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Using Propensity Score Methods with Statewide Administrative Data to Inform Education and Workforce Policy in Maryland

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Maryland's 2013 CCRCCA

- College and Career Readiness and College Completion Act of 2013 (Senate Bill 740)
  - Encourages dual enrollment, where high school students enroll in college courses
  - Special incentives for low-income students
  - Dual enrollment has increased in Maryland in recent years (Henneberger et al., 2016)
  - However, no causal evidence of its effectiveness

The Current Study

- Used data from Maryland's statewide longitudinal data system, which houses linked longitudinal data from 3 state agencies.

- Applied propensity score matching (Rosenbaum & Rubin, 1983) to improve the ability to make causal inferences about dual enrollment.

- Is the first to examine the link between dual enrollment and long-term career outcomes.

Method

- Data from the Maryland Longitudinal Data System (MLDS)

  - Population for 2009-2010 cohort of 12th grade students enrolled in public school:

    - N = 64,000 12th grade students;

    - N = 4,200 (7%) dually enrolled (overlapping enrollment dates in MD public high school and MD college);

      - 60% Female; 80% not eligible for free/reduced price meals; 64% white; 93% non-Hispanic

Method

$$ATT = E[Y_1 - Y_0 \mid D = 1, X]$$

ATT = Average treatment on the treated

D = Treatment status

X = Vector of covariates

(Rosenbaum & Rubin, 1983)

Method: Assumptions

- *Unconfoundedness*: Conditional on propensity score (and thus covariates), assignment to treatment is independent of outcomes.

$$(Y_0, Y_1) \perp D \mid P(X)$$

- *Overlap:* The probability of being treated is bounded away from 0 or 1.

$$0 < P(X) < 1$$

- *No unmeasured confounders*

$$ATT = E[Y_1 - Y_0 \mid D = 1, X]$$

(Rosenbaum & Rubin, 1983)

Method: Confounders

Confounders Predicting Dual Enrollment Program Participation (0/1)

Demographic Variables: Gender, Race, Ethnicity

Program Participation: Eligibility for Free and Reduced Price Meals (FARMS), Special Education, Homelessness
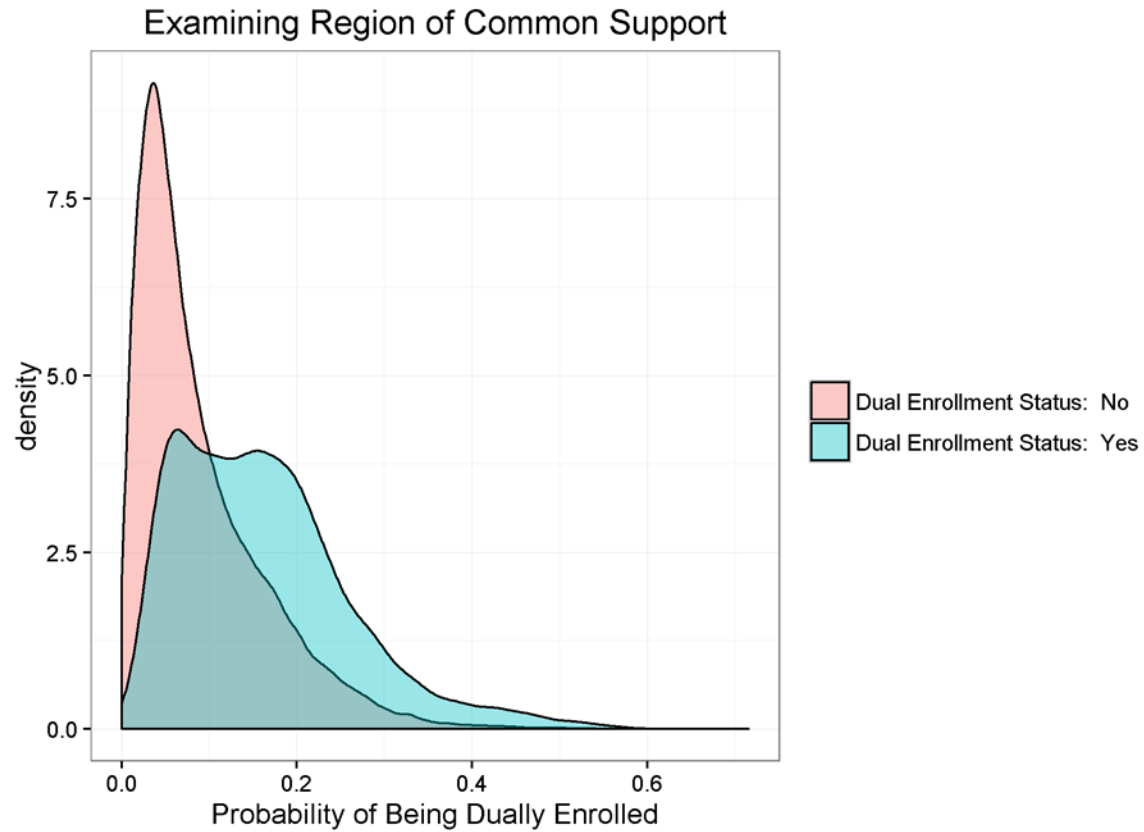
Academic Indicators: High School Assessment (HSA) Algebra, English, Biology (Presence of score * score), Number of Advanced Placement (AP) tests taken (by subject), 3.0 GPA indicator, Weeks Absent

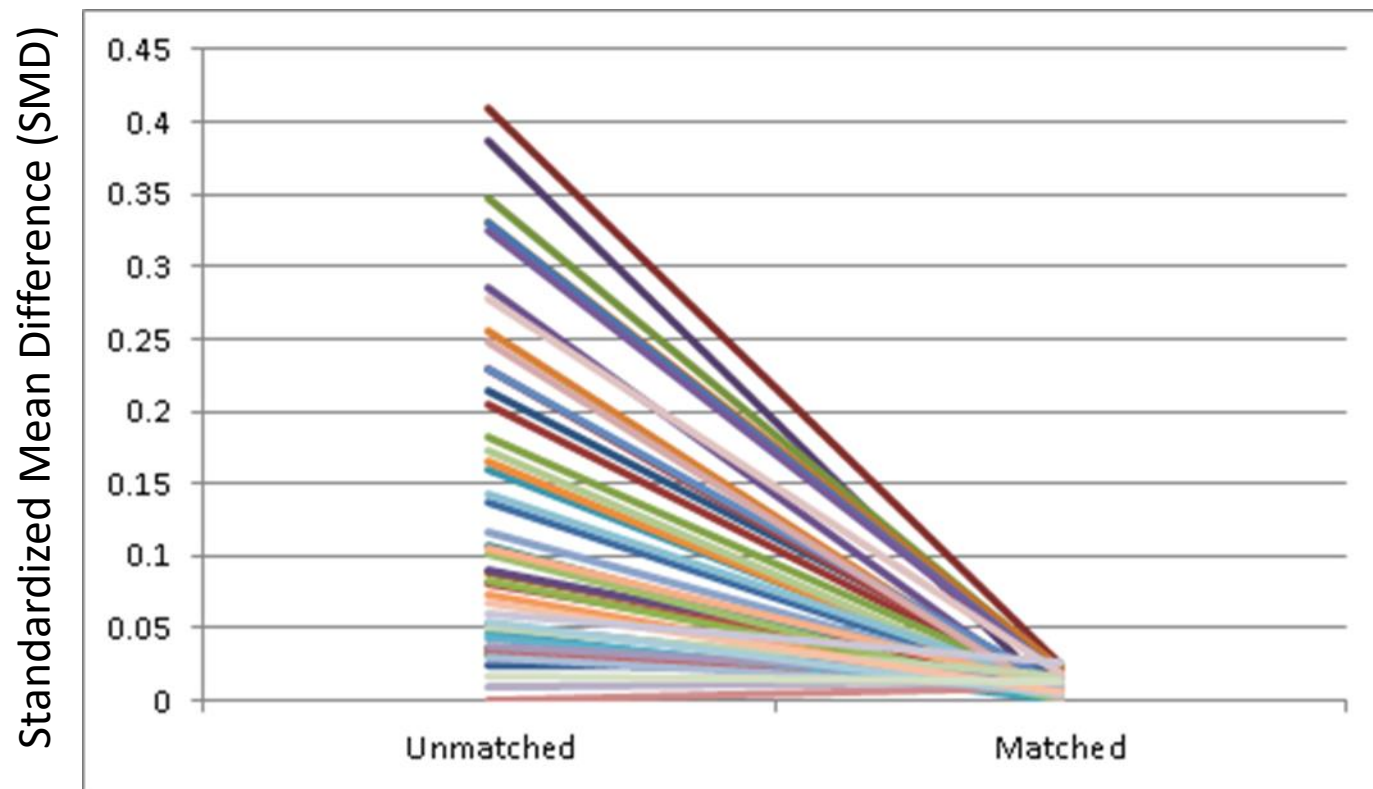**Distance** of high school to nearest 2-year college

Local School System: to account for differences between school systems that may make students in some local school systems more likely to dually enroll (e.g., course offerings, incentives, district agreements with community colleges)

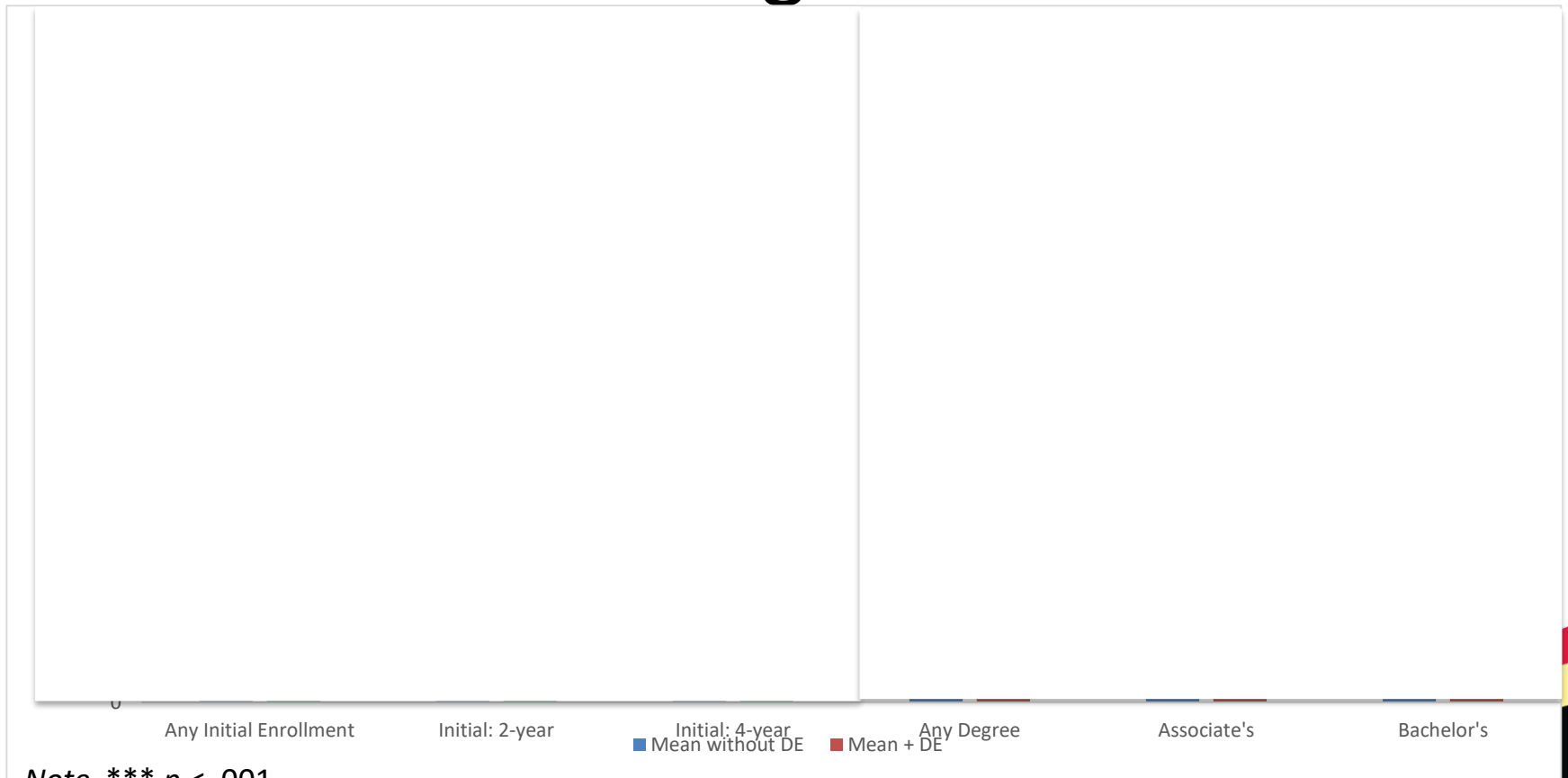Matching implemented in R; nearest neighbor match; 1:1; Caliper = 0.2
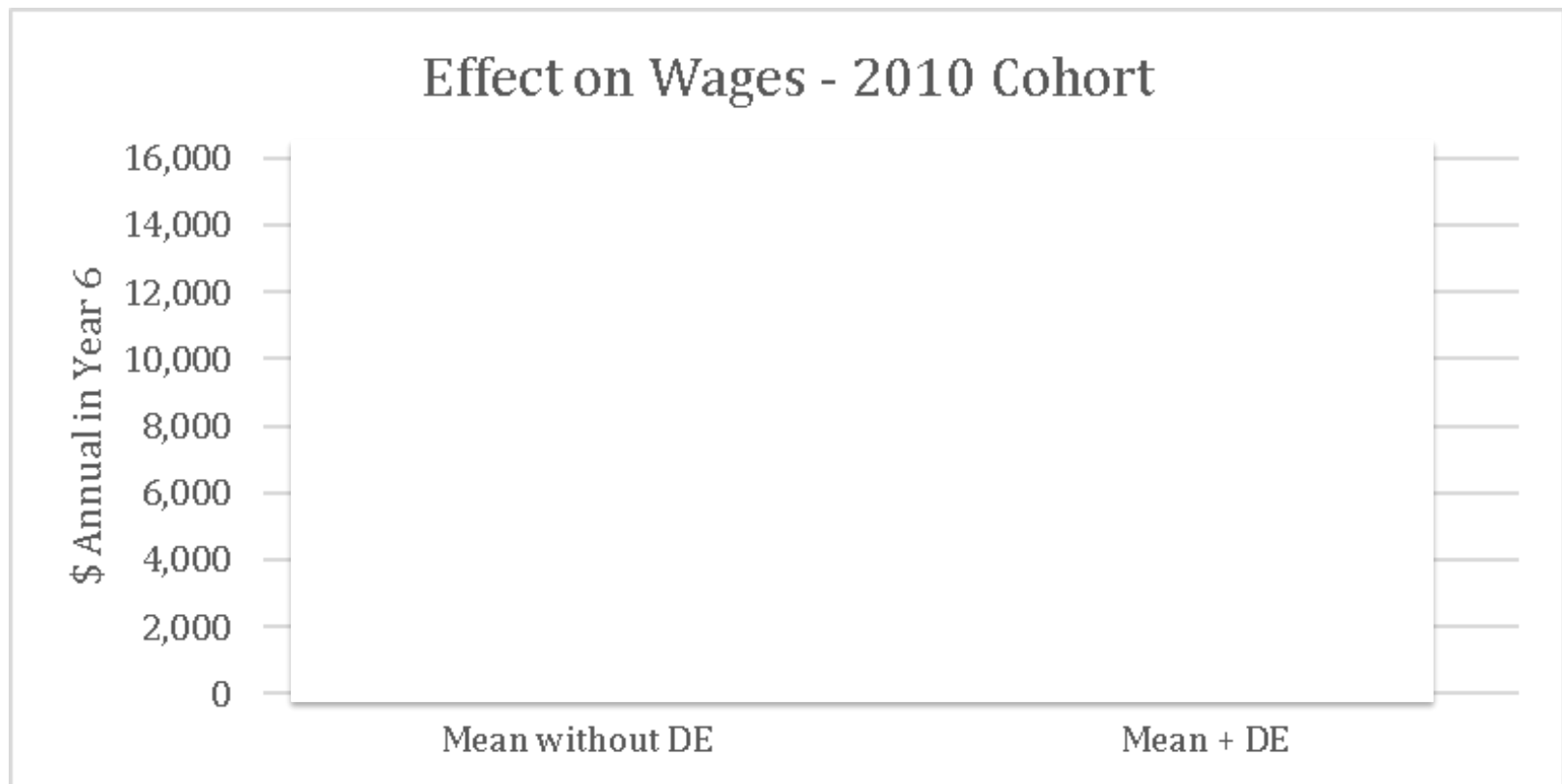
Method: Overlap

Examining Region of Common Support

Method: Balance on Confounders

Results: College Enrollment and Degrees

Any Initial Enrollment   Initial: 2-year   Initial: 4-year   Any Degree   Associate's   Bachelor's

■ Mean without DE   ■ Mean + DE

Note. *** *p* < .001

Results: Annual Earnings Year 6

Effect on Wages - 2010 Cohort

Note. * p < .05

Heterogeneity of Effects

Heterogeneous Effects of Dual Enrollment on Initial 4-Year College Enrollment

Legend: ■ Group Mean | No DE ■ Mean + DE
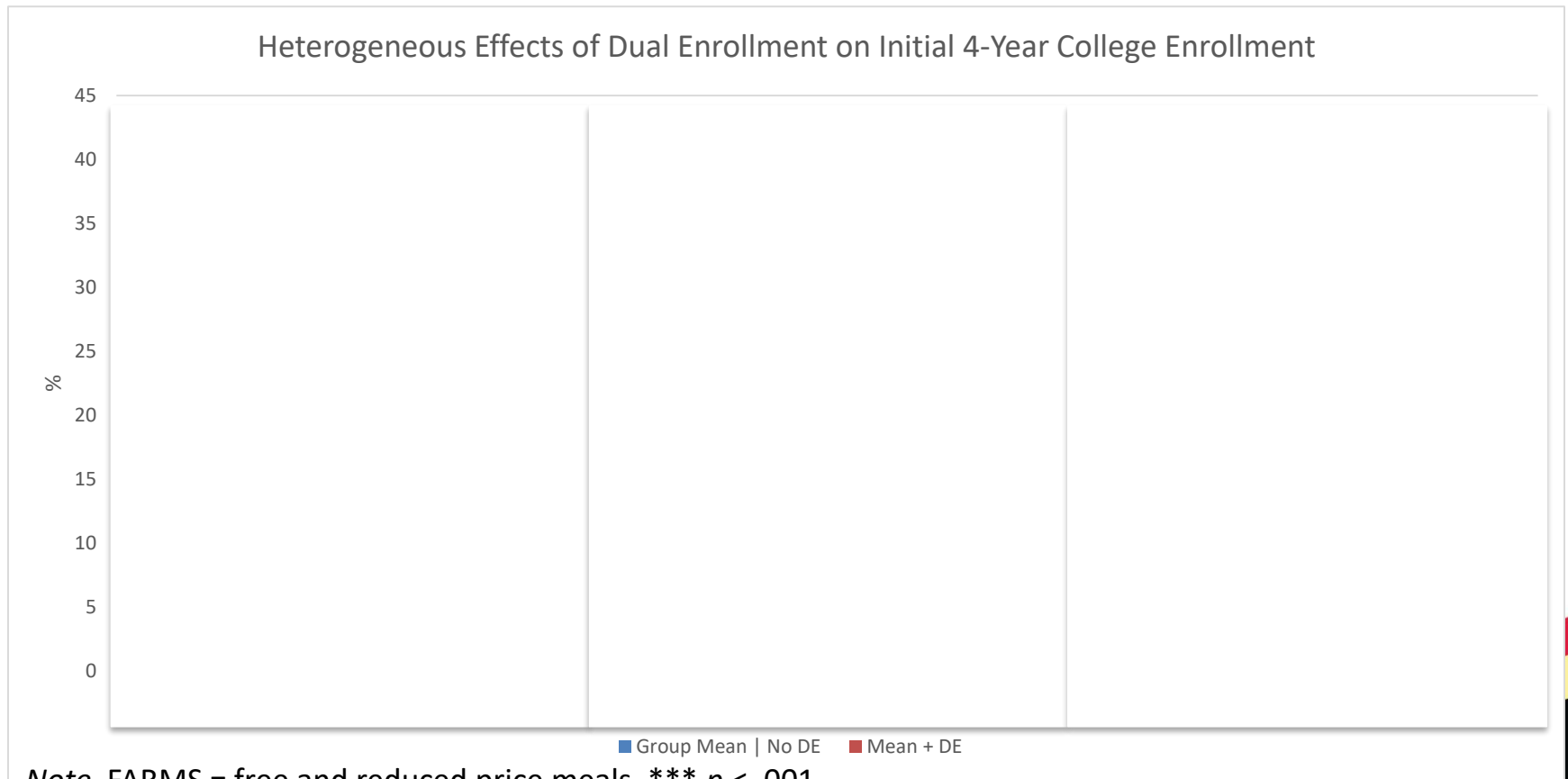
Note. FARMS = free and reduced price meals. *** $p < .001$

Summary of Results

- Positive causal effects for dual enrollment on:
  - College enrollment (suggests 2-year enrollment first, then 4-year)
  - College persistence
  - College degree earning
  - Earnings 6 years after high school
- Stronger effects for:
  - Low-income students
  - Black students
  - Hispanic students

Limitations

- Propensity score methods assume no unmeasured confounders—
  - Academic motivation
  - Behavioral problems
  - Etc.
- No information about type of dual enrollment program (e.g., characteristics of district partnership; Early Middle College program).

Strengths

- Population-level data

- Efficiently controlled for >25 confounding variables

- Ability to estimate the causal effect of a preventive intervention to guide decision making and affect policy change

Policy Implications

- Incentivize dual enrollment in high school
- Particularly for under-represented students, who benefit the most
  - Low income
  - Black
  - Hispanic
- Heterogeneity does not seem to transfer to degree earning– provide additional supports for persistence to degree for under-represented students
- Focus on 2-year college enrollment, with the goal of transfer to 4-year

Acknowledgements

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