Socioeconomic Stratification in College STEM Persistence

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Background

Much of the current stratification literature focuses on vertical forms of stratification and how families' socioeconomic status (SES) affects their children's placement in this vertical hierarchy. For instance, research on stratification in postsecondary education consistently finds that SES predicts college entry, type, and selectivity. Young adults with lower levels of SES are less likely to enter college, and when they do, are more likely to enter a two-year college over a four-year college and less likely to enter highly selective four-year colleges than those with higher levels of SES (Provasnik and Planty 2008; Davies and Guppy 1997; Astin and Oseguera 2004).

However, within each of these vertical strata, individuals also experience horizontal stratification by field of study. Because fields of study are not equally rewarded in the labor force, differential access to certain fields contributes to patterns of stratification as well. Given the increased reliance on science and technology in the global economy and that STEM occupations are consistently among the most highly rewarded in the labor force (National Science Board 2012), this paper will focus particularly on the relationship between SES and persistence in STEM. Not only are these jobs important for our economy, but disparities in access to these jobs may also have implications for broader patterns of inequality and mobility.

Theoretically, it is not clear whether SES has a positive or negative effect on persistence in STEM. On one hand, the structure of most STEM fields may exacerbate socioeconomic stratification processes. For one, the hierarchical nature of math and science courses makes falling behind in these courses especially detrimental to success in STEM and entering STEM more difficult later on. This structured nature of STEM curriculum may allow those with more resources to better navigate the pathway through math and science. Along the same line, Lucas (2001; 2009), in his theory of effectively maintained inequality (EMI), emphasizes that as vertical stratification decreases, horizontal stratification increases. Given increases in college-going and high rewards among STEM majors, stratification in these fields may be especially pronounced.

On the other hand, there are reasons to think that STEM might actually be more egalitarian than other fields. For instance, science and other mathematically-driven fields may lend themselves to a more equitable reward system, where success is based on individual merit and the accumulation of skills and less so on the accumulation of social and cultural capital (Jackson et al. 2008; Xie and Achen 2009). Similarly, others argue that individuals with lower levels of SES may choose and be more motivated to persist in more pragmatic fields of study in order to maximize economic benefit, while those with more resources may be less constrained by these concerns and have more freedom to choose fields suited to their interests (Ma 2009). It is also important to note that the effect of SES on STEM likely varies by context. Because individuals are stratified vertically by college type and selectivity, the composition of these institutions varies considerably.

This paper will seek to gain a better understanding of how students' family background affects their persistence in college and whether this varies by field and college context. I

will use longitudinal data on a nationally-respresentative sample of a recent cohort of first-time postsecondary matriculants to look at how family socioeconomic status (SES) affects students' persistence in college by field of study, in terms of both switching major and leaving college altogether before obtaining a degree. It also considers differences by college type and college selectivity and looks at the possible mediating and moderating effects of high school and college achievement, employment, and academic and social integration.

Data

This paper will use data from the Beginning Postsecondary Study (BPS: 04/09), which follows a nationally-representative sample of approximately 16,700 first-time postsecondary students in 2003-2004, with follow ups in 2005-2006, two years after entry, and 2008-2009, six years after entry into postsecondary. These data provide a detailed account of students' postsecondary education, including transcript information, and early entry into the labor force.

Variables:

Dependent Variable:

Persistence: Persistence will be measured as a categorical variable indicating whether the individual remained in their major reported in wave one versus switched majors or left college by the third wave. Since BPS includes college transcripts, switching majors will be measured by matching the student's first major to their degree major, while leaving will reflect not earning a degree by the end of the second follow up, six years after college entry. First major is student reported with 46 categories, while degree major is taken from the student's college transcript and consists of over 300 degree categories. Because of very small sample sizes in several fields, some categories will be combined.

Independent Variables:

SES: SES will be measured as highest parent education (High school degree versus less than a high school degree, two-year degree, some college, four-year degree, or advanced degree) and a categorical measure of family income thirds.

College Major: College major is measured at the end of the students' first year college and consists of 46 categories. These categories will be collapsed into STEM versus non-STEM. STEM categorization will follow other related work and consist of majors from the physical and biological sciences, engineering, and mathematics.

College Type: College type will be measured as two-year versus four-year college or university.

Selectivity: College selectivity of four-year colleges will again be measured with Barron's selectivity index, indicating minimally selective, moderately selective, or very selective.

Employment: Workload will be measured as whether the student worked while enrolled and the average hours worked per week. Since financial support may mitigate these

effects, I will also include measures of the students financial aid. This will be measured as the type of financial aid received (none versus merit or need-based) and the total loan amount (student reported).

Social and Academic Integration: Social and academic integration are composite scales created by BPS. Social integration includes how often the student had attended fine arts activities, participated in intramural or varsity sports, or participated in school clubs, while academic integration includes how often the student had participated in study groups, had social contact with faculty, met with an academic advisor, or talked with faculty about academic matters outside of class.

Controls: I will also control for gender (female versus male), race-ethnicity (white versus Black, Hispanic, Asian, or other), and high school preparation, including highest math course taken (calculus or precalculus versus trigonometry or below) and high school grades ranging from 1 (D- to D) to 7 (A- to A), and college GPA (0 to 4 continuous scale).

Preliminary Results and Analytic Plan

I will run nested multinomial logistic regression models predicting switching majors and leaving college versus persistence in first major. To see the effect of SES and whether this effect varies by field of study, I will look specifically at the interaction between SES and STEM. Other models will include demographic controls, high school preparation, college characteristics, college achievement, employment, financial support, and social and academic integration. I will also run separate models for two-year and four-year colleges and level of selectivity.

Preliminary findings suggest that STEM majors with low levels of SES may be especially disadvantaged in college persistence. STEM majors with parents who have no college experience have an added disadvantage in terms of both switching majors and leaving college altogether versus persisting in their first major, and this remains net of controls for demographics, high school and college achievement, and college characteristics. Figure 1 shows predicted probabilities of first-generation college students switching majors, leaving college, or persisting in first major for STEM and non-STEM majors. We can see from this figure that STEM majors with parents whose highest degree is a high school degree or less have a higher probability of switching majors and leaving college altogether and a lower probability of persisting in their first major than their non-STEM counterparts. Other analyses (not shown) find that this group of students whose parents have no college experience are much less likely to persist in their first major than their counterparts whose parents have higher levels of education. This is true for both STEM and non-STEM majors, but the differences are more pronounced among STEM majors.

Future analyses will focus on whether these findings vary by college type and selectivity and will further explore the role of employment, financial aid, and social and academic integration.

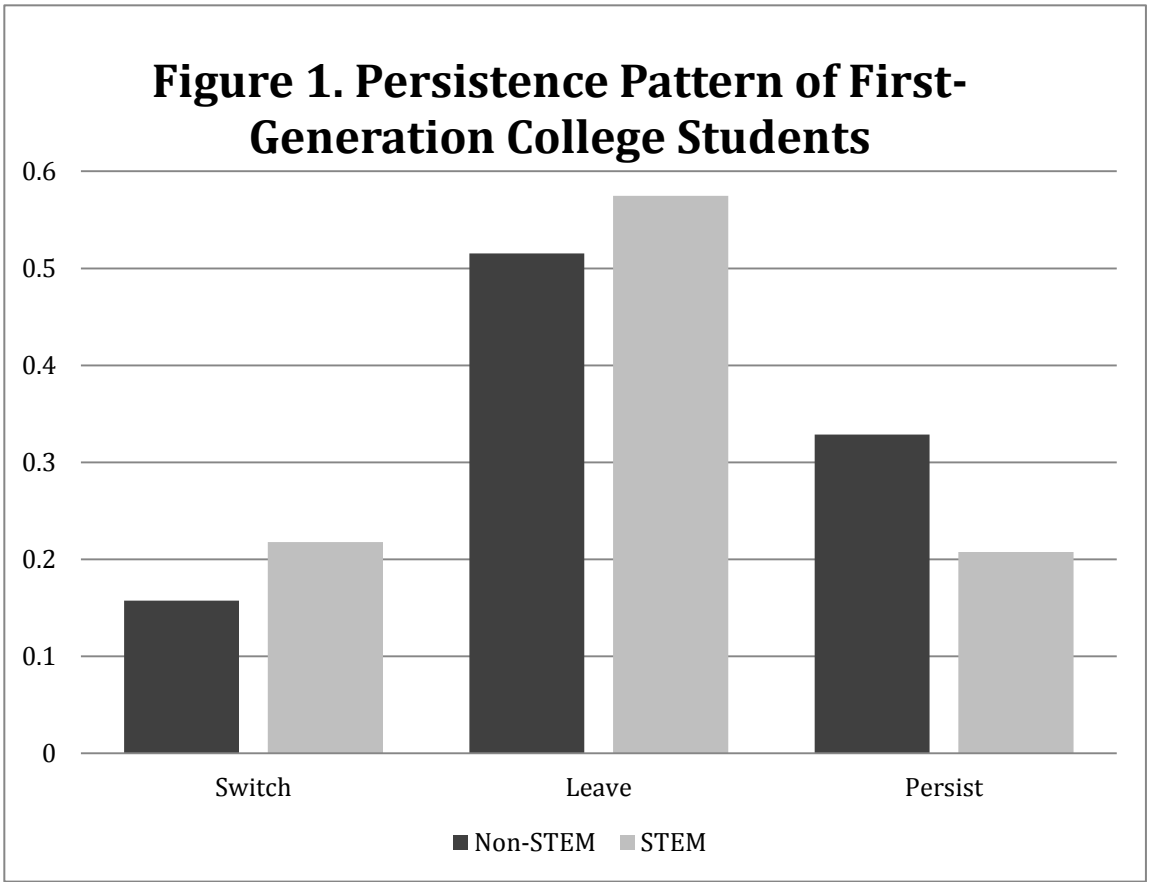
Figure 1. Persistence Pattern of First-Generation College Students
0.6
0.5
0.4
0.3
0.2
0.1
0
Switch
Leave
Persist
Non-STEM
STEM

References:

Astin, Alexander W., and Leticia Oseguera. 2004. "The Declining "Equity" of American Higher Education." *Review of Higher Education* 27(3): 321-341.

Davies, Scott, and Neil Guppy. 1997. "Fields of Study, College Selectivity, and Student Inequalities in Higher Education." *Social Forces* 75(4):1417-38.

Jackson, Michelle, Ruud Luijkx, Reinhard Pollak, Louis-Andre Vallet, and Herman G. van de Werfhorst. 2008. "Educational Fields of Study and the Intergenerational Mobility Process in Comparative Perspective." *International Journal of Comparative Sociology* 49(4-5):369-88.

Lucas, Samuel R. 2001. "Effectively Maintained Inequality: Education Transitions, Track Mobility, and Social Background Effects." *American Journal of Sociology* 106(6):1642-90.

Lucas, Samuel R. 2009. "Stratification Theory, Socioeconomic Background, and Educational Attainment." *Rationality and Society* 21(4):459-511.

Ma, Y. 2009. "Family socioeconomic status, parental involvement, and college major choices-Gender, race/ethnic, and nativity patterns." *Sociological Perspectives* 52(2):211-34.

National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington VA: National Science Foundation (NSB 12-01).

Provasnik, Stephan, and Michael Planty. 2008. "Community Colleges: Special Supplement to The Condition of Education 2008 (NCES 2008-033)." Washington, DC: National Center for Education Statistics, Institute of Educational Sciences, U.S. Department of Education.

Xie, Y., and A. Achen. 2009. "Science on the Decline? Educational Outcomes of Three Cohorts of Young Americans." *Population Studies Center Research Report 09-684. Ann Arbor: University of Michigan, Institute for Social Research*.