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Freshman Learning Communities, College  
Performance, and Retention

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**Abstract:** This paper applies a standard treatment effects model to determine that participation in Freshman Learning Communities (FLCs) improves academic performance and retention. Not controlling for individual self-selection into FLC participation leads one to incorrectly conclude that the impact is the same across race and gender groups. Accurately assessing the impact of any educational program is essential in determining what resources institutions should devote to it.

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Key words: freshman learning community, treatment effects

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# Freshman Learning Communities, College Performance, and Retention

## I. Introduction

The purpose of this paper is to accurately and quantitatively evaluate the success of a Freshman Learning Community (FLC) program in achieving goals of retention and performance at a largely nonresidential, urban campus in the U.S. The FLC program is, at its most general, a mechanism by which college freshmen can develop a small community of peers who have an area of common interest. The communities are focused around such topics as the environment, communication, and leadership. The students take the same courses during their first semester and participate in some extra-curricular activities as a group. Psychological theories suggest that involving a student in a small community early in his or her academic career will improve the student's performance and increase the likelihood of retention for that student through developing confidence and facilitating social integration (for example, see Bean and Eaton 2001-2002 and Pascarella and Terenzini 1991). The bulk of assessments directed at FLCs or, more generally, First-year Experiences, are qualitative in nature; they rely primarily on surveys of students and instructors associated with the experiences.<sup>1</sup> The evidence along these lines is that students perceive their First-year Experience very positively (Darrington and Bacon 1999; Tinto, et al. 1994).

The goal here is to determine whether these qualitative experiences translate into tangible, quantitative outcomes. Accurate assessment of the impact of a program like FLCs is important since such programs typically demand considerable resources from the institutions in

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<sup>1</sup> For example, see the Policy Center on the First Year of College web site, "Typology of Instruments for First College Year Assessment <<http://www.brevard.edu/fyc/resources/Typ.htm>> (accessed 4 February 2003); the Learning Community Commons web site, "Overall, how are you

which they are active. Assessment of a program in which students themselves choose to participate is more complicated than merely comparing mean outcomes of performance or perception among those who participated and those who did not. If there is a possibility that a student's choice to participate is correlated with the outcome measure or biases their perception, evaluation of the impact of the program based on raw mean comparisons will be inaccurate. This potential problem of "self-selection" contaminating outcome measures has been discussed but not corrected for in the literature before now (see MacGregor 1991).

This study combines four years of FLC experience at Georgia State University, located in downtown Atlanta, Georgia, in the U.S. The university has approximately 28,000 students and its infra-structure is spread over 5 city blocks in one direction and 3 city blocks in another. There is one dormitory complex with space for 2,000 students. The large size of the campus, the large size of the student body, and the absence, for the majority of students, of the natural community-forming mechanism of dormitory living is an environment in which the FLC concept is expected to provide its greatest benefit. This environment is also one in which the differences in FLC and non-FLC students, in terms of "community" participation and identification, is expected to be substantial.

## **II. The FLC Program**

### *A. Academic Structure*

The structure of the FLC being evaluated here has components that are similar across other campuses in the U.S. (for example, see Soldner et al. 1999). The main components of the FLC program on this campus are:

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assessing the effectiveness of your learning community initiative?" found at

- First semester only program. A typical bachelor's (undergraduate) degree takes eight semesters to complete (two per year), so participation in a FLC lasts half of a student's first year of college.

- 25 student maximum in each FLC. Even when a student is in a FLC with only 25 students, this doesn't mean the student only has 25 people in all of his/her classes. Some classes contain non-FLC students.

- 5-course block scheduling. This means that all the students in one FLC have the same schedule during the first semester (they all take the same five classes), although they may not be the only students in each of the classes.

- Only 2 of the 5 courses are exclusive to the FLC chosen. The only other people that will be in a student's "New Student Orientation" and "English Composition" classes will be other members of the student's FLC. The FLC members will only be up to 25 in a class size between 60 to 120 students in the other three courses in the FLC schedule of classes.

- The New Student Orientation course counts in the student's GPA, but not toward the 120 hours required for graduation. This puts FLC students at somewhat of a disadvantage in accumulating hours toward graduation, since this is a course non-FLC students aren't required to take.

- Integrated learning. This means that the professors that teach the classes included in a FLC schedule collaborate and discuss ways in which a student's learning in each class can compliment and build on the learning in each of the other classes.

The first FLCs were offered to incoming freshmen in the Fall of 1999. Enrollment was 275 in 11 learning communities. In Fall 2000, 434 incoming freshmen were enrolled in 20

FLCs; in Fall 2001, 600 incoming freshmen were enrolled in 24 learning communities; and in Fall 2002, 800 incoming freshmen were enrolled in 32 different FLCs. These numbers corresponded to roughly 18-30% of the incoming freshmen classes.

### *B. Administrative Structure and Costs*

The FLCs are structured from below, which means that the development of and resources for teaching a FLC come from the academic department level. In other words, the faculty member constructs the FLC and the department Chair agrees to let the "New Student Orientation" course count toward a faculty member's required teaching load.

The primary infrastructure costs to the University associated with administering the FLC program include funding a half-time faculty position and summer salary stipend for the Director of Freshman Studies, funding several \$2,000 summer grants to help faculty develop a FLC, and the funding of a full-time administrative assistant and minimum support staff for the Director. While exact figures are difficult to come by for the early years of the program, it is estimated that the average annual cost to the University of the FLC program was \$135,000 (\$50,000 for a half-time faculty position and summer supplement, \$50,000 for the summer development grant program, and \$35,000 for the administrative support).<sup>2</sup> While it will not be possible to assess the dollar value of the program benefit from the analysis below, this cost figure will be used in evaluating the cost effectiveness of the program.

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<sup>2</sup> Cost figures were obtained from the Vice President of the Office of Institutional Research, and reflect a lower-bound estimate of the actual cost since the Departmental cost of releasing faculty to teach the New Student Orientation course required in each FLC meant the Department Chair needed to find a replacement instructor for the (typically larger) class the FLC instructor would have normally been teaching.

### **III. The Empirical Model**

#### *A. The Issue of Self-selection*

The analysis will model the impact of participating in a FLC as a treatment effect. Since participation in a FLC is purely voluntary, there is a concern that any measured effect of the FLC on retention or grades could be capturing the effects of self-selection; i.e., systematic differences between those who do and do not choose to participate in a FLC, rather than the impact of the treatment (the FLC) itself. If not controlled for, this degree of affinity for a group or community affiliation will bias the estimated impact of the FLC itself on the outcome of interest.

As a simple illustration of how self-selection can lead to erroneous conclusions about a program's effectiveness, consider the two following hypothetical cases. Suppose the true effect of a FLC program is zero; participating in a FLC has absolutely no impact on boosting academic performance. Also assume there are two types of students: bright and not-so-bright, and the bright students always perform one letter grade better (out of a four-point grade scale) than the not-so-bright. Now, consider a case where the bright students are more likely to select to participate in a FLC. Perhaps this is because bright students are more social and are naturally attracted to opportunities to make new friends. After the FLC semester, college administrators observe that students in the FLC perform one letter grade better than those not in a FLC and declare the program a resounding success.

Alternatively, it may be the case that the FLC only attracts the not-so-bright. Perhaps these students recognize they need some help and are willing to try anything. After the FLC semester, college administrators observe that students in the FLC perform one letter grade worse than those not in a FLC and declare the program a disaster.

Neither of these conclusions is correct. In order to obtain an un-biased assessment of the

impact of FLC participation, the empirical strategy must control for the possibility that students systematically self-select into FLC participation (they are not assigned randomly). Both the corrected and uncorrected regression results will be presented below in order to demonstrate the importance of correcting for self selection in the evaluation of any education program (not just FLC programs) in which participation is self-determined.<sup>3</sup>

### *B. Empirical Specification*

The relationship of interest can be expressed as a simple regression equation:

$$Y_i = X_i\beta + \delta Z_i + \varepsilon_i \quad (1)$$

where  $Y_i$  is the academic outcome of interest for person  $i$  (e.g., GPA or retention),  $X_i$  are individual characteristics for person  $i$ , and  $Z_i$  is a binary variable describing whether person  $i$  participated in a FLC ( $Z_i=1$ ) or not ( $Z_i=0$ ).  $Z_i$  is assumed to come from an unobserved decision process that can be characterized by:

$$Z_i^* = W_i\alpha + u_i \quad (2)$$

The decision to join a FLC is made according to the following rule:

$$Z_i = \begin{cases} 1 & \text{if } Z_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

In order to account for the potential correlation between  $\varepsilon_i$  and  $u_i$ , the model is estimated via

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<sup>3</sup> It was brought to our attention by a reviewer that capping the size of each FLC or by having only a limited number of FLCs available may have implications for self-selection. The idea is that if some students want to get in but can not because of availability restrictions, then our non-participant sample is contaminated with students who would have self-selected into the FLC, but are observed not in a FLC. If this contamination were a serious problem, then it would weaken our ability to identify any selection effects, or systematic differences between the FLC and non-FLC students. Since we still are able to identify significant selection into FLCs, it appears that any potential contamination is limited. This may be because the characteristics of the few students who may have wanted to but couldn't get in to a FLC are overwhelmed by the characteristics of the thousands of students who didn't want to be in the FLC in the first place.



maximum likelihood (ML) techniques (see Maddala 1983: 122 and Greene 2000: 180).<sup>4</sup> It is the significance of this correlation between the error terms that will tell us about the importance of accounting for self-selection in measuring the impact of the FLC on student performance and retention.

It is the correlation between these two error terms that presents a problem in obtaining a consistent estimate of the impact of the FLC on outcomes for the population (or, a randomly chosen freshman). To be confident that this procedure has produced a consistent estimate of  $\delta$ , there must be at least one regressor in  $W$  that is expected to influence the student's decision to belong to a FLC, but not be influential in the student's academic performance or retention. The regressors at our disposal and chosen for this analysis include the number of FLCs offered during the student's freshman year, the number of freshmen from a student's own high school matriculating at the same time, whether the student's hometown is "local" (in the same MSA as the university), and whether the student's hometown is rural. Certainly the more FLCs being offered, the more likely a student is to join one. There is evidence that students from smaller (i.e., rural) towns or from a greater distance from campus (i.e., non-local) are more likely to join a FLC (MacGregor 1991).

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<sup>4</sup> Maddala (1983: 120-2) also derives a two-step estimation procedure that accounts for the correlation between the error terms. When  $Y_i$  is a dichotomous (0,1) variable, such as will be the case in the retention analysis, this model reduces to a standard bivariate probit (see Greene 2000: 849). The log-likelihood function is:

$$\begin{aligned} \ln \ell_i = & \left[ \ln \Phi \left\{ \frac{W_i \alpha + (Y_i - X_i \beta - \delta) \rho / \sigma}{\sqrt{1 - \rho^2}} \right\} - \frac{1}{2} \left( \frac{Y_i - X_i \beta - \delta}{\sigma} \right)^2 - \ln(\sqrt{2\pi} \sigma) \right]^{Z_i} \\ & \times \left[ \ln \Phi \left\{ \frac{-W_i \alpha - (Y_i - X_i \beta) \rho / \sigma}{\sqrt{1 - \rho^2}} \right\} - \frac{1}{2} \left( \frac{Y_i - X_i \beta}{\sigma} \right)^2 - \ln(\sqrt{2\pi} \sigma) \right]^{(1 - Z_i)} \end{aligned}$$

where  $\sigma$  is the standard error of  $\varepsilon$  and  $\rho$  is the correlation between  $u$  and  $\varepsilon$ ; the variance of  $u$

Regressors included in the outcome equation will be usual predictors of performance or retention in college: high school GPA, SAT percentage ranking, hours earned, age, race, the college of the student's major, and gender.<sup>5</sup> Means of the data are presented in Table 1. The data cover four entering freshmen classes from the Fall semesters of 1999, 2000, 2001, and 2002. There are a total of 7,249 freshmen over these four years with non-missing observations. 60 percent of the students are female, 47 percent are white, 28 percent are black, and 25 percent enrolled in a FLC. Almost half of the freshmen have a declared major in the College of Arts and Sciences, followed by the Colleges of Business, Health and Human Sciences, Education, and Policy Studies. In the raw means, one observes a higher college GPA among FLC students versus non-FLC students. The average boost is a quarter of a letter grade, with the highest difference being gained by black men and women. Conversely, FLC students have lower retention after semester 4 than non-FLC students. If, however, students with a tendency to perform worse than average, or more likely to *leave* the university, are more likely to join a FLC, comparison of the raw means will *understate* the impact of the FLC on GPA and retention. If better than average performing students, or those more likely to stay at the university, are those more likely to join a FLC, raw means comparisons will *overstate* the actual impact of the FLC.

**[Table 1 here]**

The sample is restricted to Georgia residents since information about the students' hometowns is not available for non-Georgia residents. Georgia residents constitute 93 percent of the full sample. The sample is also restricted to recent high school graduates (within two years of matriculation) in order to ensure some homogeneity of the sample and relevance of high

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is assumed to equal one.

school performance measures.

#### IV. Estimation Results

##### *A. Academic Performance - 1st Semester*

Table 2 contains the results from two estimations. The dependent variable in both cases is the student GPA after the first semester in college (this is the semester that includes the FLC).<sup>6</sup> The first estimation corresponds to the simple ordinary least squares (OLS) estimation of equation 1. The coefficient of interest is that corresponding to the "FLC = 1" regressor. The estimate of 0.27 indicates that, on average, students who belonged to a FLC ended up with a GPA 0.27 points higher than students who did not belong to a FLC.<sup>7</sup> This OLS estimation, however, does not control for the selection by students into the FLC. The results of maximum likelihood estimation, which controls for selection, are found in the second and third columns of numbers in Table 2.<sup>8</sup>

[Table 2 here]

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<sup>5</sup> Since hours earned in any semester is likely to be endogenously determined with GPA earned during that semester, hours earned is instrumented out using a standard two-step IV procedure. The first-stage regression results are reported in the Appendix. See Greene (2000: 371).

<sup>6</sup> One may question the use of GPA as a FLC assessment measure since instructors may grade differently between FLC and non-FLC classes. We do not have information on individual grades earned in each class, so we can not rule out this possibility. However, an advantage with the analysis here is that in three of the five classes, students are grouped with a majority of non-FLC students. In addition, the fairly sizable persistence of the FLC effect over time (seen later) suggests that any grading or dilution bias is likely overwhelmed by the actual impact of the FLC.

<sup>7</sup> The GPA at this institution is common to most other colleges and university in the U.S. There are five grades, yielding point levels ranging from 0 to 4. A grade of "A" reflects excellent performance and is worth 4 points, "B" is good performance and is worth 3 points, "C" is fair and is worth 2 points, "D" means poor performance and is worth 1 point, and "F" is failing and is worth 0 points. So, a 0.27 of a grade is equivalent to a quarter of a point on a 4-point scale.

<sup>8</sup> MacGregor (1991) summarizes a variety of FLC assessments, some of which are consistent with the results reported here, others are not. None of the studies summarized, however, controlled for individual selection into the FLC group.

All but one of the variables used to identify the FLC decision equation are significantly different from zero. More FLCs to choose from increases a student's chance of belonging to a FLC; students from a rural hometown and from a "local" hometown are less likely to participate in a FLC; and the more fellow students coming from one's high school, the less likely is that student to join a FLC (although this last result is not statistically significant). These results (except for the negative coefficient on Rural hometown=1) are consistent with the hypothesis that students more likely to be drawn to the FLC environment are those more likely to feel alienated by the large campus (i.e., those from a further distance away and those with fewer acquaintances from home).<sup>9</sup> In addition, students with declared majors in the college of business are significantly less likely to participate in a FLC than the omitted group (those who have not declared a major and those in the School of Policy Studies), and those in the college of education are slightly more likely to participate in a FLC.

Turning to the maximum likelihood GPA equation, we see quite a modified story than that told by the OLS estimation. Belonging to a FLC increases a student's GPA by 0.78 of a letter grade--more than predicted by the simple OLS estimation.<sup>10</sup> The reason for the larger coefficient from the ML estimation can be seen in the estimate of "Rho," the correlation between the standard errors of the FLC and GPA equations. The negative correlation indicates that students who are likely to perform worse than average are more likely to choose to belong to a

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<sup>9</sup> Given that the coefficient on Rural hometown is only weakly significant, it's unexpected negative coefficient may be arising due to multi-collinearity with some of the other regressors, such as "Local" hometown.

<sup>10</sup> This positive impact of the FLC on GPA is consistent with the finding by Soldner, et al. (1999) who find that FLC students are more likely to remain in good academic standing than non-FLC students. These authors, however, did not control for selection, so likely underestimate the FLC impact. All other regressors, such as high school GPA, perform as expected.

FLC.<sup>11</sup> This makes sense if we consider that students (or parents or other advisors) have better information about their performance potential and feel as though the FLC is a way to improve that potential; the net result will be that those with a lower performance potential will have a greater incentive to join the FLC.

Table 3 presents the OLS and ML FLC coefficients across race and gender groups to see whether the selection process and impact is different across these groups. What we see in this table is that not controlling for individual selection into the FLC underestimates the positive impact of the FLC most for black men. In other words, black men participating in a FLC experience a greater improvement in the first semester GPA than FLC participants of other race and gender groups. FLC participation impacts the GPA of black men by more than a full letter grade. This strong effect of FLC participation on the performance of black men is consistent with the findings of MacKay and Kuh (1994) and DeSousa and Kuh (1996), who find that black college students gain more than white students from involvement in academic-related activities at predominantly white institutions.<sup>12</sup>

**[Table 3 here]**

The impact of the FLC on white men and black women are also underestimated by the OLS estimation procedure. White women, on the other hand, positively select into FLCs and the selectivity-corrected impact of the FLC on their performance is small and not significantly different from zero. This zero impact of FLC participation for white women may suggest that

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<sup>11</sup> This is consistent with at least the raw high school statistics provided for FLC and non-FLC students in the study by Soldner, et al. (1999).

<sup>12</sup> The lower performance of black students at predominantly white institutions (PWI) was attributed primarily to less academic effort being exhibited by black students at these institutions, compared with effort exerted at historically black institutions (HBI). These studies, however, did not control for potential systematic differences in the characteristics of black students who choose to attend PWI or HBI, i.e., self-selection.

white women are more successful in forming informal communities among their peers than other race or gender groups. This would suggest that white women do not need the formal structure of a FLC to enhance performance, or, rather, that the FLC does not provide white women with any advantage from joining a community.

The results in Table 3 highlight the importance of controlling for individual self-selection in obtaining an accurate measure of the impact of FLC participation on GPA. Looking at the OLS estimates across race and gender groups would lead one to incorrectly conclude that FLC participation has the same impact on GPA across these groups; FLC participation improves GPA by approximately one quarter of a letter grade. However, since men and women and black and white students are apparently drawn to FLCs for systematically different reasons, the unbiased, selectivity-corrected impact varies substantially across race and gender groups; from over a letter grade for black men to a level not significantly different from zero for white women.

#### *B. Academic Performance - Persistence*

The impacts reported in Tables 2 and 3 correspond to students' GPA for their first semester in college. The question of the effect of FLC participation in a student's first semester in college on future academic performance is addressed in Table 4. Since retention may be an issue in looking further out from the FLC semester, an instrument for cumulative hours earned as of the semester of interest was included in the regression.<sup>13</sup> The sample also differs in that it only includes freshmen students from 1999, 2000, and 2001, since outcomes more than one semester out were not available for the 2002 cohort. The results in Table 4 indicate that the

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<sup>13</sup> An instrument was used in order to account for the likely endogeneity of hours earned as of a particular semester in the determination of the cumulative GPA as of that semester. See footnote 5.

impact of a FLC on academic performance diminishes after the first semester, however still has a positive and significant 0.34 boost to the student's cumulative GPA one year after enrolling in the FLC. And, as noted in the table notes, the decision to join a FLC remains significantly negatively correlated with academic performance several semesters after the experience.

**[Table 4 here]**

### *C. Retention*

Table 5 contains the maximum likelihood results from looking at student probabilities of being enrolled one year after matriculation. For students who entered in Fall 1999, for example, the dependent variable is set equal to one if they are enrolled in Fall 2000 and zero otherwise. The sample is restricted to the 1999, 2000, and 2001 FLC cohorts. The model estimated is a standard bivariate probit (see footnote 4). The number in brackets under the FLC coefficient estimate and standard error corresponds to the impact of FLC participation on the probability that a student is enrolled one year after matriculation (the partial derivative). FLC participation significantly positively impacts retention among black men and women. Enrolling in a FLC increases the probability that a black male will be enrolled one year later by 31 percentage points (19 percentage points for black females). Interestingly, FLC participation negatively impacts retention of white males.<sup>14</sup> While only marginally significantly different from zero, a potential 36 percentage point reduction in white male retention likely warrants further scrutiny.

The negative selection into FLC participation by black males and females is further evidenced by the significant negative correlation coefficient. This estimate indicates that there is a negative correlation between the probability that a black student is enrolled one year after

matriculation and the probability of participation in a FLC. It's of interest to note that even though there is evidence of negative selection of white males into FLC participation regarding academic performance, there is evidence that those more likely to leave the University are also *more* likely to participate in a FLC.

[Table 5 here]

## V. Summary and Policy Implications

The purpose of this paper was to obtain an accurate measure of the impact of Freshman Learning Community (FLC) participation on academic performance (GPA) and retention. It was found that there is significant correlation between factors that determine FLC participation and GPA; students who are likely to perform worse than average are more likely to participate in a FLC. Belonging to a FLC increases a student's GPA from about three quarters to one full letter grade, depending on the student's race and gender (except for white females, who experience no boost from FLC participation).<sup>15</sup> This impact drops to about 0.34 of a letter grade one year later. In addition, it was found that not controlling for individual self-selection would lead one to incorrectly conclude that FLC participation impacts all race and gender groups equally.

The results in this paper indicate that FLC participation can also improve the retention of some students. The probability that black men and black women were enrolled one year after matriculation increased significantly for those who participated in a FLC during their first year.

Knowing more about the true impact of programs like FLCs allows college administrators to make more informed decisions regarding the amount of resources to devote to

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<sup>14</sup> The negative coefficients on FLC=1 for white women is not significantly different from zero, implying that participation in a FLC has no impact the retention of white women.

<sup>15</sup> See footnote 7 for a description of the grading scale at this institution.



them. If improving academic performance is considered a desirable outcome, then the evidence provided in this paper strongly supports the effectiveness of a Freshman Learning Community program in achieving this goal. However, resources are limited, and as mentioned in an earlier section, the cost of the FLC program was estimated to be \$135,000 per year. While we can not put a dollar amount on the benefit of the increased performance or retention measured in this paper, we can evaluate more concretely what that \$135,000 "bought" for the institution.

Students at this university must maintain a certain GPA in order to stay in good standing. A GPA that falls below 2.0 places a student on warning, and continued low performance results in the student being excluded from the university. Using the ML estimates in Table 3, we simulated the number of FLC students that would have been placed on warning during their second semester if they had not enrolled in a FLC.<sup>16</sup> Among FLC participants, an average of 82 white males (31% of white male FLC participants), 41 black males (73%), and 140 black females (49%) per year would have been placed on warning during their second semester if they had not participated in a FLC during their first semester.<sup>17</sup> In total, then, the cost to this university was approximately \$513 per student that avoided being placed on warning during their second semester.<sup>18</sup>

The fact that the strongest impact (both in performance and retention) is measured for a

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<sup>16</sup> Of course, participating in a FLC does not guarantee a student is not put on academic warning during his/her second semester, and these calculations assume that the average ML effect of FLC participation accrues to each member of a specific race and gender group.

<sup>17</sup> These are per-year counts, as opposed to the number of observations reported in Table 3, which reflect the total over the full four-year period of time. No white females would have avoided warning status (on average) since participation in a FLC for that race/gender group yielded no performance benefit.

<sup>18</sup> It is also of interest to note that if the OLS results (those not controlling for self-selection) are used to make the same calculation, only an average of 47 students per year would have avoided warning through FLC participation at an average, per student cost of \$2,872. Not controlling for self-selection, then, would lead to a much lower cost-effectiveness conclusion in this calculation.

particularly vulnerable group--black males--suggests that tailoring FLCs to the interest of black men would yield an even greater measured benefit to the program. In addition, while the impact on performance is still present one year after completion of the FLC program, it is only half of the immediate impact. It may be worthwhile to expand "Freshman" learning communities into a learning community experience that goes beyond a student's first semester. Each year presents a new set of challenges and students may see larger long-term benefits from on-going learning communities. Of course, the impact of expansion of the program should be evaluated and weighted against the cost of that expansion.

Table 1. Sample Means by Race and Gender

	Full Sample	<u>Men</u>		<u>Women</u>	
		White	Black	White	Black
FLC = 1	0.25	0.22	0.29	0.26	0.38
SAT-verbal (percentile rank)	53.25 (12.83)	57.84 (12.42)	51.55 (11.08)	55.18 (12.13)	48.59 (10.27)
SAT-math (percentile rank)	53.39 (12.75)	58.75 (12.14)	50.37 (11.98)	53.37 (10.84)	46.33 (10.51)
High School GPA	3.24 (0.38)	3.13 (0.38)	3.13 (0.35)	3.29 (0.39)	3.30 (0.34)
College GPA, semester 1	2.78 (0.75)	2.78 (0.77)	2.46 (0.79)	2.94 (0.72)	2.68 (0.73)
College Hrs Ernd, sem. 1	12.70 (3.38)	12.80 (3.60)	12.00 (3.27)	12.94 (3.36)	12.63 (2.93)
Age	18.54 (0.47)	18.63 (0.45)	18.46 (0.50)	18.55 (0.41)	18.43 (0.43)
C of Arts and Sci. = 1	0.48	0.47	0.55	0.42	0.52
C of Business = 1	0.29	0.35	0.48	0.15	0.26
C of Hlth & Hum. Sci. = 1	0.06	0.03	0.02	0.09	0.10
C of Education = 1	0.04	0.01	0.03	0.08	0.05
Undeclared Major = 1	0.13	0.14	0.08	0.26	0.07
GPA after semester 1 (FLC=0)	2.72 (0.78)	2.73 (0.77)	2.36 (0.83)	2.87 (0.75)	2.55 (0.76)
(FLC=1)	2.97 (0.65)	2.96 (0.74)	2.72 (0.64)	3.15 (0.60)	2.90 (0.61)
In attendance semester 4=1 (FLC=0)	0.59	0.56	0.61	0.60	0.66
(FLC=1)	0.57	0.54	0.54	0.59	0.59

Table continues...

Table 1, continued

	Full Sample	<u>Men</u>		<u>Women</u>	
		White	Black	White	Black
Female = 1	0.60	--	--	--	--
White = 1	0.47	--	--	--	--
Black = 1	0.28	--	--	--	--
Asian = 1	0.13	--	--	--	--
Hispanic = 1	0.03	--	--	--	--
Native American = 1	0.002	--	--	--	--
Multi-racial = 1	0.09	--	--	--	--
Number of Observations	7,249	1,526	556	1,873	1,468

Note: Numbers of observation across race and gender groups do not add up to the full sample total, since the full sample includes racial groups other than black or white (namely, Hispanic, Asian, Native American, and Multi-racial). None of these other racial groups was large enough to allow for separate analysis. A very small number of declared majors fall into the School of Policy Studies, but are grouped with the "undeclared."

Table 2. OLS and ML Estimates of the Impact of FLC on Student Performance in the First Semester for the Full Sample

Dependent Variable =	Estimation Methodology =	OLS	Maximum Likelihood
		GPA	FLC GPA
Hours earned, semester 1 (IV)		0.0067 (0.0059)	--  0.0071 (0.0060)
SAT - verbal		0.0060* (0.0007)	0.0018 (0.0015) 0.0055* (0.0008)
SAT - math		0.0049* (0.0007)	-0.0048* (0.0015) 0.0057* (0.0008)
Black = 1		-0.2149* (0.0213)	0.2894* (0.0429) -0.2724* (0.0233)
Asian = 1		-0.0917* (0.0266)	-0.5107* (0.0637) -0.0323 (0.0287)
Hispanic = 1		-0.0321 (0.0519)	-0.1214 (0.1082) -0.0236 (0.0545)
Multi-racial = 1		-0.0448 (0.0300)	-0.1514+ (0.0636) -0.0329 (0.0316)
Female = 1		0.0843* (0.0184)	0.1292* (0.0386) 0.0682* (0.0194)
FLC = 1		0.2704* (0.0204)	--  0.7763* (0.0637)
High School GPA		0.7141* (0.0255)	-0.0539 (0.0483) 0.7097* (0.0265)
C of Business=1		-0.0589* (0.0196)	-0.1211* (0.0415) -0.0359^ (0.0207)
C of Arts & Sci. = 1		-0.0354+ (0.0179)	0.0198 (0.0375) -0.0350^ (0.0188)
C of Hlth & Hum. Sci = 1		-0.1523* (0.0366)	-0.1059 (0.0750) -0.1300* (0.0385)

Table continues...

Table 2 continued...

C of Education = 1	-0.0463 (0.0440)	0.0683 (0.0880)	-0.0550 (0.0462)
Intercept	-0.1964 <sup>+</sup> (0.0915)	-0.7361* (0.1960)	-0.3254* (0.0969)
FLC Number	--	0.0237* (0.0024)	
Rural hometown = 1	--	-0.1286 <sup>^</sup> (0.0742)	
"Local" hometown = 1	--	-0.2985* (0.0514)	
High School Count	--	-0.0002 (0.0014)	
Adjusted R squared	0.2031		
Rho	--	-0.4630* (0.0572)	
<u>Number of Observations</u>		<u>6,571</u>	

Notes: Standard errors in parentheses. \* => significant at the 99% confidence level, <sup>+</sup> => significant at the 95% confidence level, <sup>^</sup> => significant at the 90% confidence level. See the appendix for the first-stage estimation results that produce the IV prediction of earned hours used as a regressor here.

Table 3. OLS and ML Estimates of the Impact of FLC on Student Performance in the First Semester for Different Race and Gender Groups

	FLC Coefficient		No. of Obs.
	OLS	ML	
White Males	0.2357* (0.0492)	0.7824* (0.1577)	1,336
White Females	0.2447* (0.0372)	0.2050 (0.2294)	1,687
Black Males	0.2968* (0.0737)	1.1226* (0.2046)	509
Black Females	0.2922* (0.0398)	0.9324* (0.1253)	1,342

Note: See notes to Table 2. All estimates of Rho were negative and significantly different from zero except for white females. See Table 2 for the list of additional regressors included in the estimation. Numbers of observation across race and gender groups do not add up to the full sample total reported in Table 2, since the full sample includes racial groups other than black or white (namely, Hispanic, Asian, Native American, and Multi-racial). None of these other racial groups was large enough to allow for separate analysis. The estimates for white females were obtained from a two-step estimation procedure, since the full maximum likelihood estimation for that subsample had difficulty converging. Each of these ML parameter coefficients is significantly different from that estimated on the full sample at the 99 percent confidence level (calculated z-statistic).

Table 4. OLS and ML Estimates of the Impact of FLC on Student Performance in Semesters 1 and 4 for the Full Sample

	FLC Coefficient	
	<u>OLS</u>	<u>ML</u>
GPA after semester 1	0.2698* (0.0263)	0.6293* (0.0914)
GPA after semester 4	0.0823* (0.0204)	0.3410* (0.0829)

Note: Sample restricted to students in 1999, 2000, and 2001 FLC semesters only (2002 FLC students are not observed beyond their second semester) and to students who took classes during semester 4 (in order to abstract from retention issues). See the notes to Table 2 for the additional regressors included in the estimation. All estimates of Rho were negative and significantly different from zero. The number of observations was 3,841.



Table 5. ML Estimates of Impact of FLC on Probability of Enrollment during Semester 4 for Different Race and Gender Groups

Dependent Variable = 1 If Enrolled In Semester 4, 0 Otherwise					
	Full Sample	White Males	White Females	Black Males	Black Females
GPA, Semester 1	0.3774* (0.0285)	0.3407* (0.0545)	0.3012* (0.0543)	0.3112* (0.0751)	0.4287* (0.0786)
C of Business = 1	0.0069 (0.0592)	0.0756 (0.0965)	0.1444 (0.1304)	0.1664 (0.1489)	-0.0611 (0.1304)
C of Arts & Sci. = 1	-0.0142 (0.0506)	0.0091 (0.0934)	0.0361 (0.0987)	-0.0867 (0.1460)	0.0158 (0.1179)
C of Hlth & Hum. Sci = 1	-0.3757* (0.0927)	0.0294 (0.2592)	-0.4427* (0.1412)	-0.6385 (0.4154)	-0.2068 (0.1844)
C of Education = 1	0.2623^ (0.1391)	--	0.0720 (0.1865)	--	0.3050 (0.3035)
Female = 1	0.0576 (0.0515)	--	--	--	--
Black = 1	0.3628* (0.0686)	--	--	--	--
Asian = 1	0.5346* (0.0882)	--	--	--	--
Hispanic = 1	0.5233* (0.1702)	--	--	--	--
Multi-racial = 1	0.1401 (0.0897)	--	--	--	--
FLC = 1	0.0985 (0.3709)	-1.0233+ (0.4636)	-0.6997 (0.4954)	1.5039* (0.1539)	0.9636* (0.3150)
	[0.22]	[-0.36]	[-0.22]	[0.31]	[0.19]
Intercept	-0.2110^ (0.1201)	0.0045 (0.1737)	0.1764 (0.1953)	-0.3487^ (0.2051)	-0.3809^ (0.2024)
Rho	-0.0342 (0.2203)	0.5584 (0.2423)	0.4660 (0.2662)	-0.9905 (0.0207)	-0.6066 (0.1989)
Number of Observations	4,575	950	1226	347	977

Note: Standard errors in parentheses. Results from the FLC equation not reported here. See Table 2 for regressors included in the FLC equation and for significance level notation. Semester 4 refers to the Fall of the student's second year in college. Sample only includes 1999, 2000, and 2001 FLC cohorts. Numbers of observation across race and gender groups do not add up to the full sample total, since the full sample includes ethnic groups not large enough to allow for separate analysis. There were not enough observations to include the College of Education regressor in either Male regression. Each of these ML parameter coefficients is significantly different from that estimated on the full sample at the 99 percent confidence level (calculated z-statistic). The numbers in brackets under the FLC coefficients are the marginal effects of FLC participation on the probability that a student is enrolled one year after matriculation.

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Appendix: Reduced form OLS estimation for Earned Hours, Full Sample.

Dependent Variable =	Hours Earned, semester 1
Intercept	-7.1578* (0.4996)
High School GPA	1.9154* (0.1000)
SAT - verbal	0.0146* (0.0032)
SAT - math	0.0089* (0.0033)
Black = 1	-0.5233* (0.0951)
Asian = 1	-0.5192* (0.1169)
Hispanic = 1	-0.1671 (0.2285)
Multi-racial = 1	-0.1545 (0.1328)
Female = 1	0.0167 (0.0807)
Number of FLCs Offered	0.0096^ (0.0051)
C of Business=1	-0.1366 (0.0859)
C of Arts & Sci. = 1	0.0760 (0.0786)
C of Hlth & Hum. Sci = 1	-0.1459 (0.1604)
C of Education = 1	0.1214 (0.1930)
Rural Hometown = 1	-0.1715 (0.1764)
“Local” Hometown = 1	-0.0878 (0.1206)
High School Count	0.0092* (0.0030)
Hours Attempted, semester 1	0.8946* (0.0224)
Adjusted R squared	0.2487
F Statistic	128.96
Number of Observations	6,571

Notes: Standard errors in parentheses. \* => significant at the 99% confidence level, + => significant at the 95% confidence level, ^ => significant at the 90% confidence level.