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Does Living Near Classmates Help Introductory Economics Students Get Better Grades?

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This article examines whether first-year students in introductory economics courses get better grades if they have other students in their on-campus residential unit who either are taking the same course or have taken the course in the past. The study uses nine years of data for the introductory economics course at Reed College. The author finds that having dorm mates who are currently taking the class seems to have some benefit for students, but there is no evidence of benefit from having coresident students who have previously completed the class.

Keywords *classmates, dorm mates, peer effects*

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The study of student peer effects has become a prominent issue in the economics of education. Most studies of peer effects look at whether having peers with higher measured academic aptitude (such as higher SAT scores or other admission credentials) leads to improved performance. For reasons of econometric identification, the most common category of college peers to be examined is roommates, although most studies of primary and secondary students (and a few in higher education) have looked for classmate peer effects.

Many peer-effects studies have focused on primary- or secondary-school classmate effects—for example, Henderson, Mieszkowski, and Sauvegeau (1976), Epple and Romano (1998), Hoxby (2000), Zimmer and Toma (2000), Boozer and Cacciola (2001), Gaviria and Raphael (2001), Vandenberghe (2002), Hanushek et al. (2003), McEwan (2003), Rangvid (2003), Robertson and Symons (2003), Zimmer (2003), Angrist and Lang (2004), Dills (2005), Lefgren (2004), Ammermueller and Pischke (2006), Burke and Sass (2006), Ding and Lehrer (2006), and Kang

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(2007). Although the evidence is not unanimous, many studies find support for the hypothesis that young students learn more if they have peers of higher ability.

Studies of peer effects in higher education have been more limited. When students select their peers on the basis of variables we cannot observe, it becomes impossible to identify the effects of the student's own characteristics from the effects of peers.[1] Most of the work on peer effects in higher education has focused on roommate and dorm-mate effects because these peers are assigned by colleges either randomly or on the basis of observable criteria. Studies based on residential peers include those of Sacerdote (2001), Zimmerman (2003), Winston and Zimmerman (2004), Stinebrickner and Stinebrickner (2006, 2008), Foster (2006), Lyle (2007), and Kremer and Levy (2008). These studies have found some evidence that more able roommates are beneficial. The most recent studies have suggested that the mechanism of roommate peer effects may operate through study time and alcohol use, which are more closely related to the attitudes and personalities of roommates than to their innate academic ability. Carrell, Fullerton, and West (2008) explore peer effects in a unique context involving both dorm mates and classmates and find larger effects than pure residential studies.

Classmate peers are likely to influence a student's classroom environment; roommate peers may affect study habits and the student's overall college environment. But does it matter whether those living in a student's proximity are taking or have taken the student's current courses?

Many colleges and universities have pursued the idea of using residential assignments to group students together with others having similar academic or extracurricular interests in "living/learning communities."[2] The presence of these residential groups may affect students' contentment and attachment to the college as well as their academic performance.

Because the students in such communities typically take one or more courses together as a group, evaluation of such residential programs has consisted of comparing self-reported measures of satisfaction and intellectual development between treatment groups of students in such communities and control groups of students in traditional dormitories.

In one of the first studies of residential learning communities, Pike (1999) found that participating students had higher self-reported "learning and intellectual development" than the control group (281). More recently, Inkelas et al. (2006) found that self-reported growth in "critical thinking/analysis abilities" and several other intellectual outcomes was somewhat greater for students in living-learning communities than for students living in traditional residence halls at the same four large universities.

The living-learning community model usually involves all of the students in a particular course or section who are living together. While evidence of improved learning in such environments suggests positive peer effects from living near classmates, the special nature of such programs makes it hard to generalize this evidence to the far more common situation of classmates who are randomly grouped together in a residential unit.

This article examines whether first-year students' grades in introductory economics are affected by having classmates (or students who have taken the class) living in the same dormitory unit (dorm mates). Using nine years of data for students in the introductory economics course at Reed College, I found that first-year students taking introductory economics gain from having dorm mates who are currently taking the same course, but do not seem to benefit from having dorm mates who have taken introductory economics in the past.

CLASSMATES AND DORM MATES

Most students who have lived in a college dormitory are likely to agree that dorm mates can have a large influence on the college experience. One encounters the people living in one's dorm unit every day-in the halls, in the bathrooms, or just passing by an open door. Dorm mates are natural candidates for friendship and companionship. Noisy dorm mates can interrupt sleep and distract a student trying to study in his or her room. Partying dorm mates, besides being noisy, may tempt a student to join in the activity and reduce his or her study time.

A dormitory also may be a convenient venue in which to identify and utilize study partners or tutors, but this is likely only if there are dorm mates who are taking the same class (for study partners) or who have taken the course previously (for tutors). While students surely have other venues for finding such academic support, having more classmates living in the same dorm unit might afford a student a larger pool from which to draw potential study partners. If this larger pool increases the chance that the student finds someone with whom he or she can work productively, it may improve his or her performance in the class. Similarly, having more students nearby who have completed the class may enlarge the pool of individuals from whom a student may seek information, making it more likely that he or she is able to overcome difficulties in the class.

This study focuses on first-year students, although the class under examination enrolls higher-level students as well. (The term "higher-level students" is used here to mean all non–first-year students.) First-year students are the most appropriate population for two reasons. First, most higher-level students have already formed peer groups with students they met as classmates, as dorm mates, or in other ways during their previous year(s). Because they are more likely to have established peer groups, they are less dependent than first-year students on dorm mates as sources of study partners or peer mentors.[3] Second, the Reed student database does not allow us to track living arrangements of the large share of (upper-level) students who live off campus. Hence, a group of higher-level students living on campus in the same dorm unit would be counted as dorm mates, but a group of students who share an off-campus house—a very common living arrangement among higher-level Reedies—would be missed.

The mere number of classmates or students experienced in the subject in one's dorm is a crude measure of how much a student could benefit from studying with them or learning from them. Not only the quantity but also the quality of the dorm-mate peers should be considered. Many factors undoubtedly affect the academic benefit drawn from a dorm-mate peer. Even at a selective college, students vary considerably in their academic ability and background. The nature of student interaction and learning may vary depending on the academic prowess of the student and the peer. A higher-level student who received an A in introductory economics would probably be a more effective mentor than one who got a C. Similarly, a fellow first-year student with strong academic credentials (SAT scores, high school GPA, and the like) could (other things being equal) be a better study partner than one whose credentials are weak. However, some excellent peers are likely to do assignments easily on their own, limiting their willingness to participate in group work. Moreover, peers who are academically less gifted may benefit a student by having a partner to struggle with on assignments or an opportunity to reinforce his or her own knowledge by helping the struggling peer.

Many characteristics beyond pure academic ability affect the contribution of a dorm-mate peer to a student's learning. Some students are very talented communicators. Others are less so.

Some are inclined to study in groups and to spend academic time with peers. Others are more academically reclusive. Some have interests and personalities that encourage their peers to try hard and succeed. Others may distract peers from academic endeavors. These highly relevant characteristics of personality and attitude cannot be measured with available data. Thus, we must rely on measured academic quality as the sole indicator of peer quality.

The availability of dorm mates as study partners and mentors can be measured crudely by the number of dorm mates taking or having taken the same course, and these are the basic quantitative measures used in this study. I also employed two qualitative measures based on actual or predicted grades in the economics course. For students having taken the class previously, the grade they earned is used as a measure of academic ability in economics. For students currently taking introductory economics, I used the prediction of their grades from a regression of course grades on admission credentials such as SAT scores and admission-office ratings.

INSTITUTIONAL SETTING

Reed College is a selective liberal arts college located in Portland, Oregon. Reed is frequently compared with high-quality liberal arts colleges such as Carleton, Oberlin, and Grinnell, being characterized by an intense academic environment and an unusually high proportion of students attending academic graduate programs.

During the sample period, which runs from 1993–94 to 2001–02, the proportion of Reed College students living in on-campus residence halls increased from about 55 percent to about 65 percent. Throughout the period, nearly all first-year students (about 98 percent) lived on campus, with the exceptions being a handful of students who either lived at home or lived off campus due to special circumstances. Between one-third and one-half of higher-level students lived in college housing.

Reed residence halls vary considerably in size and style. Some are language houses with 8–30 students. Some are small dormitories with 25–30 students. Others are large dorms with multiple floors and/or sections. The larger dormitory buildings are divided into smaller sections of 20–30 students that are overseen by a common "house advisor," who is a higher-level student living in that dorm. Our definition of "dorm mates" is a cohort of students living in the domain of a single house advisor (which may be an entire small dorm or a floor or section of a large one). Such sets of dorm mates form natural groupings because they typically meet together periodically; share social rooms, kitchens, and bathroom facilities; and may participate jointly in college-funded social activities organized by their house advisors.[4] These dorm units are of similar size with 20–30 students in each.

Reed has no all-first-year-student dorms, meaning that all first-year students in the dorms live in proximity to at least a few higher-level students.[5] The proportion of first-year students in residential units varied from about 40 percent for the most attractive dorms (which attract many upper-class students) to over 80 percent for those that are in less demand by returning students. Thus, the exposure of first-year students to higher-level students varied considerably, but all dorm students lived in an environment with a mix of first-year and upper-level students. Some students had opportunities to find dorm mates who had previously completed introductory economics, but many did not.

Discussions with residence-life staff revealed that the assignment of students to dorms was nonsystematic. In particular, there was no consideration given to "academic promise" in choosing dorm assignments. Thus, there was, for example, no tendency for "better" first-year students to be placed in settings with higher or lower proportions of upper-level dorm mates.

This article focuses on students in Economics 201 (Econ 201), a one-semester introductory course in economics. During the sample period, two sections of Econ 201 were taught each semester. Each semester, both sections were taught by the same instructor during back-to-back morning time slots. The course content consisted of basic microeconomic theory taught at the level of "intermediate micro" and a somewhat smaller amount of macroeconomic content taught at a level that varied from introductory level to intermediate level over time and across instructors. All examination questions in the course were essays or problems created by individual instructors. With various instructors from semester to semester and only infrequent repetition of questions by individual instructors, it is highly improbable that students would improve their performance through contact with older students other than improving their learning of the material. Specifically, there is little chance of test questions being passed down from one generation of students to the next. Instructors are broadly supportive of group work outside of class and of student interaction in general.

During the nine-year sample period, 634 students received grades in Econ 201. Of these, 378 (60 percent) lived in dorms, and 237 of those (37 percent of all students taking Econ 201) were first-year students. Of these 237 potential sample members, 12 were discarded because SAT scores were not available for them, leaving an estimating sample of 225 students. (The missing-data issue is discussed in more detail below.)

Econ 201 is required for economics majors, but most students who take the course are nonmajors completing divisional or distribution requirements. Because Reed students do not formally declare a major until the end of the sophomore year, it is difficult to assess in retrospect how many were considering an economics major at the time they enrolled in Econ 201. However, given that about 70 students took Econ 201 each year and that only 10–15 per year typically completed an economics major, it is clear that most students in Econ 201 did not choose to major in economics.

Students selected sections depending largely on two factors: fitting the time of the section into their class schedules and satisfying their temporal preferences. The two sections met at 10:00 and 11:00 am on Mondays, Wednesdays, and Fridays with lab sections on Wednesday or Thursday afternoons. The 11:00 sections tended to be slightly larger and to have a slightly smaller proportion of first-year students.

MODEL, VARIABLES, AND ESTIMATION

The dependent variable is success in learning introductory economics, measured by the grade received in Econ 201. The student's grade should depend on his or her own aptitude and, if dorm-mate peer effects are present, on the peer influences. Many other factors that are difficult to measure surely also affect the student's grade—such as effort level, the effectiveness of the instructor, and luck. These inevitably end up in the error term.[6]

The equation for the model can be written as

$$y_i = X_i\beta + P_i\gamma + \varepsilon_i, \tag{1}$$

where y_i is the student's grade in the introductory course (measured on a standard 4-point scale), X_i is a row vector of control variables containing the student's own measured characteristics that are expected to affect his or her grade, P_i is a row vector describing the quantity and measured quality of student i's dorm-mate/classmate peers, and ε_i is an error term.

The elements of X_i should include all variables associated with the student's academic performance that we can measure prior to enrollment in the course. Because our sample consists of first-year students, no prior information on college-level performance is available. Thus X_i must be drawn from student i's admission credentials, such as SAT scores, high school performance, and admission-office evaluations.

To capture the effects of dorm-mate peers, P_i should measure the availability within the residential unit of two kinds of student i's peers: potential study partners and potential mentors. Our basic, quantitative measures are the number of dorm mates currently taking Econ 201 and the number of dorm mates who have previously taken it.

We also looked for possibly distinct effects of dorm mates of either kind who are of high measured academic quality. For those who previously took Econ 201, we used the grade they earned in it. We have two quality-based measures for the availability of potential mentors: One is a dummy variable that is 1 if a student has a dorm mate who completed the course with a grade of A− or better, and the other sets the threshold at B+ or better.[7]

Measuring the academic quality of the dorm mates who are currently taking an introductory course is more difficult. A dorm mate's actual grade in the course is endogenous, potentially influenced by the original student's own performance through the very peer effects we seek to measure. There are several exogenous measures of various aspects of peer ability available, including the peers' math and verbal SAT scores, high school grade point average, high school class-rank percentile, and the "reader rating" assigned by Reed's admission deans. Although one could enter each measure separately—as peer math SAT, peer verbal SAT, peer high school GPA, and the like—a single index of peer quality is less cumbersome. Because we were looking for a measure of peer aptitude in Econ 201, the weights attached to each individual ability measure should reflect the relevance of that measure to success in learning economics. For example, one might expect that the math SAT score would be more relevant to economics than the verbal score.

To find the appropriate weights to measure peers' academic aptitude for economics, we used ordinary least squares to estimate a linear relationship between the Econ 201 grade and student admission variables:

$$y_j = X_j\delta + \eta_j. \tag{2}$$

The estimates of δ provide weights to calculate a predicted course grade $\hat{y}_j$ for each peer in the sample.

Note that the same admission-file variables that affect a student's own performance should also affect those of his or her peers, so the variables included for the student in X_i in Eq. (1) are the same as those in X_j for the peers in Eq. (2). This means that the peer-ability measures in P_i are based on the same *variables* that are included in X_i, but they are for *different students*. For example, student i's own SAT scores are part of X_i; the SAT scores of his or her dorm-mate classmates go into the calculation of P_i. It also implies that if Eq. (1) is correctly specified, then Eq. (2) is the same equation with missing variables. Only if the elements of P_i are uncorrelated with X_i will the estimate of δ in Eq. (2) be unbiased.

Because P_i measures the characteristics of students living in the same residential unit as student i, P_i and X_i will be uncorrelated if students are assigned to residences in a manner that is independent of academic credentials. Staff members of the Reed Office of Residence Life are confident that this was the case through the sample period.

The predicted peer course grade based on Eq. (2) is used as a measure of course-specific peer aptitude. Although this measure of peer aptitude is exogenous—it is based solely on admission information that is determined prior to enrollment—it is a generated regressor that requires special econometric attention. Inference based on regressions with generated regressors can be invalid; bootstrap methods are used to estimate corrected standard errors appropriate for the generated-regressor case. The bootstrap technique used is similar to that used by Parker (2010). Bootstrap standard errors are numerically similar to commonly used robust standard errors and are in some cases smaller. A detailed appendix is available from the author (academic.reed.edu/economics/parker).

As is often the case in college databases, some students are missing data for some variables. For example, some high schools do not report class rank; some have nonstandard grade point averages that cannot be converted to a four-point scale; and a few students are admitted without SAT scores.[8]

Missing data are potentially problematic at two levels for this study: (1) Some of student i's X variables may be missing, or (2) data pertaining to i's peers may be missing, making it impossible to calculate P_i. Only about 60 percent of students have complete data on the full set of SAT scores, high school GPA, high school class rank, and admission rating in the Reed database. The data that are missing are plausibly "missing at random." The probability that a value is missing is unrelated to the actual missing value. When data are missing at random, one can obtain valid estimates by using a sample consisting only of complete cases.

However, in peer-effect regressions, a complete-case analysis is highly restrictive. For illustration, suppose that each student has two randomly assigned peers and that we include only observations that have complete data for the student and for both peers. If 60 percent of students have complete data, then the probability of any three randomly drawn students *all* having complete data is $(0.6)^3 = 0.216$ (21.6 percent). The other 78.4 percent of the sample will have missing data either for the student or for one or both peers. Instead of losing less than half of the sample due to missing data, we would lose nearly four-fifths.

To avoid this drastic sample-size reduction, only admission rating and SAT verbal and math scores are included in X_i in estimating Eq. (2), which is estimated only for the sample with complete data for these variables. Only 12 out of 237 first-year students are missing SAT scores (and all students have admission ratings), so the loss in sample size is small.[9]

The peer-effect regressions of Eq. (1) examine the effects of two quantitative and five quality-based peer variables. We measured the availability of potential study partners by the number of dorm mates currently taking the course. We measured the availability of potential mentors by the number of dorm mates who have previously taken the course.[10]

To proxy for the availability of high-ability study partners, we measured the number of dorm mates currently taking the course whose predicted grade is in the top 50 percent of all predicted grades and the number in the top 25 percent. As noted above, we have two quality-based measures for dorm mates who have taken the course before based on their grades. We also measured the number of the dorm mates who had previously taken Econ 201 and who went on to major in economics.

TABLE 1
Summary Statistics

Variable	*M*	*SD*
Course grade	2.83	0.91
Math SAT (/100)	6.65	0.66
Verbal SAT (/100)	6.83	0.71
Reader rating	3.39	0.61
Dorm mates taking: Total	0.88	1.00
Dorm mates taking: >50th percentile	0.49	0.73
Dorm mates taking: >75th percentile	0.25	0.55
Dorm mates having taken: Total	1.34	1.40
Dorm mates having taken: Majors	0.28	0.52
Dorm mate having taken: B+ or better?	0.38	0.49
Dorm mate having taken: A− or better?	0.28	0.45
Percentage of students receiving grade in Economics 201:	All students	First-year
A	13.0	14.7
A−	10.3	9.3
B+	14.0	13.8
B	19.5	19.1
B−	14.3	12.4
C+	7.3	8.9
C	11.7	11.1
C−	4.8	4.9
D	2.3	2.2
F	2.8	3.6

In addition to these seven peer measures, we included verbal and math SAT scores and the admission office reader rating as controls for student ability. Dummies for instructor and for the semester in which the course was taken were individually and collectively insignificant and were omitted.

Our sample is all first-year students completing Econ 201 between 1993–94 and 2001–02 who lived in dormitory housing. Summary statistics for the regression variables are shown in table 1; the lower half of the table shows the Econ 201 grade distributions of first-year students and of all students. Table 2 shows the distribution of values for the number of dorm mates taking Econ 201 and the number having taken the course. Of the 225 first-year students in the sample, 164 had at least one potential mentor in their residential unit who had taken Econ 201, and the median number is 1. The median number of classmates currently taking the class was also 1, and 126 of 225 had at least 1 classmate in their dorm unit as a potential study partner. Only 28 students in the sample had neither.

RESULTS

The regressions for Econ 201 course grade are shown in table 3. Each regression includes control variables, the total numbers of dorm mates currently taking and having taken Econ 201, and one

TABLE 2
Dorm Mates Taking and Having Taken Economics 201

Number of dorm mates taking Economics 201	Number of dorm mates having taken Economics 201						
	0	1	2	3	4	5+	Total
0	28	42	14	11	3	3	101
1	21	30	11	9	1	2	74
2	8	9	9	0	1	3	30
3	4	9	2	0	0	2	17
4	0	3	0	0	0	0	3
Total	61	93	36	20	5	10	225

TABLE 3
Economics 201 Regression Results

Category	Variable	(1)	(2)	(3)	(4)	(5)
Own control variables	Reader rating (1–5 scale)	0.441***	0.440***	0.436***	0.428***	0.436***
		(0.0821)	(0.0832)	(0.0819)	(0.0827)	(0.0821)
	Verbal SAT (in 100s)	0.0976	0.101	0.0988	0.0989	0.0989
		(0.110)	(0.110)	(0.109)	(0.109)	(0.109)
	Math SAT (in 100s)	0.211**	0.212**	0.216**	0.215**	0.216**
		(0.0846)	(0.0839)	(0.0846)	(0.0843)	(0.0839)
Dorm mates currently taking Economics 201	Total	0.177**	0.151**	0.129**	0.127**	0.129**
		(0.0850)	(0.0626)	(0.0512)	(0.0508)	(0.0505)
	Predicted grade above 50th percentile	−0.0805				
		(0.111)				
	Predicted grade above 75th percentile		−0.0714			
			(0.112)			
Dorm mates having previously taken Econ 201	Total	−0.0537	−0.0515	−0.0559	−0.0375	−0.0399
		(0.0390)	(0.0386)	(0.0417)	(0.0424)	(0.0416)
	Economics majors			0.00496		
				(0.100)		
	Earned B+ or better?				−0.0921	
					(0.124)	
	Earned A− or better?					−0.0884
						(0.131)
	Constant	−0.782	−0.806	−0.797	−0.756	−0.792
		(0.793)	(0.784)	(0.792)	(0.774)	(0.785)
	Observations	225	225	225	225	225
	R^2	0.199	0.199	0.198	0.199	0.199

Notes: Dependent variable is grade earned in Economics 201 (0.0–4.0). Robust standard errors are in parentheses. Bootstrap standard errors were used for generated variables.
$^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

of the measures of dorm-mate academic quality. The regressions explain only about one-fifth of the variance in grades.[11]

The control variables have plausible signs, magnitude, and significance. Reader rating has a strong positive effect on the Econ 201 grade. SAT scores also affect the grade in the expected way: Verbal SAT is estimated to have a small and statistically insignificant positive effect; math SAT has a stronger and statistically significant effect.[12]

The estimated effects of the number and quality of potential dorm-mate mentors having taken economics are consistently negative, small, and statistically insignificant. There is no evidence that first-year students gain from mentoring by their more experienced coresidents, even when those dorm mates are economics majors or when they excelled in introductory economics themselves.

There is a small, positive, and statistically significant effect of having Econ 201 classmates living in the same residential unit. Depending on the specification, having one additional classmate in the same dorm raises the predicted grade by 0.13–0.18 grade point—about half of a plus–minus grade unit.[13]

In contrast to prior expectations, having an additional student in the top half of the predicted grade distribution *lowers* the expected grade. Although the coefficient of the number of high-ability dorm mates is not statistically significant, the point estimates suggest that adding a high-ability dorm mate (increasing both the number of dorm mates and the number of high-ability dorm mates by one) would have only about half the positive effect of adding a lower-ability dorm mate (increasing the number of dorm mates by one but not changing the number of high-ability dorm mates). Although the standard error of the coefficient is too large to make a statistical inference, this result suggests that it is the presence of weaker-than-average students in the dorm unit that may raise a student's grade the most.

The dependent variable in these regressions is the grade earned in Econ 201, which is measured discontinuously on a standard 4-point scale, with values clustered at 4.0 (A), 3.7 (A−), 3.3 (B+), and the like. Is this discontinuity simply the rounding of an underlying cardinal variable, or are course grades fundamentally ordinal rather than cardinal? The answer depends on whether the difference in performance between an A and a B is quantitatively equivalent to the difference between a B and a C.

The ubiquitous use of the grade point average reflects the common assumption that course grades are cardinal. Under this assumption, we can view the rounding as measurement error in the dependent variable, which just becomes part of the error term. The regressions in table 3 are based on this assumption.

If course grades are not cardinal—the difference between an A and a B is not equivalent to the difference between a B and a C—then the proper estimation method is ordered probit. Table 4 shows the results of ordered-probit regressions. The qualitative results are identical to those of the OLS regressions, though the coefficients are not equivalently scaled. The number of classmates in the same dorm continues to have a small and statistically significant positive effect, with the number of high-academic-quality classmates having a negative, but not statistically significant effect. Again, the presence of dorm mates who have taken Econ 201 has no effect.

The lower columns of table 4 present the cutoff thresholds for the various grade levels. If grades are cardinal, then these cutoff values would be a linear function of the grade-points variable. Given their relatively high standard errors, one cannot reject any meaningful null hypothesis about the difference in the thresholds. For example, a chi-square test of the null hypothesis that the difference

TABLE 4
Economics 201 Ordered-Probit Regression Results

Kind	Variable	(1)	(2)	(3)	(4)	(5)
Own control variables	Reader rating	0.597***	0.591***	0.584***	0.573***	0.584***
	(1–5 scale)	(0.112)	(0.112)	(0.111)	(0.111)	(0.111)
	Verbal SAT	0.0823	0.0885	0.0835	0.0855	0.0849
	(in 100s)	(0.124)	(0.124)	(0.123)	(0.123)	(0.124)
	Math SAT	0.286***	0.289***	0.301***	0.295***	0.295***
	(in 100s)	(0.110)	(0.109)	(0.111)	(0.109)	(0.108)
Dorm mates currently taking Economics 201	Total	0.265**	0.198**	0.161**	0.160**	0.164**
		(0.112)	(0.0854)	(0.0683)	(0.0680)	(0.0681)
	Predicted grade above 50th percentile	−0.170				
		(0.147)				
	Predicted grade above 75th percentile		−0.109			
			(0.159)			
Dorm mates having previously taken Economics 201	Total	−0.0561	−0.0537	−0.0521	−0.0326	−0.0338
		(0.0455)	(0.0461)	(0.0491)	(0.0507)	(0.0509)
	Economics majors			0.00535		
				(0.125)		
	Earned B+ or better?				−0.141	
					(0.156)	
	Earned A− or better?					−0.150
						(0.170)
Estimated cutoff values	A/A−	5.755	5.799	5.804	5.725	5.775
	A−/B+	5.352	5.400	5.405	5.325	5.376
	B+/B	4.896	4.945	4.950	4.869	4.921
	B/B−	4.350	4.399	4.404	4.323	4.373
	B−/C+	3.979	4.029	4.034	3.952	4.003
	C+/C	3.677	3.726	3.731	3.648	3.699
	C/C−	3.160	3.210	3.215	3.132	3.181
	C−/D	2.783	2.831	2.838	2.754	2.804
	D/F	2.520	2.567	2.575	2.490	2.541
	Range of standard errors	(0.926–0.956)	(0.916–0.948)	(0.930–0.962)	(0.910–0.942)	(0.918–0.949)
	Observations	225	225	225	225	225

Notes: Dependent variable is grade earned in Economics 201, which is treated as a 10-level ordinal variable with levels A, A−, B+, B, B−, C+, C, C−, D, and F. Robust standard errors are in parentheses.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

between the A/A− and A−/B+ threshold equals the difference between the B/B− and B−/C+ value has a p value of 0.78. The point estimates of the thresholds are approximately equally spaced, suggesting that the differences between adjacent grades are approximately uniform. This supports the cardinality assumption for grades between A and C−, where the assumed cardinal differences are all 0.3 or 0.35, but suggests that D and F lie closer together (and closer to C−) than their GPA values suggest.

INTERPRETATION

Taken as a whole, my results provide no support for the hypothesis that Reed College economics first-year students gain from having students in their residential unit who have expertise in economics. This outcome may reflect the accessibility of other kinds of academic support on the Reed campus. Student tutors are available for Econ 201, and faculty members are generally very accessible through office hours or appointments. Residential relationships may simply be unnecessary as sources of potential mentors.

The evidence is somewhat stronger that having economics classmates in a student's dorm affects the student's performance in Econ 201. This suggests that dorm networks may be a useful source of study partners.

A puzzling aspect of the results is that it appears that having classmates with high measured academic potential in the dorm unit does not help students get higher grades, and in fact may have a negative effect. Thus, there is no support for the idea that the gain in students' grades comes from being mentored by academically gifted classmates. However, there are at least two reasons why studying with lower-ability students might be beneficial. First, it may be that classmate-mentoring relationships enhance the learning of the mentor more than that of the student being helped. If this peer-mentoring hypothesis is the correct explanation for our results, then the effects we see in the aggregate data should be especially strong for a subsample of stronger students, since they are most likely to be drafted by dorm mates as peer mentors.

The second hypothesis is that a student without a high-ability study partner may be forced to do more of the actual hard work on homework assignments because he or she cannot find anyone who has already successfully completed them. Struggling with difficult assignments without a high-ability study partner may lead to more effective learning, which could be reflected in higher exam scores and better overall grades, even if the grades on the assignment suffer from the lack of a better student's input. Such struggling also may entail additional visits to the instructor or course tutors, which might be more learning-enhancing than working with a very smart classmate on an assignment. If this working-independently hypothesis is true, then our aggregate results should apply strongly to a subsample of weaker students, who might free-ride on the efforts of stronger dorm mates if they are available.

These alternative explanations were tested with separate regressions for subsamples of Econ 201 students who were above or below the median predicted course grade. The mentors-gain hypothesis implies that peer effects should be strong for the above-median sample; the forced-to-do-the-work hypothesis means they should be strong for below-median students. The results support both hypotheses: The qualitative econometric results were very similar for the two subsamples, although statistical significance was lower in both cases due to the reduced sample size. The hypothesis of equal coefficients on the peer variables cannot be rejected.

CONCLUSIONS

The econometric work reported here suggests that first-year students at Reed College draw some benefit from living in proximity to classmates. They do not seem to gain from having dorm mates who have taken Econ 201 in previous years.

A complementary approach to studying this question would be to survey students about their study habits. A survey could ask students directly how much they study with classmates and where they met their study partners. It could ask whether they sought help from more advanced students and whether dorm contact played a role in finding these mentors. However, a survey alone could not answer the more central question of this article, which is whether studying with dorm mates or mentoring by dorm mates leads to improved academic performance. Only by linking the results of the survey with actual grade outcomes could one effectively assess whether students who study with dorm mates earn higher grades.

One must be careful in extending the results reported here to other settings. Reed College has a number of distinctive characteristics that may impede generalization of these results to other institutions. Perhaps most important, it is a small, largely residential academic community in which it is relatively easy for students to form networks of friends, mentors, and study partners. Students may be less reliant on dorm mates in such an environment than they would be in a larger university where students are more dispersed.

Reed is selective in admissions, so the range of academic abilities among the students may be smaller than the range at less selective institutions. This could affect the kind of study-partner relationships that are most productive, making joint work by peers of similar ability more common and peer-mentoring of very weak students less common.

Reed is unusual even among selective liberal arts colleges in its devotion to academics and its approach to grading. There are no athletic teams or Greek social organizations, and interest in extra-curricular activities is very limited. The Reed Library is the social center of campus. Grades are de-emphasized in favor of learning for its own sake; faculty usually do not put numerical or letter grades on exams or papers, and students are not automatically informed of their grades (as long as they are satisfactory) during or after the course, though they can get grades at midterm and the end of the semester by inquiring through their academic advisor.

In this environment, academics are at the center stage, and we would expect peer and mentoring relationships to be very important. The emphasis on learning versus grades should encourage students to focus on learning from problem sets and lab assignments rather than simply getting the assignment done and handed it in to earn points, though there remains plenty of pressure for the latter.[14]

In short, Reed College and selective liberal arts colleges in general are a small but important part of American higher education. The kinds of classmate/dorm-mate interactions we studied could be either more important or less important than at larger and less selective institutions. The academic enterprise is taken very seriously at these schools, which may encourage a greater degree of collaboration. However, the institutions are small, which should give students more opportunities to collaborate with classmates outside the residential setting. High accessibility of faculty may reduce the extent to which students utilize peer-mentoring, and, as noted above, the limited range of academic abilities may limit the need for it.

This article suggests that the opportunity to interact with classmates in a residential environment may improve academic performance of first-year students in some introductory courses. Whether this result extends to other liberal arts colleges and to universities awaits further analysis.

NOTES

1. See Manski (1993).
2. Inkelas et al. (2008) provide a typology of kinds of such programs and review the literature describing them.
3. Because Reed is a small, selective college drawing its student body from a national applicant pool, the vast majority of first-year students arrive on campus knowing no other Reed students. No entering student at Reed would have a pre-established peer group of the kind that might occur when 25 graduates of the same high school attend a large state university and remain in contact with one another.
4. In addition to dorms, Reed houses higher-level students in two apartment buildings adjacent to campus. Conversations with students who lived in dorms and those who live in apartments suggest that residents in the apartment buildings do not interact in the same ways as those in dorms. The apartment buildings are larger (about 60 students) and lack the shared kitchen, bathroom, and social-room spaces of dorm units. We thus did not consider individuals who lived in the apartment buildings to be sharing a residential unit for purposes of this study. The results are not sensitive to this assumption as very few first-year students live in apartment housing.
5. The converse is not true. Reed has five language houses and, as noted above, two apartment buildings to which first-year students are rarely assigned.
6. Dummy variables for instructor were examined and proved not to be significantly associated with grade.
7. The divisions are, of course, somewhat arbitrary. Approximately 22 percent of students during the sample period earned an A or A− in Econ 201, and another 15 percent earned a B+, so these categories correspond roughly to the top quarter and the top three-eighths of students in the course. Lowering the standard to B or better would include more than the top half of students (57 percent). Other measures of quality were explored in earlier versions of the study, including the average grade of dorm mates and the best grade received in Econ 201 by a dorm mate. These measures were never statistically significant and had the added disadvantage of being undefined for the (many) students with no dorm mate who had completed Econ 201.
8. In most cases, the no-SAT students submitted ACT scores. Only the ACT composite score is retained in the college database, which does not allow us to decompose these scores into math and verbal components.
9. An alternative method, which we have explored in detail, is to use multiple stochastic imputation to impute the values of the missing cases. Multiple imputation proved problematic in this application because of observations with pervasive missing data and because imputed values for variables such as SAT and high school GPA were frequently out of range. Alternative regressions with the full 237 students using only the reader rating yielded results that are nearly identical to those reported below. Moreover, there is only a small and statistically insignificant difference between the groups with and without SAT scores in admission ratings and Econ 201 grade.
10. An alternative measure would be the proportion of dorm mates either taking or having taken the course. This would be a preferable alternative if there were large variation in the size of dorm units or if students did not become at least somewhat familiar with all dorm mates. At Reed, the size of the dorm units is sufficiently homogeneous that the proportional and absolute measures would not differ very much. Moreover, given that Reed students achieve at least some familiarity with all of their dorm mates, studying-together or mentoring opportunities depend on the number of potential partners, not the proportion.
11. This low R^2 is characteristics of all grade regressions using Reed College data, not just these for the economics course. In studies predicting cumulative GPAs of college students, admission variables typically explain about 40 percent of variation; at Reed such variables explain at best 25 percent.

12. We must be careful to note that these coefficients are not true partial effects. A student with a higher SAT score (of either type) will, other things being equal, have a higher reader rating as well because higher scores will raise the admission deans' assessment of the student. Thus, a zero coefficient on an SAT score in these regressions would mean that the weight attached to the score in the reader rating exactly matches the weight of that score in predicting the Econ 201 grade. A positive coefficient means that the score is even more important for Econ 201 success than in forming the admission office's overall assessment. A negative coefficient on one of the SAT scores is plausible; it would mean that the admission deans put more weight on that SAT component than its importance in predicting the Econ 201 grade.
13. When the number-of-classmates-in-dorm variable is treated as a set of dummies, the effect remains statistically significant with the strongest effect at three classmates/dorm mates.
14. Another study finds strong evidence that collaboration by Reed economics students takes the form of mutual contributions to homework assignments rather than free-riding by one student on the work of another. See Parker (2010).

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