A Prediction Model for Retention and Graduation Rates Using IPEDS and WSCUC GRD

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Introduction

- Retention and graduation rates are key performance indicators (KPIs) used in college rankings, accreditation and assessment reports, and national accountability systems.

- Retention and graduation rates are used increasingly as part of state-support funding formulas for public colleges and universities.
Background

• Today’s study builds on a research project completed at the AIR/NCES National Data Institute in Washington D.C. (2013), and subsequent research by Pike & Graunke (2015).

• Objective of NDI work was to produce two institution-level prediction models (for retention and graduation rates) using IPEDS data and standard regression methods.
Purpose of Study

• Demonstrate online interactive reports to predict institutional retention and graduation rates.
  – Estimate predicted rates with IPEDS and WSCUC GRD-reported data.
  – Show interactive reports for institutional comparisons and benchmarking.
  – Show ‘what if’ scenarios associated with changes in key estimation inputs.
  – Highlight institutional characteristics associated with changes in variation between IPEDS and AGR rates.
Relevant Previous Literature

Data Sources and Data Elements

• Sources
  – IPEDS
  – WSCUC GRD

• Institution cohorts
  – New full-time first-year students
  – Retention cohort: AY 2012-13
  – Graduation cohort: AY 2008-09
  – Absolute Graduation Rate (AGR): AY 2014-15

• Institutional data elements (predictors)
  – Demographics
  – Selectivity
  – Enrollment
  – Financial aid
  – Finances
  – Student-faculty ratio
### Institution Selection in Data Center

**EZ-Group Selection**

<table>
<thead>
<tr>
<th>Selection</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Total IPEDS First Look Universe,</td>
<td>7,252</td>
</tr>
<tr>
<td>2) US, Public/Private not-for-profit four-year above,</td>
<td>1,814</td>
</tr>
<tr>
<td>3) Has full-time undergraduates,</td>
<td>1,725</td>
</tr>
<tr>
<td>4) No completely online campuses</td>
<td>1,719</td>
</tr>
</tbody>
</table>

Final release data used; retrieved 10/26/2016
Variable Selection Framework

- Institutional Characteristics
  - Demographics
  - Selectivity/Student Success
  - Enrollment
  - Financial Aid
  - Finances
  - Student-faculty Ratio

- Retention Rates (2012 cohort)
- Graduation Rate (2008 IPEDS) (2014 WSCUC)

Resulted in retrieval of >250 IPEDS variables
The URR and AGR Rates

• Unit redemption rate (URR)
  – Approximation of proportion of institutional credits completed (all UG students) that ‘lead’ to a UG degree (all UG degree recipients) for AY

• Absolute graduation rate
  – Adjusts IPEDS-reported rate by average credits of dropouts to average credits of degree recipients (weighted by time)
IPEDS versus URR and AGR Rates

• Predicting URR and AGR rates
  – Model estimation with IPEDS data
  – Model estimation with IPEDS and WASC-requested member institution data

• Identifying key factors associated with graduation-rate metrics
  – Compare factor set for IPEDS rate versus AGR
A Framework for GRD Prediction

Institutional Characteristics

WSCUC Data
Total/Graduated headcount, credits & Dropout headcount, credits

IPEDS Data
Academic Preparation
Socio-demographics
Financial aid
Institution type

Absolute Graduation Rate (AGR)
Key Predictors for IPEDS Retention Rate Prediction

<table>
<thead>
<tr>
<th>Predictors</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six-year graduation rate</td>
<td>19.14</td>
<td>***</td>
</tr>
<tr>
<td>Percent of full-time first-time Asian</td>
<td>8.00</td>
<td>***</td>
</tr>
<tr>
<td>SAT Math and Reading 75th percentile avg.</td>
<td>5.93</td>
<td>***</td>
</tr>
<tr>
<td>Percent of full-time first-time students awarded federal grants</td>
<td>-5.17</td>
<td>***</td>
</tr>
<tr>
<td>Percent of first-time undergraduates out-of-state</td>
<td>-3.19</td>
<td>***</td>
</tr>
<tr>
<td>Student-to-faculty ratio</td>
<td>3.15</td>
<td>**</td>
</tr>
<tr>
<td>Rural institution</td>
<td>-3.01</td>
<td>**</td>
</tr>
</tbody>
</table>

Adjusted $R^2 = 0.75$
# Key Predictors for IPEDS Graduation Rate Prediction

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$t$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-time full-time freshmen retention rate (2009 cohort)</td>
<td>31.36</td>
<td>***</td>
</tr>
<tr>
<td>Average net price of high income students (&gt; $110k)</td>
<td>8.84</td>
<td>***</td>
</tr>
<tr>
<td>SAT Math and Reading 75th percentile avg.</td>
<td>6.98</td>
<td>***</td>
</tr>
<tr>
<td>Percent first-time full-time students women</td>
<td>3.92</td>
<td>***</td>
</tr>
<tr>
<td>Percent of full-time first-time Black</td>
<td>-3.44</td>
<td>***</td>
</tr>
<tr>
<td>Percent first-time full-time students receiving pell grants</td>
<td>-2.42</td>
<td>*</td>
</tr>
</tbody>
</table>

Adjusted $R^2 = 0.88$
# Key Predictors for WSCUC
## Absolute Graduation Rate Prediction

<table>
<thead>
<tr>
<th>Predictors</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units earned by inactives to units earned by enrolled ratio (GRD)</td>
<td>9.03</td>
<td>***</td>
</tr>
<tr>
<td>Units earned by inactives to units earned by graduated ratio (GRD)</td>
<td>-8.08</td>
<td>***</td>
</tr>
<tr>
<td>Headcount inactives to graduated students ratio (GRD)</td>
<td>-7.92</td>
<td>***</td>
</tr>
<tr>
<td>ACT Math 75th percentile (IPEDS)</td>
<td>-5.27</td>
<td>***</td>
</tr>
<tr>
<td>Six-year graduation rate (IPEDS)</td>
<td>3.97</td>
<td>***</td>
</tr>
<tr>
<td>SAT Math 25th percentile (IPEDS)</td>
<td>3.85</td>
<td>***</td>
</tr>
<tr>
<td>Headcount part-time transfers to all undergraduates (IPEDS)</td>
<td>-2.88</td>
<td>**</td>
</tr>
<tr>
<td>GRS cohort as a percent of entering class (IPEDS)</td>
<td>-2.76</td>
<td>**</td>
</tr>
</tbody>
</table>

Adjusted $R^2 = 0.88$
Predicting 6-Year Graduation Rate with IPEDS Data (2008 Cohort)

Actual Minus Predicted Rate %\(^{-}\)Pts

Net Price ($) for High Income Students
- 335
- 5408
- 5881

% New FT Freshmen Retention
- 33
- 37
- 39

% UG Enrollment Part-Time
- 0.00 %
- 0.14 %
- 0.14 %

Avg 75th %tile SAT Combined Score
- 550
- 840
- 850

IPEDS Institution Unit ID
- 100654
- 100663
- 100706
- 100721

Suburban Institution | Rural Area Institution | Number of Institutions
--- | --- | ---
No | No | 1286
Yes | Yes | 1286

Student Enrollment
- Under 1,000
- 20,000 or more
- 1,000 - 4,999
- 5,000 - 9,999
- 10,000 - 19,999

WASC Institution
- No
- Yes

Institutional Control
- Private NFP
- Public

Carnegie Classification
- Associate/Special
- Doctoral/Research
- Master's Small
- Bachelor A&S
- Master's Large
- RUH
- Bachelor Diverse
- Master's Medium
- RUVH

Institution Name
- Abilene Christian University
- Adams State University
- Adelphi University
- Adrian College
- Adventist University of Health Sciences
- Agnes Scott College
- Alabama A & M University
- Alabama State University
- Alaska Pacific University
- Albany College of Pharmacy and Health...

% New FT Freshmen Women
- 0.00 %
- 7.07 %
- 7.08 %

% UG Enrollment Recent 3-Yr Avg
- 0.56 %
- 1.21 %
- 4.40 %

Instructional Expenses ($) per SFTE
- 2291
- 2297
- 2331
- 2340
Predicting the 'Absolute' Graduation Rate with IPEDS Data (2009 Imp)

- Actual Absolute Rate: 60.79
- Predicted Absolute Rate: 61.29
- Actual Minus Predicted Rate: -0.49

GRS Cohort as % of Entering Class:
- Choice 0
- Choice 3
- Choice 4

% New Full-Time UG Pell Students:
- Choice 7.00
- Choice 10.00
- Choice 11.00

SAT Math 25th %tile Score:
- Choice 350.00
- Choice 370.00
- Choice 380.00

PT Transfer UG to Total UG Ratio:
- Choice 0.00
- Choice 0.00
- Choice 0.00

IPEDS Unit ID:
- 108232
- 109651
- 109785

WASC Status:
- Accredited
- Accredited with Notice of Concern

Number of Institutions: 135

Institutional Control:
- Private NFP
- Public

Student Enrollment:
- Under 1,000
- 20,000 or more
- 1,000 - 4,999
- 5,000 - 9,999
- 10,000 - 19,999

Carnegie Classification:
- Associate/Special
- Doctoral/Research
- Master's Small
- Bachelor A&S
- Master's Large
- RUH
- Bachelor Diverse
- Master's Medium
- RUVH

ACT Math 25th %tile Score:
- Choice 15.00
- Choice 16.00
- Choice 17.00

ACT Math 75th %tile Score:
- Choice 17.00
- Choice 18.00
- Choice 20.00

EU Dropouts to EU Enrolled Students:
- Choice 0.01
- Choice 0.02
- Choice 0.02

EU Dropouts to EU Graduated Students:
- Choice 0.03
- Choice 0.04
- Choice 0.05
- Choice 0.06
### Predicting the 'Absolute' Graduation Rate with IPEDS Data (2009 Cohort)

**Actual Minus Predicted Rate %: Pts**
- 73.57
- 0.09
- 77.15

**Actual Absolute Rate**
- 73.62

**[21%]**

**Golden area: 25th-75th %tile**

**Predicted Absolute Rate**
- 72.13

---

<table>
<thead>
<tr>
<th>IPEDS Unit ID</th>
<th>WASC Status</th>
<th>Number of Institutions</th>
<th>Institutional Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>110361</td>
<td>Accredited</td>
<td>65</td>
<td>Private NFP</td>
</tr>
<tr>
<td>110404</td>
<td>Accredited with Notice of Concern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110413</td>
<td></td>
<td></td>
<td>Public</td>
</tr>
</tbody>
</table>

**Student Enrollment**
- Under 1,000
- 20,000 or more
- 1,000 - 4,999
- 5,000 - 9,999
- 10,000 - 19,999

**Carnegie Classification**
- Associate/Special
- Bachelor A&S
- Bachelor Diverse
- Doctoral/Research
- Master's Small
- Master's Large
- Master's Medium
- RUH
- RUVH

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**GRS Cohort as % of Entering Class**
- 28
- 30
- 34

**% New Full-Time UG Pell Students**
- 11
- 13
- 15

**SAT Math 25th %tile Score**
- 350
- 370
- 385

**ACT Math 25th %tile Score**
- 15
- 16
- 17

**ACT Math 75th %tile Score**
- 17
- 18
- 20

**EU Dropouts to UG Enrolled Students**
- 0.02
- 0.03

**EU Dropouts to EU Graduated Students**
- 0.02
- 0.03

**PT Transfer UG to Total UG Ratio**
- 0.00
Six-Year Graduation Rate: AGR versus IPEDS-Reported Rate (2014)

- **Actual Absolute Rate:** 64.39
- **Golden area: 25th-75th %tile:** [58%], IPEDS-Reported Rate: 57.59

**Rate Comparison by Institution**

- IPEDS 6-Yr Rate
- AGR Rate

**Student Enrollment**
- Under 1,000
- 5,000 - 9,999
- 20,000 or more
- 10,000 - 19,999
- 1,000 - 4,999

**WASC Status**
- Accredited
- Accredited with Notice of...
- Candidate

**Institution Name**
- Academy of Art University
- Art Center College of Design
- Ashford University
- Azusa Pacific University
- Biola University
- Brigham Young University-Hawaii
- California Baptist University
- California College of the Arts
- California Institute of Technology
- California Institute of the Arts

**Institutional Control**
- Private NFP
- Public

**Carnegie Classification**
- Associate/Spec...
- Bachelor A&S
- Bachelor Dine...
- Doctoral/Rese...
- Master's Large
- Master's Medi...
- Master's Small
- RUH
- RUVH
Six-Year Graduation Rate: AGR versus IPEDS-Reported Rate (2014)

Number of Institutions: 106

AGR (X) versus IPEDS (Y) Rate by % of Pell Student Enrollment

% of Pell Students: 87
Six-Year Graduation Rate: AGR versus IPEDS-Reported Rate (2014)

Number of Institutions: 106
AGR (X) versus IPEDS (Y) Rate by % of Admitted Students

% of Admits: 98.3

Institutional Control:
- Private NFP
- Public

IPEDS 6-Yr Graduation Rate:
- 8
- 20
- 22

ACT Math 25th %tile Score:
- (Blank)
- 15
- 16

SAT Math 25th %tile Score:
- (Blank)
- 350

Student Enrollment:
- Under 1,000
- 5,000 - 9,999
- 20,000 or more
- 10,000 - 19,999
- 1,000 - 4,999
Six-Year Graduation Rate: AGR versus IPEDS-Reported Rate (2014)

Number of Institutions: 106

AGR (X) versus IPEDS (Y) Rate by % of Enrollment Yield

Yield %: 78.2

IPEDS 6-Yr Graduation Rate:
- 8
- 20
- 22

ACT Math 25th %tile Score:
- (Blank)
- 15
- 16

SAT Math 25th %tile Score:
- (Blank)
- 350
- 370

Student Enrollment:
- Under 1,000
- 5,000 - 9,999
- 20,000 or more
- 10,000 - 19,999
- 1,000 - 4,999
Questions & Comments

Presentation at
http://www.uhwo.hawaii.edu/academics/oie/research-and-presentations/

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