High School Degrees and College Outcomes

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UTD Texas Schools Project
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Motivation

• Return to college
  – Large (Kane and Rouse, 1995; Card (1995)
  – Increasing (Goldin and Katz, 2008)

• But college attainment rates have stagnated over the last 40 years
  – Enrollment has gone up
  – Offset by reductions in completion rates
Motivation

• Inadequate preparation in high school is one possible reason for slow growth in college attainment
• This perception has motivated high school reforms aimed at increasing “standards”
  – Strengthening graduation requirements
  – High school exit exams (or harder HSEE)
Motivation

• High school reforms have ambiguous effects on college outcomes
• Positive effects if they improve academic preparation
• Negative effect for students who do not graduate from HS because of reform
  – Depends on college admissions policies
  – Depends on college outcomes of “marginal” HS graduates
Motivation

• These considerations apply more generally to interventions aimed at improving college outcomes

• Enrollment could be an inadequate outcome measure
  – Likely to be most relevant for marginal students affected by interventions
This Paper

• **Goal**: estimate the causal effect of a HS diploma on college outcomes

• **Data**: TSP administrative data with information on enrollment and attainment

• **Research Design**: “Fuzzy” RDD based on high school exit exams
This Paper

• Strong effect of HSD on $P(\text{ever enroll})$
  – About 10 ppts (or about 22% of the mean)
  – Concentrated almost entirely in 2-Yr. colleges

• No effect on college credits

• No effect on receipt of a college degree
This Paper

• Strong effect of HSD on $P(\text{ever enroll})$
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• No effect on receipt of a college degree

-> HSD’s affect enrollment, but for students who have very low college persistence
Outline

• Background
• Research Design
• Data
• Results
• Interpretation
• Conclusion
Background: Prior Literature

• Effect of HSEE on HS outcomes (Dee & Jacob, 2007; Warren et al., 2007; Reardon et al., 2009; Warren & Jenkins, 2005; Martorell, 2005; Papay et al., 2010; Ou, 2010)
  – Results are inconclusive and sensitive to empirical approach and data
• Effect of HSEE on post-HS outcomes
  – Dee & Jacob (2007) find little effect on college enrollment
  – Martorell & Clark (2010) find HSD status affected by exit exam has little effect on earnings
• Effect of GED on college enrollment
  – Tyler and Lofstrom (2010) find GED recipients less likely to enroll in college than comparable HS grads
  – Jepsen et al. (2010) use RD design and find GED increases college enrollment
• Many studies of programs aimed at college outcomes find enrollment effects but do not examine attainment outcomes
  – Kane (2003); Bettinger et al. (2009); Dynarski (2000); Cunha & Miller (2010); Jepsen et al (2010)
Background: College Admissions Standards in TX

- 4-Yr. colleges and universities require HSD or an equivalent credential (e.g., GED)
- Some 2-Yr. colleges also require HSD or GED
- Other 2-Yr. colleges admit non-graduates who score well on a placement test or who petition for admission
- Other 2-Yr. colleges admit all applicants
  - But informational barriers may prevent non-graduates from applying
Background: High School Exit Exams

• Standardized tests taken in HS

• Students must pass in order to graduate from HS

• Used in TX since the 1980’s, now in about 50% of U.S. states
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Research Design

• **Challenge**: HSD recipients would have better outcomes than non-HSD recipients irrespective of HSD status

• **Solution**: Regression discontinuity
  – Compare students “close” to exit exam passing cutoff
Research Design: High School Exit Exams

HS Exit Exams: stylized description

Single test taken by everyone at end of grade 12, perfect compliance

\[ P(\text{HSD}) \]

\[ \begin{align*}
0 & \quad \text{Fail (No diploma)} \\
1 & \quad \text{Pass (Diploma)}
\end{align*} \]

Test Score
Research Design: High School Exit Exams

- HS exit exams in practice
  1. Multiple tests: math, reading, writing (must pass all 3 sections)
  2. Retaking: Initially taken in G10 or G11, multiple retake opportunities
  3. Imperfect compliance: can graduate if fail, not graduate if pass
Research Design: High School Exit Exams

• HS exit exams in practice

  1. Multiple tests: math, reading, writing (must pass all 3 sections) with different scales
     - Recenter each score at passing cutoff
     - Redefine test score as min(M,R,W)
     - Fail if and only if min(M,R,W) < 0
Research Design: High School Exit Exams

• HS exit exams in practice

  2. Retaking: Initially taken in G10 or G11, multiple retake opportunities
  • Focus on students taking final test at end of G12 ("last-chance sample")
  • Estimates specific to students in last-chance sample (policy relevant)
Variation in HSD status that identifies effect of HSD.
Research Design

- Exit exam passing status close to random near passing cutoff
  - Variation in HSD status near passing cutoff unrelated to other determinants of college outcomes
Cannot reject continuous density using McCrary (2008) test
Average Initial Attempt Math z-score
Research Design

\[ Y_i = \beta_0 + \beta_1 \text{HSD}_i + \beta_2 X_i^s + \epsilon_i \]  
[Structural Eqn, CONSTANT Effects]

\[ Y_i = \theta_0 + \theta_1 \text{PASS}_i + f(p_i) + u_i \] [REDUCED-FORM]

\[ D_i = \kappa_0 + \kappa_1 \text{PASS}_i + g(p_i) + v_i \] [FIRST-STAGE]

\[ \hat{\beta}_1 = \frac{\hat{\theta}_1}{\hat{\kappa}_1} \]

Standard RD (Imbens and Lemieux (2008), Lee and Lemieux (2009))
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Data: Sources

- Administrative data from TSP
- High school (TEA)
  - Exit exam scores (all attempts)
  - HS graduation status
  - Baseline covariates
  - GED
- Post-secondary (THECB)
  - THECB data on public 2yr and 4yr colleges through 2005
  - 8 Year follow up for all cohorts
  - Enrollment
  - Credits (attempted academic, total enrolled)
  - Degree completion (BA, AA)
Data: Sample

• Analysis sample
  – Students who took the “last-chance” test (final 12\textsuperscript{th} grade retest)
  – Took exam for the first time with their cohort (i.e., fall 11\textsuperscript{th} grade for first 2 cohorts; spring 10\textsuperscript{th} grade for last 3 cohorts)
  – N=37,571
Data: Descriptive Statistics

Distribution of initial scores (full and last-chance samples)
## Data: Descriptive Statistics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Full Sample</th>
<th>All</th>
<th>Fail</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.487</td>
<td>0.421</td>
<td>0.416</td>
<td>0.430</td>
</tr>
<tr>
<td>Black</td>
<td>0.117</td>
<td>0.246</td>
<td>0.256</td>
<td>0.230</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.289</td>
<td>0.478</td>
<td>0.505</td>
<td>0.434</td>
</tr>
<tr>
<td>Econ. Disadvantaged</td>
<td>0.213</td>
<td>0.409</td>
<td>0.442</td>
<td>0.354</td>
</tr>
<tr>
<td>Special Education</td>
<td>0.034</td>
<td>0.034</td>
<td>0.040</td>
<td>0.024</td>
</tr>
<tr>
<td>Limited English proficient</td>
<td>0.040</td>
<td>0.147</td>
<td>0.177</td>
<td>0.099</td>
</tr>
<tr>
<td>At grade level (initial attempt)</td>
<td>0.770</td>
<td>0.541</td>
<td>0.494</td>
<td>0.617</td>
</tr>
<tr>
<td>Cohort 1</td>
<td>0.177</td>
<td>0.356</td>
<td>0.296</td>
<td>0.453</td>
</tr>
<tr>
<td>Cohort 2</td>
<td>0.174</td>
<td>0.156</td>
<td>0.179</td>
<td>0.120</td>
</tr>
<tr>
<td>Cohort 3</td>
<td>0.214</td>
<td>0.185</td>
<td>0.189</td>
<td>0.179</td>
</tr>
<tr>
<td>Cohort 4</td>
<td>0.211</td>
<td>0.157</td>
<td>0.180</td>
<td>0.120</td>
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</table>

<table>
<thead>
<tr>
<th>Initial Exam</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Took all Sections</td>
<td>0.949</td>
<td>0.956</td>
<td>0.956</td>
<td>0.955</td>
</tr>
<tr>
<td>Math (mean, sd)</td>
<td>0.9 (11.7)</td>
<td>-14.9 (7.9)</td>
<td>-16.4 (7.7)</td>
<td>-12.4 (7.4)</td>
</tr>
<tr>
<td>Reading (mean, sd)</td>
<td>3.8 (7.5)</td>
<td>-5.7 (6.8)</td>
<td>-7.0 (6.9)</td>
<td>-3.7 (6.2)</td>
</tr>
<tr>
<td>Writing (mean, sd)</td>
<td>9.0 (13.6)</td>
<td>-2.7 (11.4)</td>
<td>-4.4 (11.4)</td>
<td>-0.0 (10.8)</td>
</tr>
<tr>
<td>Pass all sections (%)</td>
<td>0.514</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Total exam attempts in HS
- 2.05 (1.54)  
- 5.7 (1.3)  
- 5.8 (1.2)  
- 5.6 (1.3)  

### Number of Observations
- 777892  
- 37571  
- 0.051  
- 0.220
Outline

• Background
• Research Design
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## Results: First Stage

<table>
<thead>
<tr>
<th>Reduced Form</th>
<th>0.444**</th>
<th>0.415**</th>
<th>0.419**</th>
<th>0.417**</th>
<th>0.417**</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.007)</td>
<td>(0.009)</td>
<td>(0.012)</td>
<td>(0.016)</td>
<td>(0.009)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baseline X's?</th>
<th>N</th>
<th>N</th>
<th>N</th>
<th>N</th>
<th>Y</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Test score specification</th>
<th>Local</th>
<th>Linear</th>
<th>Quad.</th>
<th>Cubic</th>
<th>Quartic</th>
<th>Quad.</th>
</tr>
</thead>
</table>
Results: College Enrollment

Fraction Ever Enrolled in College
Results: College Enrollment

Fraction Ever Enrolled, by 2yr/4yr

diamond Ever enrolled in 2-Yr. College
bullet Ever enrolled in 4-Yr. College
## Results: Enrollment Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Reduced Form</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ever enroll</strong></td>
<td>0.059**</td>
<td>0.103**</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.027)</td>
</tr>
<tr>
<td><strong>Ever enroll - 4yr</strong></td>
<td>0.015**</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.015)</td>
</tr>
<tr>
<td><strong>Ever enroll - 2yr</strong></td>
<td>0.049**</td>
<td>0.083**</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.027)</td>
</tr>
<tr>
<td><strong>Attempt any acad cred</strong></td>
<td>0.056**</td>
<td>0.105**</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.027)</td>
</tr>
<tr>
<td><strong>Baseline X's?</strong></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>Y</td>
</tr>
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<td><strong>Test score specification</strong></td>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Quartic</td>
<td>Quad.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quad</td>
</tr>
</tbody>
</table>
Results: Attainment Outcomes

College Credits

Diamonds: Total Enrolled Credits
Black Circles: Attempted Academic Credits
Results: Attainment Outcomes

College Credits

4 Yr. Acad. Credits
2 Yr. Acad. Credits
## Results: Attainment Outcomes

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<thead>
<tr>
<th></th>
<th>Reduced Form</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total credits enrolled</td>
<td>2.563**</td>
<td>3.301</td>
</tr>
<tr>
<td></td>
<td>(0.751)</td>
<td>(2.175)</td>
</tr>
<tr>
<td>Acad Credits</td>
<td>1.398*</td>
<td>1.016</td>
</tr>
<tr>
<td></td>
<td>(0.546)</td>
<td>(1.593)</td>
</tr>
<tr>
<td>Earn BA or AA</td>
<td>-0.001</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>Earn BA</td>
<td>0.003</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Earn AA</td>
<td>-0.003</td>
<td>-0.012</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Baseline X's?</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Local</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Quad.</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Cubic</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Quartic</td>
<td>Quadratic</td>
<td></td>
</tr>
</tbody>
</table>
Results: Enrollment Effects Over Time
# Results: Subgroups

<table>
<thead>
<tr>
<th>Enrollment Outcomes</th>
<th>Men</th>
<th>Women</th>
<th>p-value for Men = Women</th>
<th>Whites</th>
<th>Nonwhite</th>
<th>p-value for Whites = Nonwhites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever enrolled in college</td>
<td>0.051</td>
<td>0.140**</td>
<td>0.120</td>
<td>0.070</td>
<td>0.113**</td>
<td>0.485</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.034)</td>
<td></td>
<td>(0.052)</td>
<td>(0.032)</td>
<td></td>
</tr>
<tr>
<td>Ever enrolled in 4yr college</td>
<td>0.022</td>
<td>0.020</td>
<td>0.938</td>
<td>-0.006</td>
<td>0.030</td>
<td>0.252</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.019)</td>
<td></td>
<td>(0.025)</td>
<td>(0.019)</td>
<td></td>
</tr>
<tr>
<td>Ever enrolled in 2yr college</td>
<td>0.019</td>
<td>0.127**</td>
<td>0.058</td>
<td>0.054</td>
<td>0.091**</td>
<td>0.551</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.034)</td>
<td></td>
<td>(0.052)</td>
<td>(0.032)</td>
<td></td>
</tr>
</tbody>
</table>

| Attainment Outcomes |  |  |
|---------------------|  |  |
| Total credits enrolled | 3.580 | 3.262 | 0.943 | 0.914 | 4.195 | 0.486 |
|                     | (3.387) | (2.827) | | (3.935) | (2.592) | |
| Attempted academic credits | 2.516 | 0.133 | 0.463 | -0.337 | 1.486 | 0.601 |
|                     | (2.512) | (2.052) | | (2.936) | (1.888) | |
| Earn BA or AA | 0.015 | -0.017 | 0.076 | -0.012 | -0.003 | 0.656 |
|                     | (0.013) | (0.012) | | (0.018) | (0.011) | |
| Earn BA | 0.004 | 0.006 | 0.903 | -0.000 | 0.007 | 0.626 |
|                     | (0.008) | (0.010) | | (0.013) | (0.008) | |
| Earn AA | 0.011 | -0.025** | 0.008 | -0.014 | -0.011 | 0.829 |
|                     | (0.010) | (0.009) | | (0.013) | (0.008) | |
Outline

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Interpretation: Why are Attainment Effects Small?

- College going in the last-chance sample low across the board
- “LATE” might be unusually small relative to other students in last-chance sample
- Data issues (no private, out of state schools)
- GED replaces regular high school diploma
Interpretation: Policy Implications

• Policies that affect HS graduation unlikely to directly affect college attainment
  – HSEE, course completion requirements, etc. may reduce graduation, but probably not college attainment
  – Potential positive effects on college outcomes if quality of high school instruction improves
Interpretation: Policy Implications

• Examining attainment effects critical for evaluations of programs that seek to improve college outcomes
  – Interventions have largest effects on “marginal” students; persistence might be lowest among these students

• Relevant for evaluations of
  – Scholarships (Kane, 2003; Dynarski, 2000)
  – Financial aid information (Bettinger et al., 2009)
  – General college informational campaign (Cunha & Miller, 2010)
Conclusion

• High school diplomas “matter” for college enrollment but not attainment
  – Enrollment effects large, but short-lived
  – Persistence among “marginal” students very low

• Policies that change HS graduation rates unlikely to have large effects on college outcomes

• Evaluations of programs that target college outcomes need to consider attainment and not just enrollment