

On Time Intervention: An Instrumental Variables Evaluation of a Community College Early Alert Program

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Outline

- 1 Acknowledging IES Support
- 2 Outline
- 3 Background
- 4 Methodology
- 5 Data
- 6 Regression
- 7 Results
- 8 Conclusion

Background - Community College Context

- Many college students face challenges with success.
 - Only 40% of 2-year students complete degrees within 6 years (Juskiewicz, 2014).
 - Reasons for drop out are varied (e.g. academic performance, financial concerns, employment).
- Colleges typically offer a range of student supports.
 - These include academic (e.g. tutoring) and non-academic supports (e.g. counseling, financial aid).
 - Programs often rely on students to seek out resources as needed.

Background - Early Alert Systems

- Early Alert systems established to more effectively target services to students in need.
 - Step 1: Signal of potential risk factor triggers alert.
 - Step 2: College staff follow up with student to assess need and provide intervention.
- Systems vary across many dimensions.
 - Processes (e.g. how alert triggered, messaging).
 - Roles and responsibilities of staff and students.
 - Technology.
 - Interventions.

Lit. Review

- Colleges rapidly developing/adopting early alert systems.
 - Approx. 90% of colleges report using early alert systems (Noel-Levitz, 2013).
- No rigorous, peer-reviewed evidence on impact.
 - All available studies rely on descriptive methods that fail to properly account for selection issues with students and instructors.
 - More than 25% of colleges report systems are "minimally effective" (Noel-Levitz, 2013).

Contribution to Literature: We build evidence on the impact of early alert systems

- Examines impact of early alert on course outcomes.
- Data: Administrative data from a large community college system in Texas (> 25,000 students).
- Findings:
 - Early alerts increase likelihood of withdrawing and decrease likelihood of passing and failing.
 - Relationships between early alerts and course outcomes vary by race, gender, and type of issues facing student.

Implementation of Early Alerts at Community College Under Study

- Alerts are triggered by faculty member, sending emails to students and an advisor.
 - Alerts can be for academic reasons (e.g. failed test, lacking homework), attendance, or personal reasons.
- Advisor attempts to contact student by email and phone 3 times.
- Advisor discusses issue and recommends course of action.
- Notes tracking the process stored in student data system.

Implementation of Early Alerts, cont'd

- System first implemented in 2012.
- Many issues with implementation acknowledged.
 - Misuse of alerts by faculty.
 - Lack of faculty engagement in helping to address issues.
 - Challenges contacting students.
 - Limited set of supports and interventions for advisers to offer.
 - No accountability for students to take prescribed course of action.
 - Limited case management capabilities in software.

Methodology I - Problem Statement

- Main Interest: the effect of Early Alerts on academic outcomes.
 - OLS Regression: $Y_i = X_i\beta + \delta EA_{i,s} + u_i$
- Endogeneity: without randomization, early alerts select poor-performing students.
 - OLS will be negatively biased.
 - Need a method to separate selection effect from treatment effect of EA's.
- EA's are a function of two factors.
 - $EA_{i,s} = g(\text{Class Performance}_{i,s}, \text{Faculty Discretion}_s)$
 - $\text{Corr}(Y_i, u_i) \neq 0$ - class performance is not observed/controlled and is strongly correlated with Y_i .

Methodology II - Instrument Idea

- Idea: If faculty vary in tendency to send early alerts, then similarly-performing students will differ in early alert receipt due to randomness in faculty assignment.
 - Some faculty may blast EA's, while others might be oblivious to the system.
- We employ an instrumental variable (IV) approach to disentangle early alert receipt and course performance.
- We construct a measurement of faculty members' propensities to send early alerts, and use this as an instrument to overcome selection bias.

Methodology III - Construction

- Our IV is based on the frequency of EA's sent.
- Faculty EA frequency is partially due to the students they teach.
 - Example: Teachers of upper-division courses have students with better than average study skills. Therefore, they will send fewer EA's.
- This can disguise the tendency to send EA's.
- An association between IV and outcome develops due to sorting of students into classes.
- To control this, we construct our IV in a course-specific manner.

Methodology IV - Construction cont'd

- Our main instrument is the percentage of a faculty's students that received an early alert, by course, over the entire span of our data.
 - Courses are organized by department and number: e.g. ENGL 1301.
 - Multiple faculty members teach each course over the span of the data.
- We explore a number of other instruments that capture the tendency to send early alerts.
 - Different time spans around a given semester.
 - Previous faculty behavior only vs. all observed early alerts.
 - Different sensitivity to intensity of early alerts in a given section.

Methodology V - Validity

- IV validity: Must be uncorrelated with factors besides EA_i that affect Y_i .
 - $Corr(IV, u_i) = 0$.
- Other faculty characteristics might be associated with our measurement.
- Example: Those with high EA tendencies may also be tougher than average graders, or better than average teachers.
 - Control: We include a companion measure that is the teacher's average grade given (by course).

Methodology VI - Validity cont'd

- Students may have preferences among teachers and be able to effectively seek (or avoid) them.
 - They may seek easy graders, for instance.
- Student selection may generate a correlation between the instrument and the student population.
 - Ability bias may form if low/high performing students are able to select low/high EA tendency faculty.
 - Causes exclusion restriction to fail.
- If ability is well-captured by test scores and demographics, then conditional upon our covariates the instrument is clean.
 - This is equivalent to the assumption that unobserved ability is a linear combination of the observed variables.

Methodology VII - Validity cont'd

- Student selection bias is only a problem if early alert tendency is selected.
- Selection of other faculty qualities is not problematic if they do not correlate with early alerts.
- We are looking into further ways to control for student selection explicitly.
 - RateMyProfessor.com

Data I

- This project uses data on early alerts sent over the period from 2012-2016 at a large community college system in Texas.
- Early alert information tells us the student, the date, and the class for which EA was sent.
 - Also gives a reason code: academic, attendance, or personal.
- We also employ administrative data from the Texas Higher Education Co-ordinating Board (THECB).

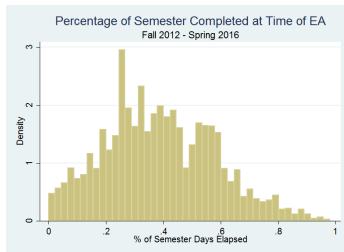
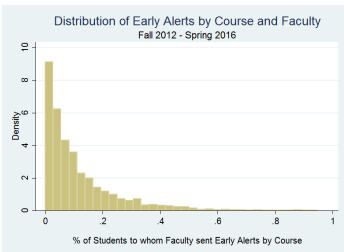
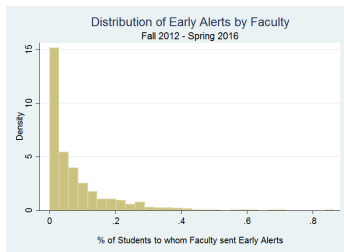
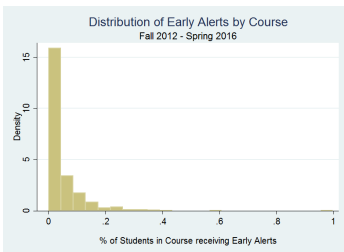
Data II

- THECB data includes extensive information on students, including:
 - Demographics (gender, race/ethnicity, age, financial, language, and disability status).
 - Test scores.
 - Courses enrolled.
 - Grades assigned (incl. withdrawals after 12th business day of the semester).
- THECB data also includes faculty info, including:
 - Courses taught.
 - Demographics.
 - Tenure, highest degree, salary, rank.

Data III

- Unit of observation for our analysis is a student-course enrollment.
- We obtain all student-course enrollments at the community college system from 2012-16.
- We then link early alerts by course, student, and semester.
- We connect faculty info by course and semester.
- This results in a dataset of 24,032 course enrollments with complete data.
 - 7,085 Students.
 - Across 451 courses.

Data IV - Descriptive Statistics



Data V - Descriptive Statistics, cont'd

- Outcome Pcts:
 - Passing (69.84%).
 - Withdrawing (7.13%).
 - Failing (23.03%).
- Gender:
 - Male (47.37%).
 - Female (52.63%).
- Race/Ethnicity:
 - Black (28.72%).
 - Hispanic (36.26%).
 - Other (22.82%).
 - White (12.21%).
- Early Alert Reason Code:
 - Academic (63.15%).
 - Attendance (51.13%).
 - Personal (2.81%).
- Enrollment Intensity:
 - Full Time (53.99%).
 - Part Time (46.01%).

Econometrics

■ First Stage:

$$\blacksquare EA_{i,c,s} = X_i\beta_i + X_f\beta_f + \delta IV_{i,c,s} + \gamma_c + \gamma_t + u_i$$

■ Second Stage:

$$\blacksquare Y_{i,c,s} = X_i\beta_i + X_f\beta_f + \delta EA_{i,c,s} + \gamma_c + \gamma_t + \epsilon_i$$

■ $\gamma_c + \gamma_t$ are course and time fixed effects.

■ $Y_{i,c,s}$ is one of three exclusive outcomes (Pass, Withdraw, Fail) or enrollment persistence.

■ IV_i construction: Student's course section is left out of instrument calculation to avoid reflection.

■ Faculty IV is calculated for each course section using *all other sections of course* taught by instructor.

Results I - First Stage

First Stage Regression Results			
Main Instrument	Coefficient	Std. Err.	F-Statistic
Pct of Students Alerted: All Time, Within Course	0.638***	(0.0149)	37.30
Alternative Instruments			
Pct of Sections Alerted: All Time, Within Course	0.198***	(0.0040)	47.84
Pct of Students Alerted: Same Year, Within Course	0.614***	(0.0167)	34.64
Pct of Sections Alerted: Same Year, Within Course	0.178***	(0.0031)	62.61

Results II - Main

Main OLS and IV Regression Results				
	Pass	Withdraw	Fail	Persistence
OLS	-0.381***	0.193***	0.188***	-0.144***
IV	-0.091	0.200***	-0.109*	0.143*

Results III - Heterogeneity

IV Reg. Results by Gender and Race/Ethnicity				
	Pass	Withdraw	Fail	Persistence
Female	0.040	0.122**	-0.162*	0.150*
Male	-0.219***	0.277***	-0.058*	0.135*
Black	-0.187**	0.260***	-0.074	0.134*
Hispanic	0.059	0.151**	-0.210**	0.165
Other	-0.006	0.018	-0.012	0.265
White	-0.273*	0.326***	-0.054	-0.033

Results III - Heterogeneity, cont'd

IV Reg. Results by Reason Code				
	Pass	Withdraw	Fail	Persistence
Academic	-0.097	0.053	0.046	0.172
Attendance	0.134	0.220*	-0.357*	-0.223
Personal	-0.108	2.061**	-1.948	1.692
IV Reg. Results by Enrollment Intensity				
	Pass	Withdraw	Fail	Persistence
Full Time	-0.188**	0.232***	-0.044	0.138*
Part Time	0.006	0.168***	-0.175**	0.148

Summary/Extensions

- We use variation in faculty propensity to send early alerts to assess the effect of these alerts on course performance and enrollment.
 - Students are more likely to withdraw, less likely to fail, and (weakly) more likely to pass.
- Extension: RateMyProfessor.com.
- Extension: Tutoring center access data.
- Further research into behavioral responses of students should emphasize how students are constrained in their ability to respond to notifications.

Appendix: Main regression results for alternative instruments.

IV Reg. Results For Alternative Instruments				
	Pass	Withdraw	Fail	Persistence
Pct of Sections Alerted: All Time, Within Course	-0.114**	0.206***	-0.092*	0.0353
Pct of Students Alerted: Same Year, Within Course	-0.081	0.214***	-0.133**	0.083
Pct of Sections Alerted: Same Year, Within Course	-0.143***	0.215***	-0.071	-0.0499

Appendix

- Additional histograms of early alerts or other early alert statistics (DE vs. College for instance).
 - Percentages of students receiving an early alert.
 - Percentages of early alerts for DE courses.
 - Percentages of early alerts to .