Addressing Gaps in Research On First-Year Success

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Gauging the Influence of the High School Environment, Part-Time College Instructors, and Classroom Diversity

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Challenges Facing Higher Education

- **Academic**: Mounting numbers of under-prepared students graduating from high schools
- **Economic**: Greater reliance on part-time, non-regular adjunct instructors
- **Demographic**: Increase in the ethnic/racial diversity of students

How do they affect preparation, cognitive growth and persistence of first-year students?
Case Study at One University

- Total enrollment of ~17,000 students
- Moderately selective admission
- Public, research institution in medium-size town
- 2,800 new freshmen from 55 high schools (93% of 2004/05 in-state cohort)
- Data sources:
  - Institutional student information system (SIS)
  - State Department of Education accountability reports
- Variables tested:
  - Student demographics, academic preparation, first-year university experience, financial aid
  - Ten high school environment features

Analytical Approach

- Input-environment-output model by Astin (1993) to isolate marginal effect of variables
- All variables are measured on basis of objective indicators
  - % of courses taken in first year that were taught by part-time faculty
  - % of classmates by ethnic/racial identity in courses
  - Quantitative metrics to measure HS environment
- Output measures
  - Academic preparation at college entry: 100-point index comprising grades, test scores, AP credits
  - First-year cumulative grades (GPA)
  - Enrollment persistence into second year of study
Variable Definitions

High school environment
- Student enrollment
- Expenditure per student
- % of not highly qualified teachers (not certified)
- Student dropout rate
- Disciplinary incident rate
- % of non-Asian minorities
- % of Asian minorities
- % limited English learners
- Average class size
- Urban vs. rural location

Grading and curricular rigor in freshman year
- Average grade awarded in courses taken during first year
- Highest level math and English course (with grade) taken in first year (6 and 7 groups, respectively)
- Number of science-based courses taken in first year

Gauging Effects on Cognitive Growth

Input-environment-output model by Astin (1993, pp. 9-13) to isolate marginal effect over time
- Input measures
  - Academic preparation index score (HSGPA, ACT, AP)
  - Socio-demographics, high school environment
- Environment or freshmen experience
  - Campus life: living in dorms, employment, recreation
  - Academic: credit load/transfer, major, gateway courses, grading and curricular rigor, part-time faculty
  - Financial aid: package type and unmet need $
  - Peer influence: classmate ethnic/racial diversity
- Output measure
  - First-year cumulative academic performance (GPA)
Statistical Technique

- To estimate high school environment influence on academic preparation and first-year performance, *mixed-level linear regression* with cross-level interaction takes following form:

\[
Y_{ij} = y_{00} + y_{0i}X_{pij} + y_{0q}Z_{qj} + y_{pq}Z_{qj}X_{pij} + u_{ij} + e_{ij}
\]

- To estimate probability of enrollment persistence into second year, *logistic regression* with higher-order interaction term:

\[
\log\left(\frac{p_i}{1-p_i}\right) = y_0 + y_1X_i + y_2Z_j + y_3XZ_{ij} + e_i
\]

Findings: Descriptives

- High school environment from which students came shows great variation:
  - Student enrollment: 101 to 3,500
  - Per student $ expenditure: $1,160 to $11,900
  - % of not highly qualified teachers: 0 to 70.4
  - Number of safety violations per 100 students: 0 to 14.2
  - % of non-Asian minority students: 6.1 to 74
  - Average class size: 5.6 to 33.1
  - % of students with limited English skills: 2.4 to 61
  - 82% of schools are located in urban areas

- But they have no significant effect on level of academic preparation at college entry, except
  - 5.5 percentage point rise in Asian students is associated with a one-unit increase in AP credits
Findings: High School Effects

- Significant effects on first-year GPA:
  - Average class size in high schools (5-student rise leads to 0.10 drop in GPA)
  - Negative effect of high school environment for low-income students
    - % of non-Asian minority student enrollment: one std.deviation rise 0.10 drop in GPA
    - % of students with limited English proficiency: one std.deviation rise 0.14 drop in GPA
    - Number of safety violations (guns, drugs, violence): one std.deviation rise 0.11 drop in GPA
  - Positive effect of per-pupil $ for Asians
    - One std.deviation rise 0.14 rise in GPA

Findings: Effects on 1st Year GPA

- Net of grading and curricular rigor, no significant high school environment effect
- Classroom ethnic/racial diversity effects:
  - One percentage point rise in non-Asian minority classmates 0.016 drop in GPA
  - No significance due to Asian classmates, borderline significance due to foreign students
  - Enrollment in diversity course 0.06 GPA rise
- Grading/curricular rigor effects:
  - One letter-grade difference in course grades awarded 0.26 change in GPA
  - Taking 3 or more science courses 0.17 drop in GPA
Gauging Effects on 1st Year GPA

**Significant Beta Coefficients**
(Blue = positive; Black = negative)

- Model explains 54.4% of variation in GPA, nearly double compared to other estimation models (VIF < 3.2; var matrix < 0.6)
- No significance:
  - Student ethnicity/race
  - Income background
  - County residency
  - Living on campus
  - Undeclared major
  - Transferred credits

Findings: Effects on Persistence

- Not significant:
  - High school environment
  - Classroom ethnic/racial diversity *in general*
  - Taking courses from part-time faculty
- Significant:
  - First-year GPA: *14% change per one letter grade*
  - Local residency: *10.3% rise*
  - Asian students: *7.5% rise*
  - 3+ science courses: *6.5% rise*
  - Received I, W, D, F grade(s): *6% drop*
  - At least 15 first-semester credits: *5.75% rise*
  - Female gender: *5.3% drop*
  - 2 science courses: *4.8% rise*
Findings: Effects on Persistence

- Significant interaction effects on enrollment persistence (% probability):
  - % of non-Asian minority classmates
    - Positive for non-Asian minority students
    - Negative for students outside commuter distance
  - For male students, positive effect with
    - First-year academic performance (GPA) \(\text{4\% rise per one letter grade over females}\)
    - Working on campus \(17\% \text{rise}\)
  - Living on campus, positive effect with
    - Academic preparation at college entry \(>10\% \text{rise for those in 50\%ile or higher compared to bottom Quartile}\)
    - Foreign student classmates \(6\% \text{rise for top}^{1}Q\)

**Significant Interaction Effect**

[Chart showing significant interaction effect with a line graph.]

One standard deviation (50-84 %ile)
Conclusion

• First-year students from low-income background may be negatively affected by the confluence of environmental factors in high schools that relate to peer culture, physical safety, and probably immigrant student enrollment.
• There is no evidence that part-time status of teaching faculty influences academic success and enrollment persistence of first-year students.
• There is evidence that ethnic/racial diversity in the classroom has mixed effects on enrollment persistence of first-year students depending on their background.

Future Research

• Use of objective measures of diversity to replace or complement subjective data from student/faculty surveys.
• Examine high school data from individual schools in larger states to increase number of schools in the analysis.
• Explore effects of part-time faculty across different disciplinary areas, beyond first-year.
• Test for higher-order effects in single multivariate model, rather than multiple tests on subsets of students.
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Link to paper and presentation:
http://www.cis.unr.edu/IA_Web/research.aspx