

Identifying Students at Risk for Leaving an Institution: SAT and HSGPA as Tools to Improve Retention

Emily J. Shaw and Krista D. Mattern
The College Board

April 15, 2012
Annual Meeting of the American Educational Research Association,
Vancouver, BC



Outline of Presentation

- Purpose of Study
 - Retention
 - Academic Index
- Method
 - Sample
 - Measures
 - Analyses
- Results
- Implications of Findings

Purpose of Study

- Retention is an important issue in higher education.
 - Over 50% of students leave their first 4 yr institution without receiving a degree and almost half of those students do not ever receive degrees (Tinto, 1993).
 - Individuals with college degrees earned on average 62% more than those with only high school diplomas (Baum & Ma, 2007).
- Students with higher SAT scores and HSGPAs are more likely to be retained.
 - 95.5% of students in the highest SAT score band returned for their second year compared to 63.8% of students in the students in the lowest SAT score band (Mattern & Patterson, 2009).
- The current study explores the validity and potential of using the SAT, in conjunction with HSGPA, to improve student retention at four-year postsecondary institutions.

What is the “Academic Index” and how is it related to retention?

- Admission offices typically incorporate SAT or ACT results along with HSGPA and possibly other predictors of interest to compute an “academic index.”
- By including applicant information such as HSGPAs and SAT scores in the model with the appropriate weights for each measure, one can arrive at a predicted FYGPA which can signal to the institution how well the applicant should be able to perform at the institution.
- This predicted FYGPA, or academic index, can be used in a variety of ways in admissions depending on the institution’s philosophies and policies (Rigol, 2003).

Study Questions

- By examining the difference between a student's predicted FYGPA and their actual FYGPA once in college, we can explore the role of the SAT and HSGPA as tools in identifying students at risk for leaving an institution.
- We ask the following questions:
 - Are those students performing below their potential (predicted FYGPA) in college more likely to leave an institution (after 2, 3, or 4 years)?;
 - Does a discrepancy between predicted and actual performance flag a problem?
 - What are the retention implications of the **direction** and/or **magnitude** of the discrepancy in the predicted versus actual FYGPA (performing much worse or much better than predicted)?

Sample

- National, longitudinal higher education database which included first-time, first-year students that entered 110 four-year colleges/universities in fall 2006.
 - 59 of the original 110 institutions provided students' coursework, grades, and retention to the fourth-year.
 - The sample of institutions was diverse with regard to region, control, size, and selectivity (admittance rate).
- Data used to calculate a student's academic index were available for 75,847 students
 - Logistic regression was used to model retention. The model included additional predictors (gender, race/ethnicity, parental income), resulting in a final sample size of 48,398 students.

Measures

- SAT scores
- High School GPA (HSGPA)
- Demographic information
- Institutional characteristics
- First-Year GPA (FYGPA)
- College retention

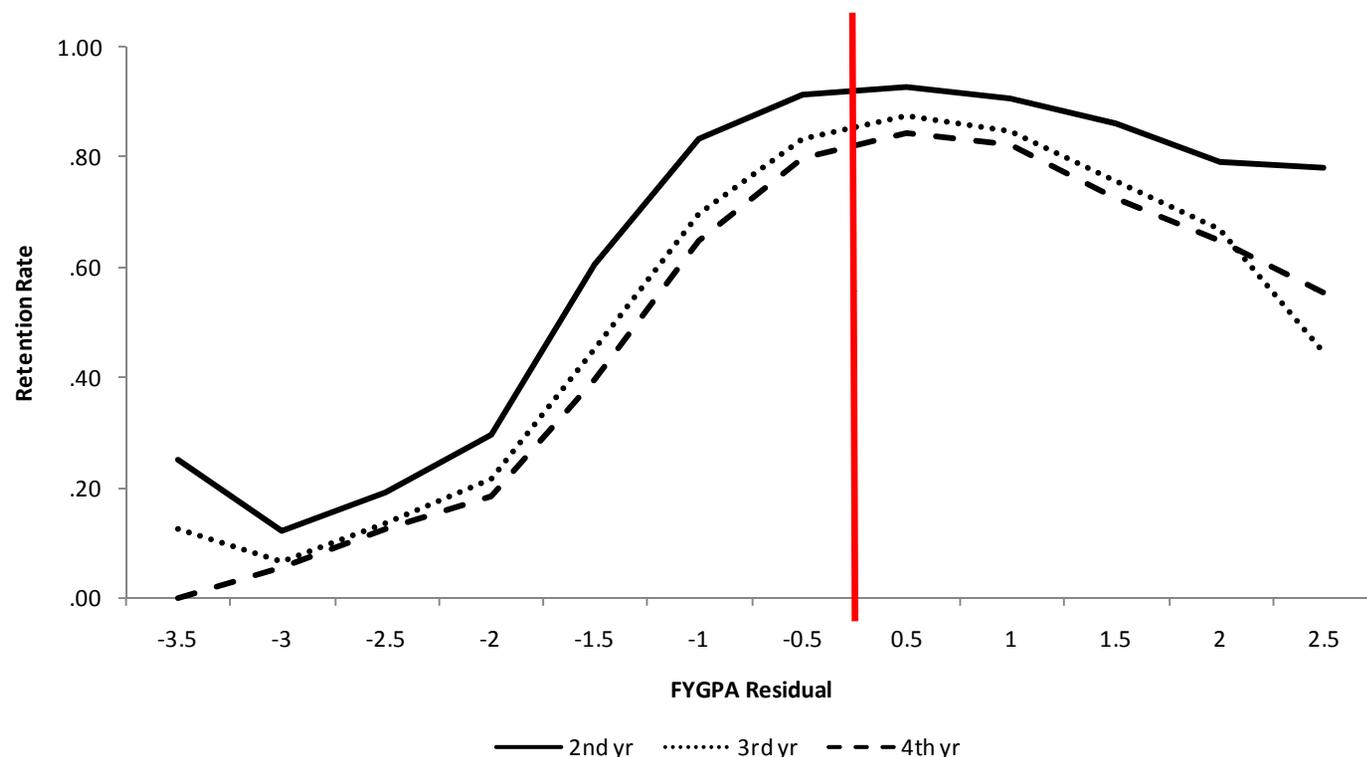
Analyses

- The extent to which students over- or under-performed in their first-year of college was determined based on the difference between a student's predicted FYGPA (based on running a regression within each institution with HSGPA and SAT scores included as predictors) and observed FYGPA, which is referred to as residual or error term:

$$\text{Residual} = \text{FYGPA}_{\text{observed}} - \text{FYGPA}_{\text{predicted}}$$

Analyses (cont.)

Second-, Third-, and Fourth-Year Retention Rates by FYGPA Residual



Both students who earned college grades that were higher (positive residuals) and lower (negative residuals) than what was expected given their academic credentials (i.e., SAT scores and HSGPA) were less likely to return for their second, third, and fourth year.

Analyses (cont.)

- Based on visual inspection of the relationship, logistic regressions predicting 2nd, 3rd, and 4th year retention were run with the absolute value of the residual included as a predictor:

$$|\text{residual}| = |\text{FYGPA}_{\text{observed}} - \text{FYGPA}_{\text{predicted}}|$$

- FYGPA, gender, race/ethnicity, and socio-economic status and institutional characteristics such as selectivity and control were included as controls in the model.
- Interactions (student and institutional characteristics x absolute residual) were included to examine whether under- or over-performing has more of an effect for certain groups of students or types of institutions.

Results – Descriptive Statistics

Subgroup		N	FYGPA _{observed}		FYGPA _{predicted}		residual		2 nd Yr Retention	
			M	SD	M	SD	M	SD	M	SD
Overall		48,398	2.97	.71	2.98	.37	.46	.39	.87	.33
Ethnicity	Underrepresented minority	7,382	2.69	.74	2.81	.38	.51	.43	.85	.36
	Nonminority	41,016	3.02	.69	3.01	.36	.45	.38	.88	.33
Gender	Female	25,963	3.05	.67	2.99	.37	.44	.36	.87	.34
	Male	22,435	2.88	.73	2.96	.38	.48	.41	.88	.33
Income	< \$30,000	5,266	2.79	.77	2.86	.38	.51	.45	.84	.36
	\$30,000 - \$50,000	6,739	2.89	.73	2.93	.38	.48	.40	.85	.35
	\$50,000 - \$70,000	7,756	2.93	.71	2.96	.37	.47	.39	.86	.35
	\$70,000 - \$100,000	12,263	2.99	.70	2.98	.37	.46	.38	.87	.33
	> \$100,000	16,374	3.06	.66	3.04	.36	.42	.36	.90	.30
Institutional Control	Private	17,015	3.11	.59	3.11	.33	.37	.31	.91	.28
	Public	31,383	2.89	.75	2.91	.37	.50	.42	.85	.36
Institutional Selectivity	Under 50%	7,024	3.24	.50	3.25	.25	.33	.27	.95	.22
	50 to 75%	31,515	2.93	.72	2.94	.36	.48	.40	.87	.34
	Over 75%	9,859	2.89	.75	2.90	.41	.48	.40	.82	.38

Results –Logistic Regression for Retention to 2nd Yr

	B	S.E.	Exp(B)	Sig.	VIF	Pseudo R_{CS}^2	Pseudo R_N^2
Constant	2.509	.052	12.298	<.001		.108	.202
FYGPA	.797	.023	2.218	<.001	1.338		
 Residual 	-.868	.084	.420	<.001	6.030		
Underrepresented minority	.235	.071	1.265	.001	2.598		
Underrepresented X Residual	-.188	.088	.829	.033	2.938		
Male	.426	.050	1.530	<.001	2.409		
Gender X Residual	-.233	.067	.792	<.001	3.708		
Public	-.067	.059	.935	.259	3.218		
Public X Residual	.044	.085	1.045	.604	7.776		
Selectivity	-1.845	.213	.158	<.001	3.165		
Selectivity X Residual	-.503	.311	.605	.106	3.001		
Income	.049	.018	1.051	.008	2.578		
Income X Residual	-.021	.024	.979	.390	2.637		

Strongest predictors in bold font

Note. $N = 48,398$. B = log odds; $Exp(B)$ = odds ratio; Pseudo R_{CS}^2 = Cox and Snell R^2 ; Pseudo R_N^2 = Nagelkerke R^2 .

Selectivity = numbers of students admitted/ number of student that applied. FYGPA, Selectivity, and Income were grand mean centered. Underrepresented minority students include American Indian, African American, and Hispanic students. Nonminority students include White and Asian students.

Implications of Study Findings

- The residual indicates that the student is behaving academically differently than expected and is likely signaling that the student is at risk for leaving the institution.
 - The residual likely holds a great deal of information related to psycho-social variables at play, which are typically very hard to obtain and/or measure in higher education.
- By capturing students' predicted FYGPAs during admission and then later comparing them to the students' actual/observed FYGPAs or even first-semester GPAs, the IR or EM office can develop a list of students that they may choose to contact for follow-up academic or other counseling services.
- Students who perform much better than predicted are also at greater risk for leaving an institution.

Limitations

- Used self-reported HSGPA.
 - Though prior research suggests that students are quite accurate in reporting their HSGPA (e.g. Kuncel, Credé, & Thomas, 2005; Shaw & Mattern, 2009)
- Access to “reasons” as to why students left institutions would inform future research.
- Examine graduation as the outcome when available.

Future Research

- Higher Education Trajectories for Over- versus under-performers
 - Drop out versus transfer?
 - Transfer up versus transfer down?
- Better understand factors influencing under-performance, and examine whether the predicted or actual outcome was the truer reflection of the student's capabilities.
- Replicate and explore interventions to assist these students in adjusting to their institution and/or choosing other academic pursuits that may better fit their needs and interests.

Thank You

- Researchers are encouraged to freely express their professional judgment. Therefore, points of view or opinions stated in College Board presentations do not necessarily represent official College Board position or policy.
- Please forward any questions, comments, and suggestions to:
 - Emily Shaw at eshaw@collegeboard.org