

# Difference in the Educational Attainment between Community College Transfer Students and Four-Year College students: A sensitivity analysis approach

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# Introduction

- Community college debate
  - Democratization vs. Diversion (Rouse, 1995)
- Educational outcomes of transfer students (mixed results)
  - Community college transfer students are less likely to complete a bachelor's degree
    - Doyle (2009)
    - Long, B. T., & Kurlaender, M. (2009).
  - Community college transfer students have similar graduation rates as students who started at a four-year institution.
    - Melguizo, Kienzl, & Alfonso (2011)
    - Xu, Jaggars, Fletcher, Fink (2018)

# Research question

- Are Community College Transfer Students Less Likely to Earn a Bachelor's Degree than students who started at a 4-year institution?

- National Education Longitudinal Study of 1988 (NELS:88)
  - Nationally representative, longitudinal study of 8th graders in 1988.
  - A sample of students followed throughout secondary and postsecondary years.
- Limitation: restricted data use file
  - Transcript-level data:
    - Number of non-remedial credits earned
    - Credits associated with threshold to identify transfer vs. rising junior
  - Regional data:
    - County-level labor market outcomes
    - Higher education characteristics (e.g. tuition by county)

TABLE 1 Descriptive Statistics of Transfers and Rising Junior Students

Variable	Mean.Tr	SD.Tr	Mean.Co	SD.Co	Diff. stat. sign
Completed bachelor's degree by 2000	0.61	0.49	0.78	0.42	**
<i>Individual characteristics</i>					
Female	0.54	0.50	0.54	0.50	
Asian	0.07	0.25	0.09	0.29	*
black	0.04	0.19	0.07	0.25	**
Hispanic	0.13	0.34	0.06	0.25	**
White	0.76	0.43	0.77	0.42	
Socioeconomic status (range -1 to 1)	0.09	0.23	0.20	0.26	**
<i>High school academic preparation and other characteristics</i>					
High school test score (math and verbal)	53.10	7.19	57.93	6.78	**
Academic program in high school	0.48	0.50	0.59	0.49	**
Participated in honors program in high school	0.15	0.36	0.22	0.42	**
Participated in student government in high school	0.11	0.32	0.16	0.36	**
Had a child by 1992	0.00	0.07	0.00	0.05	
Married by 1992	0.04	0.19	0.01	0.12	**
Bachelor's degree expectations	0.97	0.17	0.98	0.13	

Variable	Mean.Tr	SD.Tr	Mean.Co	SD.Co	Diff. stat. sign
<i>Financial aid and work related activities</i>					
Received a grant	0.38	0.49	0.51	0.50	**
Took out a loan	0.14	0.35	0.34	0.47	**
Worked on-campus	0.11	0.31	0.30	0.46	**
Working on 92-93	0.93	0.25	0.91	0.29	*
<i>Regional characteristics</i>					
College in Northeast region	0.15	0.36	0.23	0.42	**
College in Midwest region	0.24	0.43	0.31	0.46	**
College in South region	0.34	0.47	0.32	0.47	
College in West region	0.26	0.44	0.13	0.34	**
N	654		2944		

*Notes.*

Differences are: \* Significant at 5%; \*\* Significant at 1%

Values marked in red differ substantially from those in the original paper

Source: national education longitudinal study of 1988/2000 (NCES 2003-402)

# Empirical Strategy

## OLS & Probit

$$BA_i = Transfer_i\beta + X_i\gamma + \epsilon$$

- $BA_i$ : Bachelor attainment, =1 if the student attained a bachelor's degree within eight years of high school graduation.
- $Transfer_i$ : Transfer student, =1 for students who first attended a community college and transferred to a four-year college.
- $X_i$ : Individual-specific covariates:
  - Includes individual characteristics (sex, race/ethnicity, SES, etc.)
  - High school academic preparation and other characteristics (test scores, bachelor degree expectations, etc.)
  - Financial aid and work related activities (received grant, took out a loan, etc.)
  - Regional characteristics (region of college attended)

# Empirical Strategy

## OLS & Probit

TABLE 2 Differences on Bachelor's Degree Attainment (OLS & Probit)

	OLS	Probit	Probit (marginal effects)
(Intercept)	-0.254 *** (0.075)	-2.517 *** (0.278)	
Transfer vs. Rising Junior	-0.060 ** (0.019)	-0.184 ** (0.063)	-0.057** (0.021)
<i>Control individual characteristics, high school academic preparation and other characteristics, financial aid and work related activities, regional characteristics</i>	Y	Y	Y
N	3598	3598	3598

Notes.

Differences are: \* Significant at 5%; \*\* Significant at 1%

Source. national education longitudinal study of 1988/2000 (NCES 2003-402)

# Empirical Strategy

## PSM

- Individuals might self-select into specific types of institutions based on many observed and unobserved individual characteristics.
- Matching groups of students based on observable pre-treatment characteristics to approximate randomization.
- Based on strong assumption: all the factors related to college degree attainment were observed and all observed characteristics to match individuals are used in the estimation strategy.
- Propensity scores are estimated using all of the control variables in a probit function.



# Empirical Strategy

## PSM

TABLE 3 Differences on Bachelor's Degree Attainment (Probit and PSM)

	Probit	ATT	PSM	
			ATE	ATU
Transfer vs. Rising Junior	-0.057** (0.021)	-0.046* (0.028)	-0.105*** (0.032)	-0.046* (0.028)

*Notes.*

Differences are: \* Significant at 5%; \*\* Significant at 1%

*Source.* national education longitudinal study of 1988/2000 (NCES 2003-402)

# Sensitivity analysis

Using sensitivity analysis, we can investigate how strong confounding would need to be to substantively alter the results.

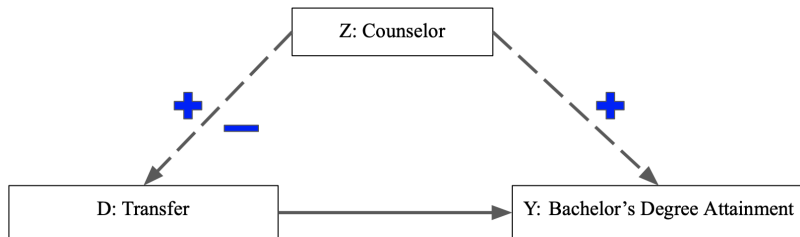
# Sensitivity analysis

## Confounders

- Non-random selection in college admission and applicant enrollment decision
  - Affect both institutional selection and academic performance
  - Including, but not limited to: individual ability, ambition, motivation, hard work, academic preparation, maturity, access to resources (e.g. school counselors), and family characteristics

# Sensitivity analysis

## Confounders

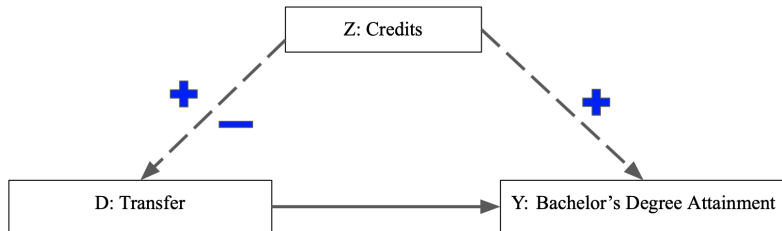


Having access to resources such as a college counselor may have a positive effect on transfer. The quality of those interactions may change the direction of the effect, if for example, college counselors give students the wrong information which may impact their ability to transfer.

Access to resources such as college counselors may have a positive effect on academic performance in the form of exposure to navigational resources.

# Sensitivity analysis

## Confounders

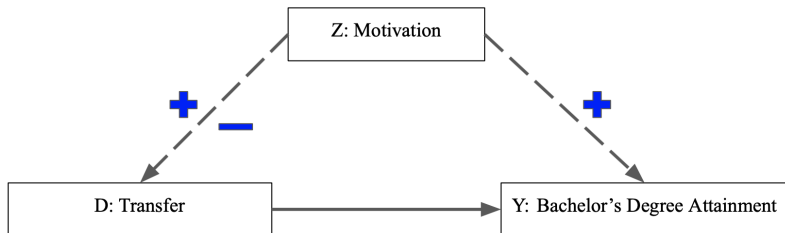


Non-remedial credits earned may have a positive effect on transferring to a 4-year institution. After a certain point, however, the number of credits earned may change the direction of the effect if there is no progress towards transferring.

Non-remedial credits earned may have a positive effect on bachelor's degree attainment as credits earned count towards students' major requirements for degree completion.

# Sensitivity analysis

## Confounders



Motivation may have effects on institutional selection where more motivated students may self-select into a particular type of institution. Students who successfully transfer into a four-year college through the complicated transitional process between different education settings are strongly motivated and more inclined to persist.

Motivation may affect academic performance, that is students that are highly motivated may do better academically and have higher rates of Bachelor's Degree attainment.

# Sensitivity analysis

## Results

TABLE 4 Sensitivity Analysis Result

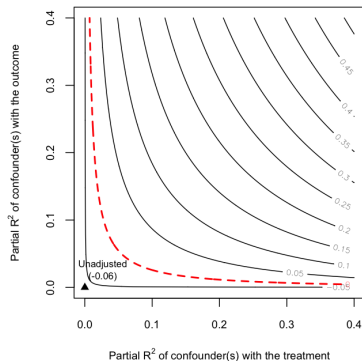
Treatment	Est.	SE	t-stat	$R^2_{Y \sim D X}$	RV	$RV_{\alpha=0.05}$	df
Transfer vs. Rising Junior	-0.06	0.019	-3.204	0.29%	5.21%	2.06%	3598

- Confounding that explains just 5.21% of the residual variance of transfer and education attainment would eliminate the result entirely; and a confounder explaining just 2.06% would reduce it below conventional levels of statistical significance.

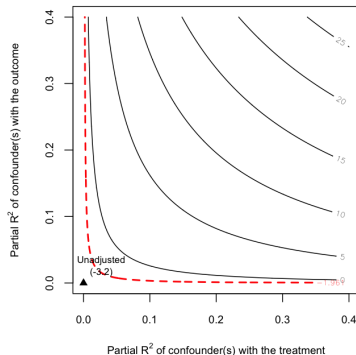
# Sensitivity analysis

## Results

### Sensitivity of point estimate



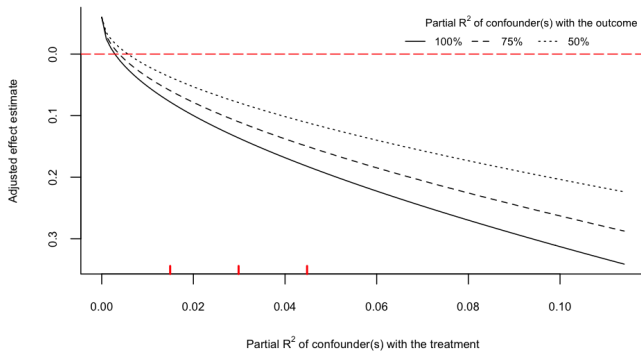
### Sensitivity of t-statistic





# Sensitivity analysis

## Results - Extreme Scenario



# Sensitivity analysis

## Benchmarking

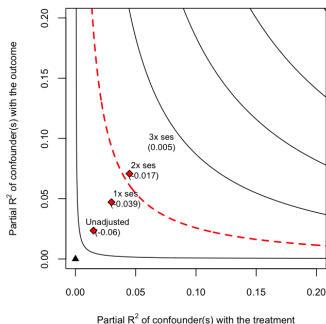
Socioeconomic status is used as the benchmark variables to bound the relative strength of the unobserved confounders.

- constructed from a composite of parental education, parental occupation and household income
- $X \sim D$ : socioeconomic disparity  $\rightarrow$  high school academic preparation  $\rightarrow$  type of starting institution
- $X \sim Y$ : socioeconomic status  $\rightarrow$  family resources, environment  $\rightarrow$  academic attainment

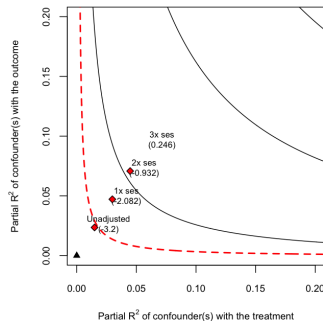
# Sensitivity analysis

## Results - Benchmarking

### Sensitivity of point estimate



### Sensitivity of t-statistic



- If confounders explain more than three times (twice) the residual variance explained by socioeconomic status, the point estimate (significance level) would be changed.

# Conclusion

- Conventional regression analyses find transfer students are less likely to obtain bachelor's degrees, holding individual characteristics, high school academic preparation, financial aid and work opportunities, and regional characteristics the same.
- However, the results is likely sensitive to the unobserved confounders. The relationship between transfer and bachelor's degree attainment can be overturned by even very weak confounders.
- “Sensitivity analyses leave the door open for progress”
  - measure and include confounders?
  - other identifcaiton strategies? IV?

Thank you!

Questions and feedback are welcome.