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The Effect of Part-time Faculty on Student Degree or Certificate Completion in Two-year Community Colleges

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Office of Community College Research and Leadership (OCCRL),
University of Illinois at Urbana-Champaign
Inconsistent Findings (Armstrong, 2005; Leslie & Gappa, 2002; Jacob, 2006; Jaeger & Eagan, 2009)
Research Questions

- Whether part-time faculty significantly impact student degree or certificate completion while holding individual and institutional level variables constant. If there is a significant effect on student degree or certificate completion, the magnitude and direction of such effect.

- Whether individual level variables and other institutional variables significantly impact student degree or certificate completion. If there are significant effects, the magnitude and the direction of such effects.

- Whether there are differences in terms of variables that impact student degree or certificate completion between three years’ data (2003/04-2005/06) and six years’ data (2003/04-2008/09).
Prior Literature

- **Community Colleges**: Largest sector in higher education with diverse student body and multiple missions. Expanding access is a great contribution.

- **Part-time Faculty in Community Colleges**: The majority of faculty; inexpensive alternatives for full-time faculty; positive and negative impact on student degree or certificate completion.

- **Student Persistence and Graduation**:  
  - Student Integration Model (Tinto, 1975)  
  - Student Involvement Model (Austin, 1999)  
  - Causal Model of Student Attrition(Bean, 1980)  
  - Institutional Retention Framework (Swail, 1996)  
  - Conceptual Framework for Student Persistence (Terenzini & Reason, 2005)
Figure 1: The Conceptual Framework Predicting Student Academic Achievement in Two-year Community Colleges
Methodology: Data Source

- Integrated Postsecondary Education Data System (IPEDS) and Beginning Postsecondary Students Longitudinal Study (BPS: 04/09).

- Variables pertaining to institutional characteristics are drawn from IPEDS, and variables pertaining to student characteristics and college experience are drawn from BPS. Data from two data systems are merged into one dataset using the same institution ID.
Methodology (cont'd): Multiple Imputation

- Multiple imputation is used to account for the missing values in the survey data. Compared with other methods that deal with missing values in complex surveys (i.e. list wise deletion, pairwise deletion, mean substitution, regression-based single imputation), multiple imputation yields unbiased parameter estimates and standard errors. Three to ten multiple imputed datasets are appropriate (Rubin, 1996). For the study, a total of five multiple imputed datasets are created.
Methodology (cont'd): Multi-level Logistic Modeling

Level-1 Model:

\[
\text{Prob}(PRATT3Y_{ij}/PRATT6Y_{ij}=1|\beta_{ij}) = \phi_{ij} \]

\[
\log[\phi_{ij}/(1 - \phi_{ij})] = \eta_{ij} \]

\[
\eta_{ij} = \beta_{0j} + \beta_{1j}^* (\text{GENDER}_{ij}) + \beta_{2j}^* (\text{RACECEN}_{ij}) + \beta_{3j}^* (\text{TOTAID}_{ij}) + \beta_{4j}^* (\text{JOBHOUR}_{ij}) + \beta_{5j}^* (\text{ATTEND}_{ij}) + \beta_{6j}^* (\text{FREQA}_{ij}) + \beta_{7j}^* (\text{FREQB}_{ij}) + \beta_{8j}^* (\text{HCGPAREP}_{ij}) + \beta_{9j}^* (\text{TEACTDER}_{ij}) + \beta_{10j}^* (\text{TESATDER}_{ij}) + \beta_{11j}^* (\text{TUITION}_{ij})
\]

Level-2 Model:

\[
\eta_{0j} = \gamma_{00} + \gamma_{01}^* (\text{PROPPTFA}_{ij}) + \gamma_{02}^* (\text{INSTITUT}_{ij}) + \gamma_{03}^* (\text{URBAN}_{ij}) + \gamma_{04}^* (\text{PCTMINOR}_{ij}) + \gamma_{05}^* (\text{PCTWOMEN}_{ij}) + \gamma_{06}^* (\text{TUITIONF}_{ij}) + \gamma_{07}^* (\text{PELLGRAN}_{ij}) + \gamma_{08}^* (\text{PROPORT}_{ij}) + \gamma_{09}^* (\text{INSTRUCT}_{ij}) + u_{0j}
\]

\[
\beta_{1j} = \gamma_{10} \\
\beta_{2j} = \gamma_{20} \\
\beta_{3j} = \gamma_{30} \\
\beta_{4j} = \gamma_{40} \\
\beta_{5j} = \gamma_{50} \\
\beta_{6j} = \gamma_{60} \\
\beta_{7j} = \gamma_{70} \\
\beta_{8j} = \gamma_{80} \\
\beta_{9j} = \gamma_{90} \\
\beta_{10j} = \gamma_{100} \\
\beta_{11j} = \gamma_{110}
\]

The combined model:

\[
\eta_{ij} = \gamma_{00} + \gamma_{01}^* (\text{PROPPTFA}_{ij}) + \gamma_{02}^* (\text{INSTITUT}_{ij}) + \gamma_{03}^* (\text{URBAN}_{ij}) + \gamma_{04}^* (\text{PCTMINOR}_{ij}) + \gamma_{05}^* (\text{PCTWOMEN}_{ij}) + \gamma_{06}^* (\text{TUITIONF}_{ij}) + \gamma_{07}^* (\text{PELLGRAN}_{ij}) + \gamma_{08}^* (\text{PROPORT}_{ij}) + \gamma_{09}^* (\text{INSTRUCT}_{ij}) + \gamma_{10}^* (\text{GENDER}_{ij}) + \gamma_{12}^* (\text{RACECEN}_{ij}) + \gamma_{13}^* (\text{TOTAID}_{ij}) + \gamma_{14}^* (\text{JOBHOUR}_{ij}) + \gamma_{15}^* (\text{ATTEND}_{ij}) + \gamma_{16}^* (\text{FREQA}_{ij}) + \gamma_{17}^* (\text{FREQB}_{ij}) + \gamma_{18}^* (\text{HCGPAREP}_{ij}) + \gamma_{19}^* (\text{TEACTDER}_{ij}) + \gamma_{20}^* (\text{TESATDER}_{ij}) + \gamma_{21}^* (\text{TUITION}_{ij}) + u_{0j}
\]
Methodology (cont'd): Weighting and Centering

- **Weighting Issue**
  - Normalized sampling weights are used when conducting multi-level logistic regression using HLM 7.0 software.

- **Centering**
  - Non-centering approach is used in the study.

- **Two-step analytical process**
  - Random ANOVA (unconditional analysis) is firstly conducted to assess level-2 variances. If level-2 variances are significant, multi-level analysis (conditional analysis) is justified. Analytical results indicate that level-2 variance is significant for both datasets ($\chi^2=167.96, p<.05$; $\chi^2=109.16, p<.05$).
Limitations

- The current research is unable to track community college students transferring to four-year institutions without completing an associate degree or certificate. And these students are counted as students who didn’t graduate from community colleges.

- Since both IPEDS and BPS are secondary datasets, the current study is also limited by the variables available in these datasets. More variables pertaining to student characteristics and college experiences, as well as institutional characteristics could be added into the analytical model.
**Limitations (cont'd)**

Table 4-8: Final estimation of variance components for pratt3yij (conditional)

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Standard Deviation</th>
<th>Variance Component</th>
<th>d.f.</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRCPT1, $u_0$</td>
<td>0.20</td>
<td>0.039</td>
<td>40</td>
<td>60.84</td>
<td>0.023</td>
</tr>
</tbody>
</table>

*The chi-square estimates are calculated based on Rubin (1987)'s research work on multiple imputed datasets.*

Table 4-9: Final estimation of variance components for pratt6yij (conditional)

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Standard Deviation</th>
<th>Variance Component</th>
<th>d.f.</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRCPT1, $u_0$</td>
<td>0.17</td>
<td>0.033</td>
<td>40</td>
<td>64.25</td>
<td>0.012</td>
</tr>
</tbody>
</table>

*The chi-square estimates are calculated in HLM 7.0 based on work on multiple imputed datasets.*
### Table 4-6. Final estimation of fixed effects

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Logs odd (odds ratio)</th>
<th>Standard error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROPPTFA, $\gamma_{01}$</td>
<td>0.006 (1.006)</td>
<td>0.003</td>
<td>2.020</td>
<td>0.050*</td>
</tr>
<tr>
<td>INSTITUT, $\gamma_{02}$</td>
<td>-0.588 (0.5554)</td>
<td>0.240</td>
<td>2.450</td>
<td>0.019*</td>
</tr>
<tr>
<td>URBAN, $\gamma_{03}$</td>
<td>0.611 (1.8423)</td>
<td>0.191</td>
<td>3.191</td>
<td>0.003*</td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{40}$</td>
<td>-0.012 (0.9881)</td>
<td>0.004</td>
<td>2.729</td>
<td>0.006*</td>
</tr>
<tr>
<td>For FULLTIME slope, $\beta_5$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{50}$</td>
<td>0.816 (2.2614)</td>
<td>0.158</td>
<td>5.157</td>
<td>0.000*</td>
</tr>
<tr>
<td>For MEET slope, $\beta_6$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For HCGPAREP slope, $\beta_8$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{80}$</td>
<td>0.140 (1.1503)</td>
<td>0.070</td>
<td>1.990</td>
<td>0.050*</td>
</tr>
<tr>
<td>For TUITION2 slope, $\beta_{11}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{10}$</td>
<td>0.00001 (1.0001)</td>
<td>0.00006</td>
<td>2.011</td>
<td>0.045*</td>
</tr>
</tbody>
</table>
### Table 4-6. Final Estimation of Fixed Effects (between 03/04 and 05/06)

<table>
<thead>
<tr>
<th>Institutional characteristics</th>
<th>Positive(+)</th>
<th>Non-negative</th>
<th>Negative(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical location</td>
<td></td>
<td>Part-time faculty</td>
<td>Institution size</td>
</tr>
<tr>
<td>High school GPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time attendance</td>
<td>Tuition</td>
<td></td>
<td>Working hours</td>
</tr>
</tbody>
</table>

Published by The Keep, 2014
<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Log odds (odds ratio)</th>
<th>Standard error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSTITUT, $\gamma_{02}$</td>
<td>-0.435 (0.6473)</td>
<td>0.182</td>
<td>-2.393</td>
<td>0.021*</td>
</tr>
<tr>
<td>PCTWOMEN, $\gamma_{05}$</td>
<td>-0.005 (0.995)</td>
<td>0.016</td>
<td>-3.295</td>
<td>0.002*</td>
</tr>
<tr>
<td>For FEMALE slope, $\beta_1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{10}$</td>
<td>0.464 (1.5904)</td>
<td>0.106</td>
<td>4.375</td>
<td>0.000*</td>
</tr>
<tr>
<td>For MINORITY slope, $\beta_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{20}$</td>
<td>-0.428 (0.6518)</td>
<td>0.130</td>
<td>-3.290</td>
<td>0.001*</td>
</tr>
<tr>
<td>For FULLTIME slope, $\beta_5$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{50}$</td>
<td>0.708 (2.0299)</td>
<td>0.123</td>
<td>5.777</td>
<td>0.000*</td>
</tr>
<tr>
<td>For HCGPAREP slope, $\beta_8$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{80}$</td>
<td>0.138 (1.148)</td>
<td>0.052</td>
<td>2.667</td>
<td>0.011*</td>
</tr>
<tr>
<td>For TUITION slope, $\beta_{11}$</td>
<td>0.00001 (1.0001)</td>
<td>0.00006</td>
<td>2.406</td>
<td>0.016*</td>
</tr>
</tbody>
</table>
Table 4-7. Final Estimation of Fixed Effects (between 03/04 and 08/09)

<table>
<thead>
<tr>
<th></th>
<th>Positive(+)</th>
<th>Non-negative</th>
<th>Negative(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institutional</strong></td>
<td></td>
<td>Percentage of female students</td>
<td>Institution size</td>
</tr>
<tr>
<td>characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Student pre-college</strong></td>
<td></td>
<td></td>
<td>Minority</td>
</tr>
<tr>
<td>characteristics</td>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High school GPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Student college</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>experiences</td>
<td>Full-time attendance</td>
<td>Tuition</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

- Part-time faculty have a non-negative impact on student degree or certificate completion.

- Individual level variables, such as high school GPA, race, gender, working hours, and attendance status impact student degree or certificate completion; and institutional level variables, such as institution size, percentage of female students, and geographical location affect student degree or certificate completion.
Conclusions (cont'd)

- For three years' data (between 2003/04 and 2005/06), institution size, attendance status, high school GPA, geographical location, and working hours are significant predictors.

- For six years' data (between 2003/04 and 2008/09), institution size, attendance status, high school GPA, percentage of female students, race, and gender are significant predictors.
Implications for Higher Education Research

- Data related to individual students’ exposure to part-time faculty should be further collected.
- Research should also consider combing National Study of Postsecondary Faculty (NSOPF) dataset with IPEDS and BPS datasets.
- Retention models that focus on community college students should be developed.
- Qualitative research should be conducted to complement the current study.
Implications for Higher Education Administration

- Collaboration between high schools and community colleges
- Developmental education programs be instituted to help students better prepare for the academic studies in community colleges.
- Mentoring and tutoring services should be in place to help students adjust the college life in addition to developmental education.
- Hiring part-time faculty doesn’t necessarily lead to decrease in a student’s likelihood of degree or certificate completion. However, policies that improve working conditions for part-time faculty should be implemented.
### Variable Names

<table>
<thead>
<tr>
<th>Variable Description</th>
<th>Abbreviation</th>
<th>Scale points and data sources</th>
</tr>
</thead>
</table>
| Degree or certificate completion between 03/04-05/06                                | PRATT3Y      | Categorical, Not graduate=0, Graduate=1  
Source: BPS                                                                                           |
| Degree or certificate completion between 03/04-08/09                                | PRATT6Y      | Categorical, Not graduate=0, Graduate=1  
Source: BPS                                                                                           |

#### Dependent Variables

#### Independent Variables (Student Level)

<table>
<thead>
<tr>
<th>Variable Description</th>
<th>Abbreviation</th>
<th>Scale points and data sources</th>
</tr>
</thead>
</table>
| Gender                                                                               | GENDER       | Categorical, Male=0, Female=1  
Source: BPS                                                                                           |
| Race                                                                                 | RACECEN      | Categorical, White=0, Minorities=1  
Source: BPS                                                                                           |
| Total aid excluding work study                                                       | TOTAID       | Continuous,  
Source: BPS                                                                                           |
| Hours worked per week (including work study)                                         | JOBHOUR      | Continuous,  
Source: BPS                                                                                           |
| Attending status                                                                     | ATTEND       | Categorical, Not Full-time=0, Full-time=1,  
Source: BPS                                                                                           |
| Faculty informal meeting                                                             | FREQ04A      | Categorical, Not often=0, Often=1  
Source: BPS                                                                                           |
| Faculty talk outside class                                                           | FREQ04B      | Categorical, Not often=0, Often=1  
Source: BPS                                                                                           |
| High school GPA                                                                      | HCGPAREP     | Continuous, 0.5-0.9 (D- to D)=1, 1.0-1.4 (D to C-)=2, 1.5-1.9 (C- to C)=3, 2.0-2.4 (C to B-)=4, 2.5-2.9 (B- to B)=5, 3.0-3.4 (B to A)=6, 3.5-4.0 (A- to A)=7  
Source: BPS                                                                                           |
| ACT score                                                                            | TEACTDER     | Continuous,  
Source: BPS                                                                                           |
| SAT score                                                                            | TESATDER     | Continuous,  
Source: BPS                                                                                           |
| Tuition and fees                                                                      | TUITION      | Continuous,  
Source: BPS                                                                                           |

#### Independent Variables (Institutional Level)

<table>
<thead>
<tr>
<th>Variable Description</th>
<th>Abbreviation</th>
<th>Scale points and data sources</th>
</tr>
</thead>
</table>
| The percentage of part-time faculty                                                | PROPPTFA     | Continuous,  
Source: IPEDS                                                                                           |
| Institution size                                                                    | INSTITUT     | Categorical, 0-9,999=0, 10,000-20,000 and above=1  
Source: IPEDS                                                                                           |
| Geographical location                                                               | URBAN        | Categorical, Rural =0, Non-rural=1  
Source: IPEDS                                                                                           |
| Percentage of minority students                                                     | PCTMINOR     | Continuous,  
Source: IPEDS                                                                                           |
| Percentage of female students                                                       | PCTWOMEN     | Continuous,  
Source: IPEDS                                                                                           |
| Tuition and fees (institution)                                                      | TUITIONF     | Continuous,  
Source: IPEDS                                                                                           |
| Pell Grant                                                                           | PELLGRAN     | Continuous,  
Source: IPEDS                                                                                           |
Questions and Answers
Contact Information

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