

School Choice in the Wild West

Statistical Predictors of Student Enrollment

Case Study: Chander Unified School District

Matthew Hom¹ Patrick Cizek²

¹Department of Economics
Yale University

²Department of Economics
University of Arizona

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Outline

- 1 Motivating Questions
- 2 Descriptive Statistics
 - Descriptive Statistics
- 3 Discrete Choice Methodology

What is the value of school choice?

Advocates: If we create a “market for education” then good things will happen

- 1 Increase access to good schools
- 2 Induces competition amongst schools for students, which translates into achievement gains (*“tide to lift all boats”*)

Detractors argue that it will

- 1 Promote de-facto segregation
- 2 Inconsistent with the provision of a public good

Economic theory is *ambiguous* in its predictions.

Need to empirically characterize what parents *value most*

Today's Talk

Present evidence from Arizona, the frontier for school choice

- 1 Focus on inter & intra district open enrollment
 - 1 Literature Review
 - 2 Case Study: Chandler Unified School District
- 2 Goal: Model selection between charters & districts
 - 1 Data Sets: Student Achievement Data (ADE) + District directory data
 - 2 SAISID Crosswalk
 - 3 Unlock entire enrollment history of student
 - 4 10 partner districts: urban, rural, large, small

Literature Review

Previous formal studies of AZ lack of data on student location.

- 1 Focus on reenrollment (e.g. Garcia, Dong)
- 2 Study movement between districts & charters *across school years* (Powers, et al.)

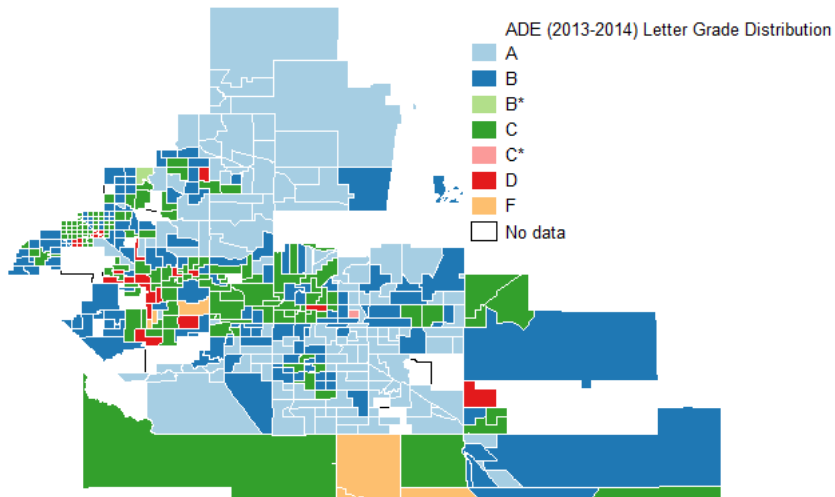
Major Findings

- 1 Reenrollment rates are stable across performance labels.
- 2 District to district movement generates the most foot traffic
- 3 Self segregation along demographic lines
- 4 Mobility patterns differ depending upon geography

Chandler Open Enrollment Data (2016-2017)

- 1 Grades represented: Pre K - 6th Grade
- 2 Self reported information:
 - 1 Grade of Child
 - 2 Residential Address
 - 3 Rank ordered list of schools (list up to two options)
- 3 Not reported:
 - 1 Socioeconomic status
 - 2 Ethnicity
 - 3 Previous Test Scores (if applicable)

Boundary Map



Method of Attack

- 1 Identify students' home schools/districts
 - 1 Geocode student addresses
 - 2 Stitch together boundary maps for districts
 - 3 Intersect
- 2 Identify features of all possible student-school pairs
 - 1 Interact student and school characteristics
 - 2 Example: Compute distance a student would have to travel to attend to all possible Chandler schools
- 3 Discrete choice model
 - 1 Recover the *relative weights* parents assign to different features by comparing *actual application choices* with foregone choices

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Who is applying?

Table 1: Grade/ District of Origin Breakdown

Grade Level (2016-2017 school year)	No		Out of District Yes		Total	
	No.	%	No.	%	No.	%
1st	151	9	133	13	284	11
2nd	115	7	107	10	222	8
3rd	131	8	84	8	215	8
4th	123	7	90	9	213	8
5th	88	5	94	9	182	7
6th	74	4	69	7	143	5
Kindergarten	936	57	474	45	1,410	52
Priority Preschool	28	2	3	0	31	1
Total	1,646	100	1,054	100	2,700	100

Source: Chandler OE Data; July 2016

Participation Rates by Boundary School Letter

Table 2: Residential Boundary School Letter Grade by District Affiliation

Boundary Letter	No		Out of District Yes		Total	
	No.	%	No.	%	No.	%
A	948	58	652	64	1,600	60
B	499	31	199	19	698	26
C	175	11	135	13	310	12
D	0	0	8	1	8	0
F	0	0	29	3	29	1
Total	1,622	100	1,023	100	2,645	100

Source: Chandler OE Data; July 2016

What did they choose?

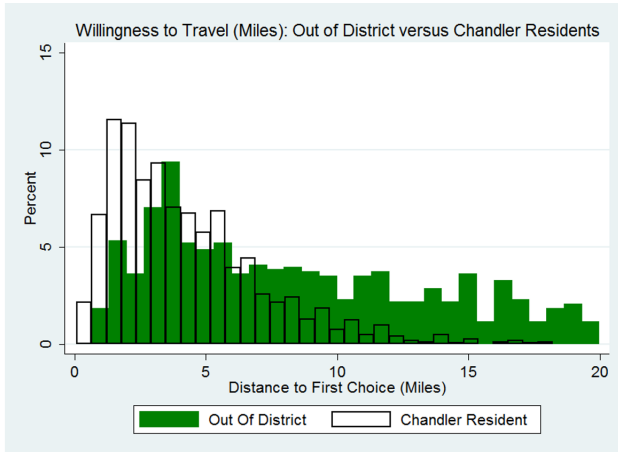
Table 3: Boundary School Letter Grade versus First Choice School's Letter Grade

Boundary Letter	First Choice Letter				Total
	A	B	C	NA	
A	1,252	97	15	233	1,597
B	476	130	51	41	698
C	189	73	24	23	309
D	2	1	0	5	8
F	27	2	0	0	29
Total	1,946	303	90	302	2,641

Source: Chandler OE Data; July 2016

Willingness to Travel

Figure 1: Distance to First Choice School



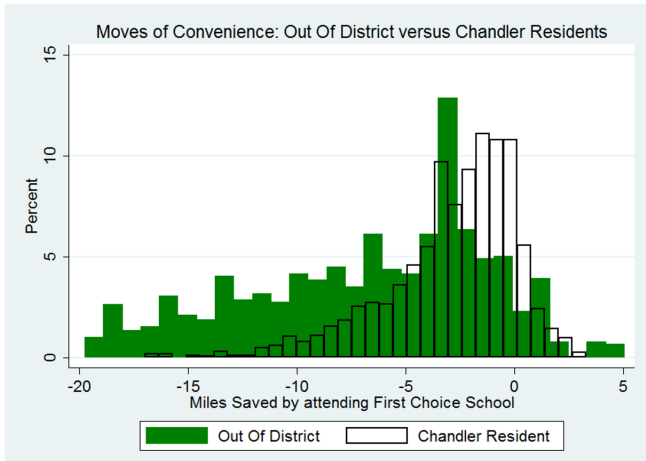
The Raw Numbers...

Table 4: Willingness to Travel by District of Origin

Out of District	mean	sd	p10	p25	p50	p75	p90
No	4.24308	2.952068	1.27515	2.014307	3.528001	5.656654	8.306449
Yes	10.87249	8.447482	2.789551	4.157023	8.681758	15.2497	22.76077
All Applications	6.812408	6.588768	1.529	2.557659	4.670764	8.551191	15.2497

Convenience of Commute

Figure 2: Convenience of Commute



Evaluating “Student - School Fit”

- 1 Parents pick schools on the basis of “best overall fit”
- 2 Parametrize fit between student i and school j

$$U_{ij} = \mathbf{z}_{ij}\theta + \epsilon_{ij}$$

- 3 z_{ij} capture *relative differences* between student i 's home boundary school and
 - 1 student i 's first choice Chandler School
 - 2 student i 's foregone Chandler options

How does it work?

- 1 Choice is not deterministic
- 2 Probability that student i picks school j is

$$\text{Prob}(Y_i = j) = \frac{\exp(\mathbf{x}'_{ij}\beta + w'_i\alpha)}{\sum_{j=1}^J \exp(\mathbf{x}'_{ij}\beta + w'_i\alpha)} = \frac{\exp(\mathbf{x}'_{ij}\beta) \exp(w'_i\alpha)}{\sum_{j=1}^J \exp(\mathbf{x}'_{ij}\beta) \exp(w'_i\alpha)}$$

- 3 MLE

$$\log L = \sum_{i=1}^n \sum_{j=1}^J 1_{\{Y_i=j\}} \log \text{Prob}(Y_i = j)$$

Variables Considered

Variable	Description
same letter	Apply for lateral move
move up letter	Apply to a higher ranked school
higher growth	Higher growth metrics
dist to alt	Distance Traveled from Home
more diversity hispanic	More ethnically diverse
smaller size	Smaller pupil/teacher ratio

Conditional Logit Results

$$OR = \frac{P(event|x + 1)/(1 - P(event|x + 1))}{P(event|x)/(1 - P(event|x))}$$

	Odds Ratio	StdError	Z	P value
same letter	1.8881696	.31381661	3.824321	.00013113
move up letter	1.7977057	.52740344	1.9991804	.04558884
higher growth	1.3380788	.10366495	3.7591802	.00017047
dist to alt	.75100214	.00600048	-35.838293	0
more diversity hispanic	.93337031	.07354924	-8.7504534	.38154924
smaller size	1.0373334	.08660386	.43903108	.66063902

- 1 Lateral moves more likely than upward moves
- 2 Each addl miles ↓ odds of applying by factor of .75
- 3 Parents care about growth, not passing rates

Caveats & Extensions to Future Research

- 1 Location matters! (Urban Core \neq Suburbs)
 - 1 Extend analysis to additional districts
 - 2 Incorporate enrollment data + student achievement data
 - 3 Merge geocoded data with census tract info
- 2 Model selection between charters & district
 - 1 SAISID + District Directory = Higher resolution of student mobility

Acknowledgements

- 1 Matt Strom (CUSD)
- 2 ADE Research Staff
- 3 David Garcia