Priced Out?
Does Financial Aid Affect Student Success?

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Project Background

• Expansion of our previous research on multi-institutional success in college.
• Continued refinement of our institutional model of probability of six-year graduation.
• Development of a system to account for the inputs and outputs associated with student finance at the University.
The Rising Cost of College

- For AY 2008-09:
  - 6.4% increase in average published in-state tuition and fees for students at public four-year colleges.
  - 5.9% increase in average published tuition and fees at private four-year colleges.
  - 4.7% increase in average published tuition and fees at two-year colleges.

The New Philosophy of Financing Higher Education

• Early focus of student aid was to remedy income inequalities through grants.

• End of the 20th century “federal student aid drifted from a grant based system to a loan-based system” (College Board, 2000).

• Recent trends suggest that state aid is increasingly shifting from a need-based system to merit-based system (Heller, 2004)
Research Questions

- Does financial aid affect the likelihood of student success?
- Does the different types of financial aid available to students differentially impact the likelihood for success?
What does it mean to be successful in college?

- Most studies of student graduation utilize a strict dichotomy to identify success: graduate or not.
- Additionally, our interpretation of success has been largely constrained to the institution of entry.
Redefining Student Success

• Student success should include graduation outcomes beyond University of Minnesota.

• Expand the dependent variable to include a separate category to identify students who obtain other four-year degrees.

• Results in a three category dependent variable where students are:
  – successful here
  – successful somewhere
  – not yet successful.
National Student Clearinghouse

- Streamlines the student record verification process for organizations such as: colleges, lenders, and employers.
- Maintains a comprehensive registry of records providing accurate verification of student enrollment, degree, and loan data.
- More than 3,300 colleges, enrolling 92% of US college students, and hundreds of high school districts nationwide participate.

Source: http://www.studentclearinghouse.org/about/aboutus.htm
Six year graduation rates for first-time, full-time freshman, Fall 2001 cohort
The University of Minnesota at a Glance

- **Established:** 1851
- **President:** Robert H. Bruininks
- **Students:** 40,572 undergraduates, 25,527 graduate, professional, and other students.
- **Faculty:** 4,088 full-time faculty
- **Alumni:** 400,000
- **Research:** $619.2 million in sponsored research.
- **Campuses:** Flagship and four coordinate campuses: Crookston, Duluth, Morris, and Rochester.

Source: [http://www1.umn.edu/twincities/about.php](http://www1.umn.edu/twincities/about.php)
Sample

• Fall 2002 cohort of all first-time, full-time freshman (n=5,188).

• Utilized data from three sources:
  – Student data obtained from tenth day census data stored in the University’s data warehouse.
  – Financial data obtained from detailed PeopleSoft student financial transactions data.
  – Outcome data obtained from institutional records and the NSC.

• After removing missing cases, 99% of observations were usable (n=5,116)
Method

- Adopted a multivariate approach to modeling success.
- Graduation outcomes are represented by an unordered multi-categorical variable: MN Degree, Other Degree, No Degree.
- Neither OLS nor Binary Logit is appropriate.
Multinomial Logit Models

- MNLM represents simultaneous estimation of parameters for all possible binary outcomes.
- Each pair of outcomes are compared separately.
- Coefficients represent the change in the likelihood of an alternative relative to a reference category.
Independent Variables

- **Academic Background:** ACT Score, First Generation College, First Choice College, AP Credits, and Remedial Course.

- **First Semester Performance:** Course Completion Ratio, C Count, D Count, and W Count

- **Demographic Characteristics:** Female, Asian, Underrepresented Minority, and Athlete
Independent Variables (cont.)

- **Geographic Origin**: Out-of-state, Reciprocity

- **Social Integration**: On-campus Housing, Living Learning Community (LLC), Federal Work Study, and On-campus employment.
Better Financial Aid Information

- Past reliance on Pell eligibility produced an incomplete financial picture of students.
- Financial aid data in our study was disaggregated from detailed PeopleSoft financial records data.
- By identifying and categorizing all the payments and expenditures associated with a student’s financial account, we are more confident that we have the most complete information possible.
Financial Aid Variables

- **Unmet Need:** (amount) calculated by financial system based on both FAFSA data and internal award and budget information.

- **Need Aid:** (dummy) identifies if the student received any grants or scholarships based on need (Pell, MN State, or institutional)

- **Loan Aid:** (dummy) identifies if a loan from any source was applied to a student’s account.

- **Merit Aid:** (dummy) identifies scholarship dollars allocated by admission office.
Financial Aid Picture at UMN, Fall 2002

Need Aid
- 39%
- $1991

Loan Aid
- 46%
- $3377

Merit Aid
- 12%
- $1383

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Some Recognizable Limitations

- Single institution/ limited time period hinders generalizability.
- Only include a limited set of variables.
- NSC does not have a complete listing of degrees (slippage).
- More complicated patterns of enrollment are not examined.
Results

• MNLM results reflect the ceteris paribus change in the log-odds of an outcome *relative to* another outcome.

• Three outcomes produce six potential comparisons:

  1 | 2  
  1 | 3  
  2 | 1  
  2 | 3  
  3 | 1  
  3 | 2  

• Redundancy makes each specific comparison unnecessary.
Reading the Results

• Selected three relevant graduation outcome comparisons

  UMN|Dropout       Other|Dropout       Other|UMN

• Patterns to look for:
  – Variables that affect success similarly across institutions (comparisons 1 and 2 move the same).
  – Variables that affect institutional goals (comparisons 1 and 3 in different directions)
# Results: Academic Background

<table>
<thead>
<tr>
<th></th>
<th>UMN</th>
<th>Dropout</th>
<th>Other</th>
<th>Dropout</th>
<th>Other</th>
<th>UMN</th>
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<tr>
<td></td>
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<td>Sig.</td>
<td>Coef</td>
<td>Sig.</td>
<td>Coef.</td>
<td>Sig.</td>
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<td>Composite ACT</td>
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<tr>
<td>Score</td>
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<td>-0.027</td>
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<tr>
<td>First Generation Student</td>
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<td>-0.941</td>
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<td>0.059</td>
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- Black square: P < 0.01
- Gray square: P < 0.05
- White square: P < 0.10
# Results: First Semester Performance

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<th>UMN</th>
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<td>Coef.</td>
<td>Sig.</td>
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<td>Sig.</td>
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<td>Course Completion Ratio</td>
<td>0.037</td>
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<td>0.023</td>
<td>↑</td>
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<tr>
<td>C Count</td>
<td>-0.381</td>
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<td>-0.249</td>
<td>↓</td>
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<tr>
<td>D Count</td>
<td>-0.647</td>
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<td>-0.110</td>
<td>↓</td>
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<tr>
<td>W Count</td>
<td>-0.928</td>
<td>↓</td>
<td>-0.517</td>
<td>↓</td>
<td>0.411</td>
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- P < 0.01
- P < 0.05
- P < 0.10
## Results: Demographic Characteristics

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<tr>
<td>Female</td>
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<td>0.219</td>
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<td>0.596</td>
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<td>0.377</td>
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<tr>
<td>Asian</td>
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<td>-0.557</td>
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<td>Underrepresented Minority</td>
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<td>-0.004</td>
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<tr>
<td>Athlete</td>
<td></td>
<td></td>
<td>0.660</td>
<td></td>
<td></td>
<td>0.156</td>
<td></td>
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<td></td>
<td></td>
<td>-0.504</td>
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</table>

- \( P < 0.01 \) □
- \( P < 0.05 \) □
- \( P < 0.10 \) □
### Results: Geographical Origin

<table>
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<tr>
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<th>Other\UMN</th>
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<tr>
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<td>Sig.</td>
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<tr>
<td>Out of State</td>
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<td>Reciprocity State</td>
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<td>0.705</td>
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- ![Black Box] P < 0.01
- ![Gray Box] P < 0.05
- ![White Box] P < 0.10
## Results: Social Integration

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<tr>
<th></th>
<th>UMN</th>
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<th>Sig.</th>
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<th>Dropout</th>
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<td>Living on Campus</td>
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<td>0.373</td>
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<td>0.271</td>
<td>0.160</td>
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<td>Living Learning Community</td>
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<td>0.381</td>
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<tr>
<td>Work On-Campus (Federal)</td>
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<tr>
<td>Work On-Campus (Other)</td>
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- P < 0.01
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- P < 0.10
### Results: Financial Aid

<table>
<thead>
<tr>
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<th>Dropout</th>
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<th>Sig.</th>
<th>Other</th>
<th>Dropout</th>
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<th>Sig.</th>
<th>Other</th>
<th>UMN</th>
<th>Coef.</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>Unmet Need ($1000)</td>
<td></td>
<td></td>
<td>-0.002</td>
<td>0.002</td>
<td></td>
<td></td>
<td>0.002</td>
<td></td>
<td></td>
<td>0.004</td>
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<tr>
<td>Need Aid Award</td>
<td></td>
<td></td>
<td>0.018</td>
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<td>-0.188</td>
<td></td>
<td></td>
<td>-0.206</td>
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<tr>
<td>Loan Award</td>
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<td></td>
<td>-0.294</td>
<td>0.016</td>
<td></td>
<td></td>
<td>0.016</td>
<td></td>
<td></td>
<td>0.310</td>
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</tr>
<tr>
<td>Merit Aid Award</td>
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<td>0.858</td>
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<td>-0.169</td>
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<td>-0.689</td>
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</tbody>
</table>

- **P < 0.01**
- **P < 0.05**
- **P < 0.10**
How Does Financial Aid Affect Success Probabilities

• Due to nonlinearity, “no single approach to interpretation can fully describe the relationship between a variable and an outcome probability” (Long, 1997).

• While the log-odds provide a ceteris paribus interpretation of the impact of variables, they remain difficult to interpret.

• It is often helpful to fix all other variables at some level and plot the change in predicted probabilities of the outcomes as a single variable changes.
Predicted Probabilities: Need Aid

<table>
<thead>
<tr>
<th></th>
<th>No Aid</th>
<th>Aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnesota</td>
<td>83.1%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Other Degree</td>
<td>84.4%</td>
<td>9.2%</td>
</tr>
<tr>
<td>No Degree</td>
<td>69.8%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Other Degree</td>
<td>71.2%</td>
<td>21.4%</td>
</tr>
</tbody>
</table>
Predicted Probabilities: Loan Aid

<table>
<thead>
<tr>
<th></th>
<th>Median Student</th>
<th>Mean Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Aid</td>
<td>9.2%</td>
<td>19.4%</td>
</tr>
<tr>
<td>Aid</td>
<td>7.7%</td>
<td>7.5%</td>
</tr>
<tr>
<td>No Aid</td>
<td>83.1%</td>
<td>73.1%</td>
</tr>
<tr>
<td>Aid</td>
<td>11.6%</td>
<td>23.8%</td>
</tr>
<tr>
<td>No Aid</td>
<td>78.4%</td>
<td>66.9%</td>
</tr>
<tr>
<td>Aid</td>
<td>10.0%</td>
<td>9.3%</td>
</tr>
</tbody>
</table>

- Minnesota
- Other Degree
- No Degree

(Interpreted from the image)
Predicted Probabilities: Merit Aid

<table>
<thead>
<tr>
<th></th>
<th>Median Student</th>
<th>Mean Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Aid</td>
<td>9.2%</td>
<td>23.0%</td>
</tr>
<tr>
<td>Aid</td>
<td>4.3%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Mean Student</td>
<td>7.7%</td>
<td>5.3%</td>
</tr>
<tr>
<td>No Aid</td>
<td>83.1%</td>
<td>68.2%</td>
</tr>
<tr>
<td>Aid</td>
<td>91.4%</td>
<td>82.8%</td>
</tr>
</tbody>
</table>

- Minnesota
- Other Degree
- No Degree
Implications

- Multi-institutional enrollment trends require a rethinking of student success.
- Success as a strict dichotomy results in measurement error in our dependent variable producing imprecise parameter estimates.
- Data from the National Student Clearinghouse goes a long way to help minimize this problem.
- The results of this study reaffirms work done by others which suggests that financial aid types differentially impact student outcomes.
The Differential Affects of Financial Aid

- **Need awards** appear *equalizing* not affecting the likelihood of graduating from either the U or another institution, relative dropping out.
- **Student loans** appear to be working at cross purposes of institutional retention goals as first semester borrowing *decreases* success at UMN.
- **Merit Aid**, while controversial, appears to support the institution’s retention goals.
Institutional Responses

• **Expanding Student Success:** Developing a P-20 tracking system to better reflect a student’s educational career path.

• **Financial Aid:** Institution has developed and expanded new aid programs to help offset student need.

• **Financial Literacy:** Introduced financial literacy classes to educate students and parents about the implications of borrowing for college.
Future Research

• **Consider Aid Packaging**: Expand the research from independent effects of aid type to consider possible interactive effects.

• **Explore Aid Dynamics**: Consider how aid after the first semester, particular changes in aid status, might impact success probabilities.
Acknowledgments

Additional Resources:

- **Multinomial Logit**