cheating and the remaining exogenous variables.

Table 5: Probability of Tolerating and Reporting Suspected Violations

Specification	18	19	20	21
Variable	Tolerating Suspected Violations		Reporting Suspected Violations	
Model	Logit	Ordered Logit	Logit	Ordered Logit
Academy X Dummy	-1.165***	-1.064***	0.516***	0.520***
	(-6.51)	(-7.21)	(2.67)	(2.74)
Academy Y Dummy	-0.721***	-0.466**	0.462**	0.462**
	(-3.29)	(-2.24)	(2.30)	(2.33)
High School Cheating	0.157***	0.208***	0.022	0.023
	(2.84)	(4.33)	(0.45)	(0.48)
Graduation Order of Merit	0.305***	0.315***	-0.235***	-0.235***
	(4.86)	(5.93)	(-3.28)	(-3.30)
Observations	1,121	1,121	1,121	1,121
Function Value	-679.37	-1,267.71	-611.91	-650.83
Control Variables	Graduating Cohort	Graduating Cohort	Graduating Cohort	Graduating Cohort

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level

Z-statistic in parentheses, robust standard errors are clustered by service academy and graduating cohort

Appendix A: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
College Cheater (dummy variable)	2060	0.167	0.373	0	1
High School Cheater (dummy variable)	2060	0.526	0.499	0	1
One-Time High School Cheater (dummy variable)	2060	0.286	0.452	0	1
Frequent High School Cheater (dummy variable)	2060	0.240	0.427	0	1
Proportion of one's *Peers* who are High School Cheaters	2060	0.526	0.128	0.262	0.729
Proportion of *Peers* who are **One-Time** High School Cheaters	2060	0.286	0.080	0.103	0.451
Proportion of *Peers* who are **Frequent** High School Cheaters	2060	0.240	0.105	0.043	0.475
Percent of population cohort in Top 25% of *SAT Math*	828	0.466	0.057	0.298	0.519
Proportion of Peers who *report* or *confront* a known violation	2060	0.764	0.123	0.444	1
Academy X (dummy variable)	2060	0.361	0.480	0	1
Academy Y (dummy variable)	2060	0.317	0.465	0	1
Academy Z (dummy variable)	2060	0.322	0.467	0	1
Graduation Order of Merit	2060	2.190	1.090	1	7
Reported an Honor Code Violation (categorical variable)	2060	1.147	0.378	1	6
Tolearted an Honor Code Violation (categorical variable)	2060	1.162	0.491	1	6

Appendix B: Honor Survey*

PART I. *DEMOGRAPHICS*
Please circle whichever applies to you.

1. I graduated from:

a. USMA
b. USNA
c. USAFA

2. In the class of:

a. 1959, 60, 61, or 62	b. 1963, 64, 65, or 66
c. 1967, 68, 69, or 70	d. 1971, 72, 73, or 74
e. 1975, 76, 77, or 78	f. 1979, 80, 81, or 82
g. 1983, 84, 85, or 86	h. 1987, 88, 89, or 90
i. 1991, 92, 93, or 94	j. 1995, 96, 97, or 98
k. 1999, 00, 01, or 02	

3. My current military status is: (Please disregard any Reserve or National Guard Status)

a. I am still on active duty.
b. I voluntarily resigned from the service.
c. I voluntarily retired from the service.
d. Other (medical retirement, not commissioned, etc.)

4. My graduation order of merit was:

a. Top 1/4
b. Second 1/4
c. Third 1/4
d. Fourth 1/4

Part II. *QUESTIONNAIRE*. Please circle whichever you feel applies. If you prefer not to answer any question, just leave it blank.

5. As a cadet/midshipman, my *respect* for the honor code was:

1	2	3	4	5	6	7
totally negative	strongly negative	mildly negative	neutral	mildly positive	strongly positive	totally positive

* Questions 19-21 were included in a latter mailing to approximately half of the graduates surveyed. As a consequence, numerical data from question 19 was not included in our empirical analysis.

6. As a cadet/midshipman, my *motivation* to make the service a career was:

1	2	3	4	5	6	7
never intended to stay	strongly non-career	mildly non-career	neutral wait and see	mildly pro-career	strongly pro-career	totally intended a career

7. As a cadet/midshipman, I *suspected* (but could not confirm) other cadets/midshipmen of violating the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

8. As a cadet/midshipman, I *knew of* (but did not report) other cadets/midshipmen who were violating the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

9. As a cadet/midshipman, I *wanted to* (but did not) report violations of the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

10. As a cadet/midshipman, I *confronted* other cadets/midshipmen who I felt had violated the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

11. As a cadet/midshipman, I *reported* other cadets/midshipmen who I felt had violated the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

12. As a cadet/midshipman, I *received* (but did not actively seek out) *academic information* in violation of the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

13. As a cadet/midshipman, I was *actively involved* in either receiving or passing academic information in violation of the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

14. As a cadet/midshipman, I felt I had violated *some NON-academic* aspect of the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

15. As a cadet/midshipman, I felt I had violated *some academic* aspect of the honor code:

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

16. When I was in *high school*, I was actively involved in either receiving or passing academic information (activities which would otherwise have been academic violations of the academy honor code):

1	2	3	4	5	6	7
never	1-3 times total	1-4 times a year	occasionally every few months	about once a month	2-3 times a month	routinely weekly or daily

17. Today, my *respect* for the honor code is:

1	2	3	4	5	6	7
totally negative	strongly negative	mildly negative	neutral	mildly positive	strongly positive	totally positive

18. Compared to civilian college and universities, I think *today's* service academy cadets/midshipmen are involved in academic cheating:

1	2	3	4	5	6	7
much less [<1/10]	less than half as much	a bit less	about the same	a bit more	about twice as much	much more [>10X]

19. Of all those values I learned at the Academy, I rate these items (shown alphabetically below) to be of the following importance. Please rate using the number scale shown (ties are acceptable):

1	**2**	**3**	**4**	**5**	**6**	**7**
not at all	not very	at times important	moderately important	above average	very	extremely important

Rating:	Topics Learned:
________	a. Academics
________	b. Athletics
________	c. Confidence
________	d. Coping with pressure
________	e. Honor
________	f. Leadership
________	g. Loyalty
________	h. Self-discipline
________	i. Working with others
________	j. Other(s) [please specify]

20. My feelings about the honor code/concept today can be expressed as:

21. If, as a cadet/midshipman you feel you violated the honor code/concept, could you briefly describe those circumstances?

21. Do you have any other comments, suggestions, or questions? Many thanks for your cooperation.

Appendix C: Logit Model Results

Appendix C: Peer Effects in Academic Cheating: Logistic Regression Model

Variable	1	2	3	4	5
High School Cheater (dummy variable)	1.053*** (7.76)	1.053*** (7.76)	1.064*** (7.58)	1.055*** (7.45)	1.251*** (5.22)
Proportion of one's *Peers* who are High School Cheaters	2.418*** (2.98)	2.512*** (3.03)	1.428*** (2.64)	1.492*** (2.84)	1.727*** (6.47)
Academy X Dummy	-1.354*** (-6.43)	-1.387*** (-6.60)	-2.293*** (-7.65)	-2.351*** (-7.90)	-1.540*** (-7.11)
Academy Y Dummy	-0.558** (-2.27)	-0.563** (-2.25)	-1.516*** (-4.52)	-1.545*** (-4.49)	-1.559*** (-9.55)
Graduation Order of Merit		0.249*** (4.41)		0.271*** (4.40)	0.350*** (3.30)
Percent of population cohort in Top 25% of *SAT Math*					-2.107*** (-8.86)
Observations	2,060	2,060	2,060	2,060	828
Psuedo R-Sqr	0.075	0.086	0.097	0.110	0.100
Control Variables			Graduating Year Cohort, Academy Specific Time Trend	Graduating Year Cohort, Academy Specific Time Trend	Graduating Year Cohort, Academy Specific Time Trend

* Significant at the 0.10 level, ** Significant at the 0.05 level, *** Significant at the 0.01 level. Z-statistic in parentheses, robust standard errors are clustered by service academy and graduating cohort.