# Labor Market Returns to Community College: Evidence from Admissions Lotteries

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# Community Colleges in the Spotlight

- Increased attention from policymakers and researchers

- Expansions of CTE programs
  - $2 billion in 2010-2014 through TAA
  - Expansion of health training programs through ACA
  - Numerous state efforts

- Important questions given increased policy interest
  - What is the value of a community college credential?
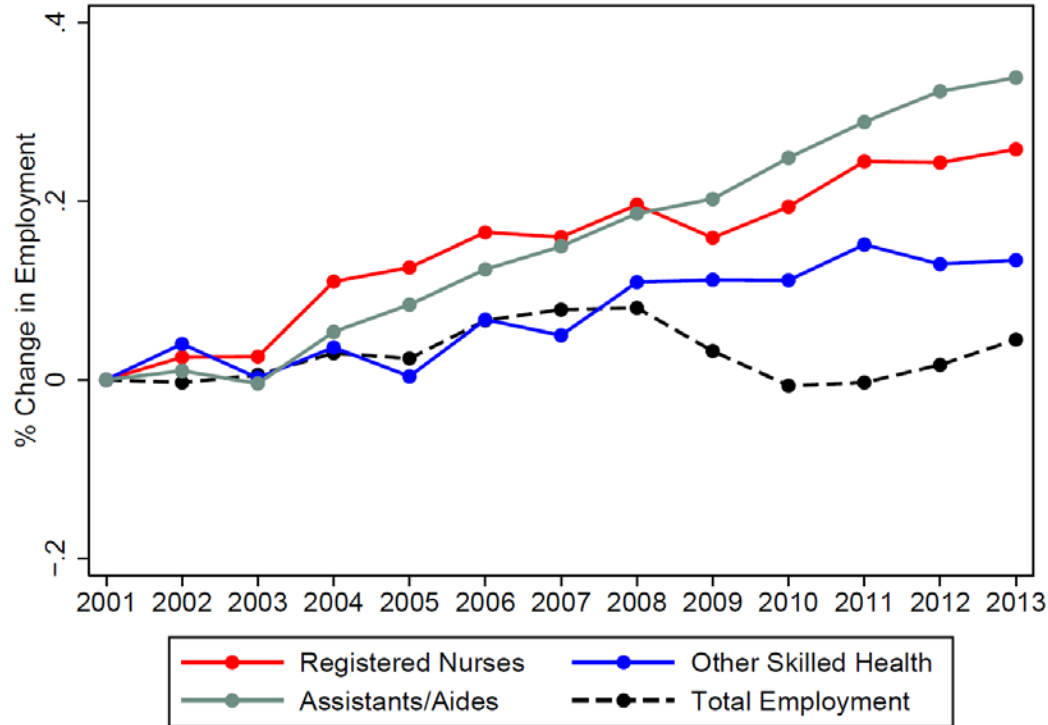  - Is expansion of programs beneficial? Is it cost-effective?

# Recent work

- Large administrative datasets, student fixed effects
  - Jacobson et al. (2005), Jepsen et al. (2014), Belfield et al. (2014), Stevens et al. (2015), Belfield (2015), Liu et al. (2015), Dadgar and Trimble (2015), Xu and Trimble (2015), Bahr et al. (2016)
  - Wide range of returns, vary by content and degree type

- No study has used experimental variation to identify the effects of CTE on earnings
  - Experimental evidence rare outside of explicitly designed interventions

# This Project

- Focus on particularly important field: registered nursing

- Estimate effects using variation from lottery admissions at one large college in California

- Also use student fixed effects models

- Explore differences in returns to nursing degree across California colleges

- Estimate economic benefit of program expansion

# Focus on Associate's Degree in Nursing



Employment changes in California. Source: Occupational Employment Statistics. Other Health professions include LPN, radiologic techs, dental hygienists, respiratory care therapists, surgical techs.

# "Central College" and its Nursing Program

- Large community college located in California's Central Valley

- Typical ADN program
  - Curriculum/prerequisites set by state board
  - Approximately 100 students per cohort, among largest in state

- Admission determined by a lottery among eligible applicants
  - 23 of 70 ADN programs in CA use randomization in admissions
  - Some differences from researcher-designed experiment
    - Reapplication allowed
    - Increased change of admission on 5<sup>th</sup> consecutive application

# Data

- Student-level data from CA community colleges, 1992-2015
  - Courses, grades, degrees/certificates, demographics, financial aid
  - Quarterly earnings and industry from state administrative records

- Admissions lotteries results from Central College, 2005-2014

- Qualitative data from site visits, 2015
  - Interviews with dean, program directors, other administrators
  - Focus groups with incoming students
  - Attended orientation event for new students

- Program-level operating and expansion cost estimates
  - Individual colleges, Office of the State Architect, other state sources

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# Methods

- Effect of enrollment on long-term earnings

$$y_{it} = \beta_0 + \beta_1 D_i + X_{it}\beta + \nu_t + \varepsilon_{it}$$

  - $y_{it}$: earnings for student $i$ in year $t$
  - $D_i$: Enrolled in ADN program
  - This regression will lead to biased estimate of $\beta_1$

- Use result of admissions lottery as an instrument for $D_i$
  - Randomly assigned and determines admission
  - Multiple reapplications makes methodology less straightforward

# Summary Statistics and Balance

|  | Mean | Admit-Reject Difference |
|---|---|---|
| Female | 0.794 | 0.0393 |
|  |  | (0.0225) |
| White | 0.264 | 0.00189 |
|  |  | (0.0349) |
| Black | 0.0463 | -0.0251** |
|  |  | (0.00759) |
| Hispanic | 0.301 | 0.0795 |
|  |  | (0.0476) |
| Asian | 0.118 | -0.018 |
|  |  | (0.023) |
| Age | 29.82 | -0.216 |
|  |  | (0.444) |
| GPA | 2.391 | 0.0434 |
|  |  | (0.0651) |
| Had Tuition Waiver | 0.720 | 0.0442 |
|  |  | (0.0386) |
| Had Pell Grant | 0.437 | -0.00919 |
|  |  | (0.0376) |
| Employed > 8 Quarters | 0.628 | 0.00672 |
|  |  | (0.0365) |
| Mean Quarterly Earnings | 4717.3 | -210.3 |
|  |  | (252.4) |
| Industry is Health | 0.407 | 0.0281 |
|  |  | (0.0338) |
| Industry is Retail | 0.223 | 0.00259 |
|  |  | (0.0299) |
| Industry is Food Service | 0.158 | 0.00805 |
|  |  | (0.0238) |
| N | 3506 | 8870 |

Notes. Mean characteristics measured at term of first application. Difference includes lottery-term fixed effects. $*p < 0.05, **p < 0.01, ***p < 0.001$

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# Main Results: Log Earnings at Years 5-7

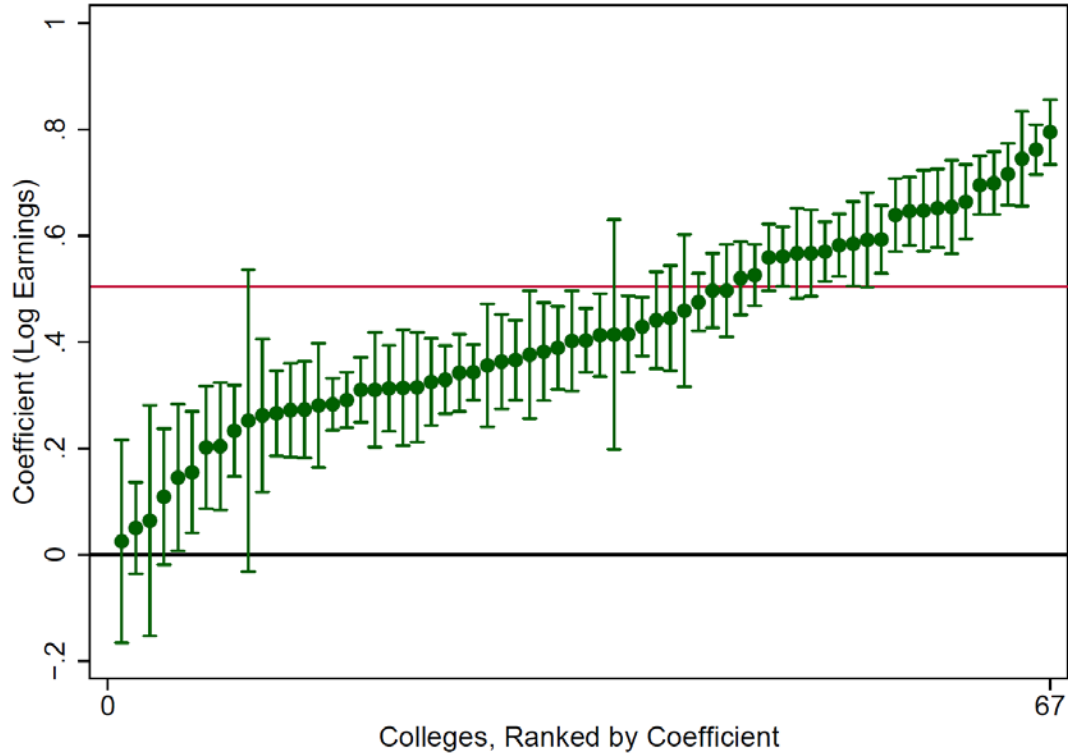| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Start Program | 0.420** | 0.424** | 0.444** | 0.445** | 0.446** | |
| | (0.157) | (0.160) | (0.161) | (0.166) | (0.164) | |
| Earn ADN | | | | | | 0.667* |
| | | | | | | (0.293) |
| N | 20885 | 20885 | 20885 | 20885 | 20885 | 20885 |
| Mean Earnings | 12686.3 | 12686.3 | 12686.3 | 12686.3 | 12686.3 | 12686.3 |
| First stage F | 20.04 | 18.35 | 18.19 | 18.70 | 17.36 | 3.775 |
| Demographics | | X | X | X | X | X |
| Academic | | | X | X | X | X |
| Labor Market | | | | X | X | X |
| Financial Aid | | | | | X | X |

Notes. Dependent variable is quarterly log earnings five to seven years after focal lottery. The four instruments include the result of an applicant's first four lotteries. All regressions control for year, cohort, and lottery-instance. Standard errors clustered at the individual level. $*p < 0.05, **p < 0.01, ***p < 0.001$

- Coefficient of 0.446 ≈ 44% increase in earnings
- Coefficient of 0.667 ≈ 95% increase in earnings

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# Other Lottery Results

- Effects on employment
    - No effect on likelihood of having non-zero earnings
    - Large effect on employment in health industry


- Lottery results similar to results with student fixed effects
    - Important given growing number of studies using this method

# Student Fixed Effects Returns, by Program



- Differences drive in large party by labor market opportunities

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# Expansions and Capacity

- Labor market for nurses dominated by fears of shortages (Kuehn 2007)
  - Rising demand for healthcare
  - Aging out of baby-boomer nurses
  - Supply side moving slowly

- Do expansion benefits outweigh costs?
  - Private return : $140,000-$200,000 per student
  - Positive spillovers in better health: $40,000-$70,000 per new nurse
    - Dall et al. (2009), Needleman et al. (2006)
  - Expansion costs: $20,000 per new seat

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# Conclusions and Policy Implications

- Large earnings effects from ADN programs
  - 55% earnings effect from enrolling
  - Value of enrolling is $150,000 to $200,000
  - Economic benefits far outweigh expansion costs

- Incentives often aligned against expansion
  - Colleges in California funded per pupil, regardless of program
  - Incentive to expand less-costly programs, not nursing
  - Suggests need for more involvement at federal and state level
  - Other approaches: different pricing/funding of programs

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