Moving Matters: The Causal Effect of School Mobility on Student Performance

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Introduction

- Student mobility across U.S. schools is significant
  - GAO (2010): 95% of K-8th grade students change schools at least once before 9th grade; roughly 30% change schools 3+ times
- Conventional wisdom is that mobility hurts students' academic performance
- But research on the causal rather than correlational effects of mobility is scarce
- We aim to provide causal evidence on the impact of school mobility

- Early literature using cross sectional data finds a negative correlation between mobility and performance (Mehana and Reynolds, 2004)

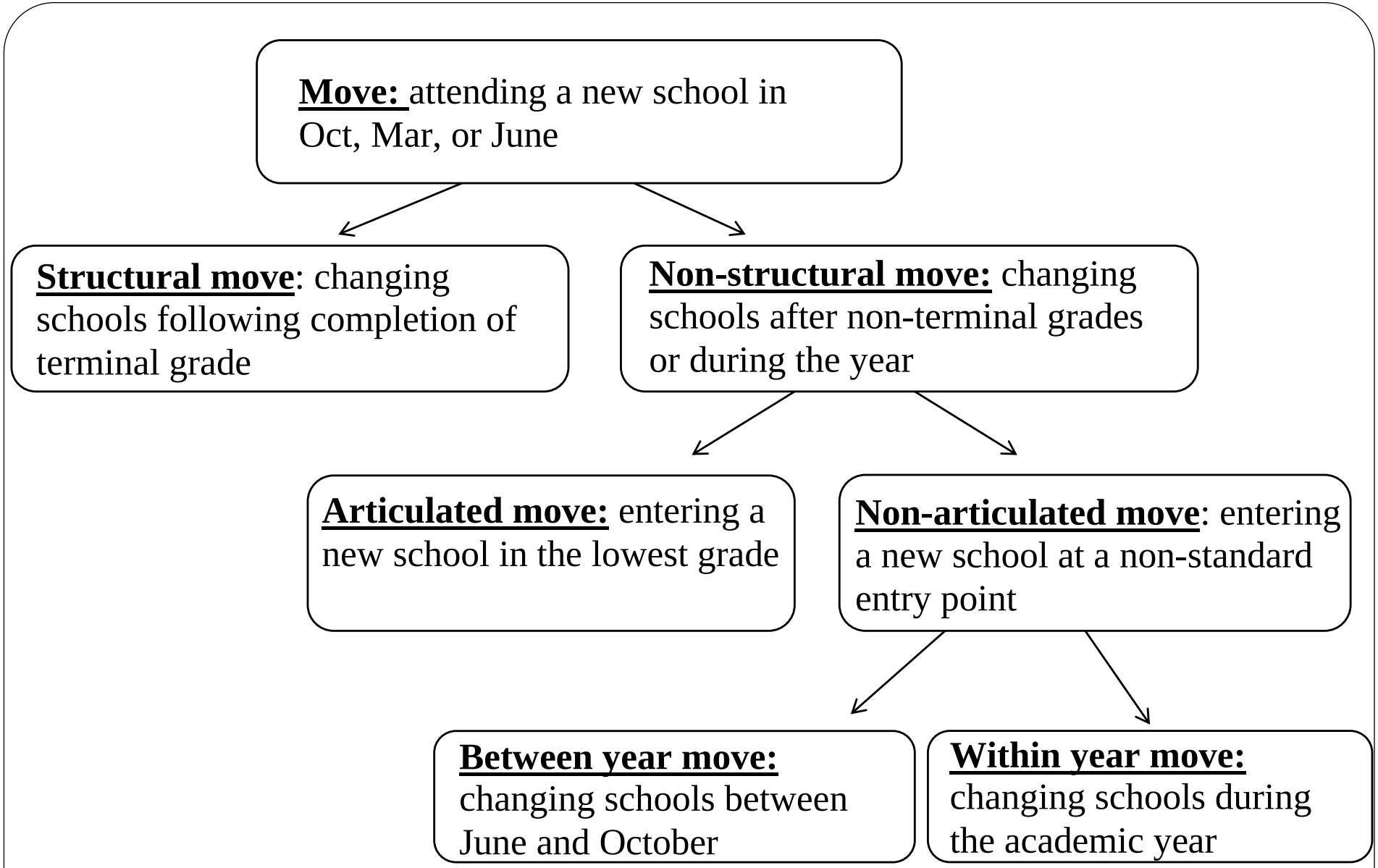
- More recent work uses longitudinal data with improved controls and, in one case, student FX (Alexander, Entwisle, and Dauber 1996; Temple and Reynolds 2000; Hanushek, Kain, and Rivkin 2004)

  - Typically focuses on *non-structural* moves
    - Non-structural: moves not related to "graduating" from school's terminal grade
  - Finds most moves have negative effects on performance, but some (to better schools) have positive effects

- Parallel literature (grade span) focuses on *structural* moves and consistently finds negative effects (Schwartz, Stiefel, Rubenstein, Zabel 2011; Rockoff and Lockwood 2010)

Three empirical challenges

- Movers are likely different than non-movers
  - Both in observable and unobservable characteristics
- Heterogeneity in the impact of mobility depending on timing of moves
  - Structural vs. non-structural
  - Articulated vs. non-articulated
  - Between-year vs. within-year
- Mobility is likely endogenous
  - Determined by student academic performance, among other things



Note: all structural moves and articulated moves are, by construction, made between academic years.

Project uses IESP microdata on NYC public school students, schools, and neighborhoods

- 5 cohorts of students in the 8th grade classes of 2005-2009 (limited to students making standard academic progress)
- 8 years of data per student: grades 1-8 (test data in grades 3-8)
- Roughly 37,000 students per SAP cohort
- Over 185,000 unique students in 1,100 different schools
- Almost 1 million student-year observations
  - Rich data on student demographics, ELA and Math test scores
  - Mobility measures are constructed using unique student identifiers and school codes in Oct., Mar., and Jun. between grades 1-8

Regression model

$$Y_{itg} = \alpha_i + \beta X_{itg} + \gamma M_{it} + \alpha_t + \alpha_g + \varepsilon_{it}$$

- Where
  - i indexes individual
  - t indexes time
  - g indexes grade
- Outcome variable Y_{itg} is ELA (Math) test score (z-score)
- Coefficient of interest is γ: impact of moving in year t
- Include controls for
  - Student specific characteristics: X_{itg}
  - Grade (α_g) and year (α_t) effects
  - Student fixed effects: α_i
- Alternate specifications include a measure of school quality

Motivating the identification strategy

- Parents choose to move child's schools if expected benefits of new school ≥ expected costs of moving
- Implies that mobility is shaped by schedule of structural moves (grade-spans)
- Parents likely consider both *prior* and *anticipated* moves
  - Time since last move
  - Time until next structural move
- School grade-span at 1st grade school should be a credible instrument for mobility

Figure 2b: Distribution of Structural Moves by Years from Baseline Terminal Grade

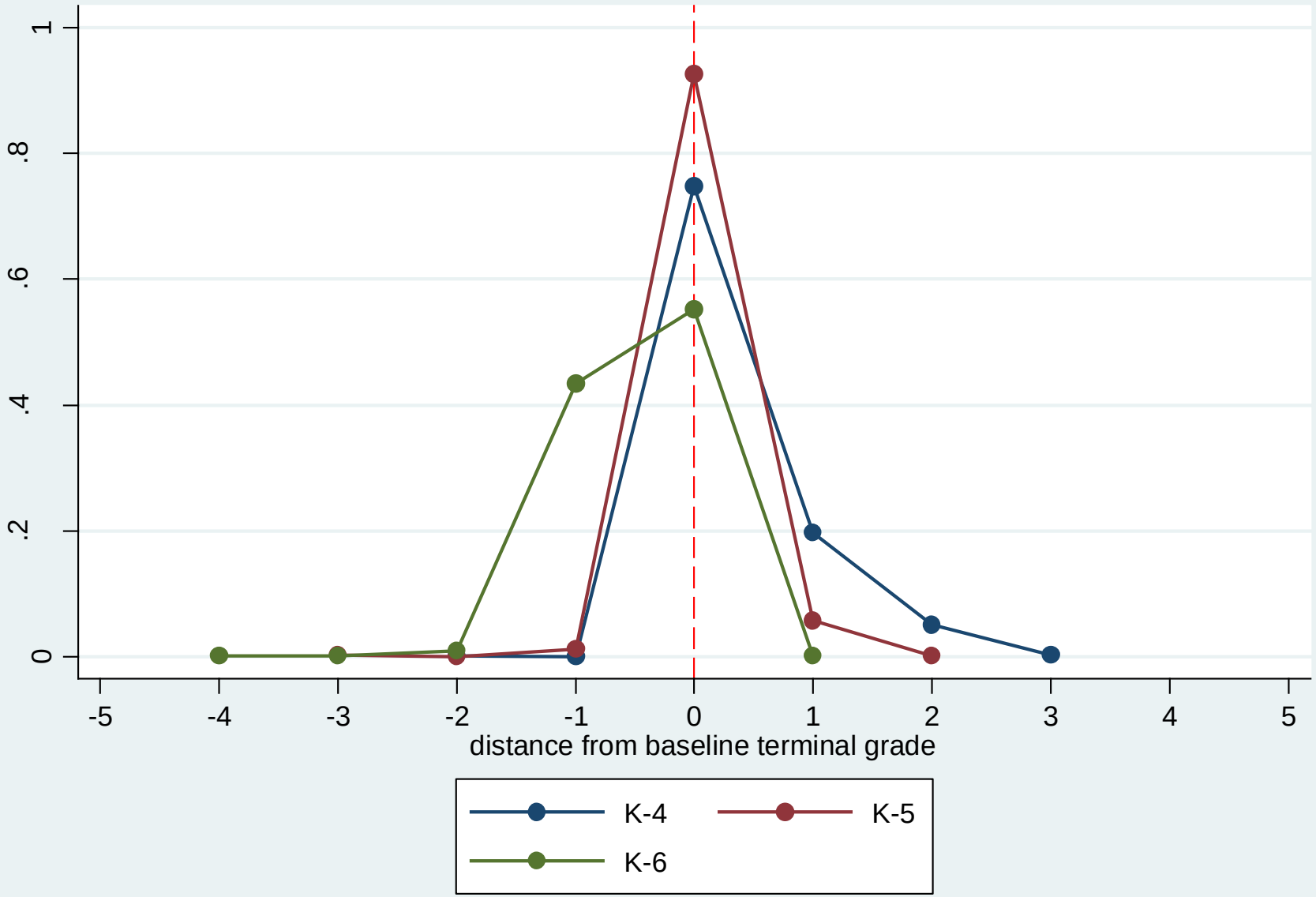
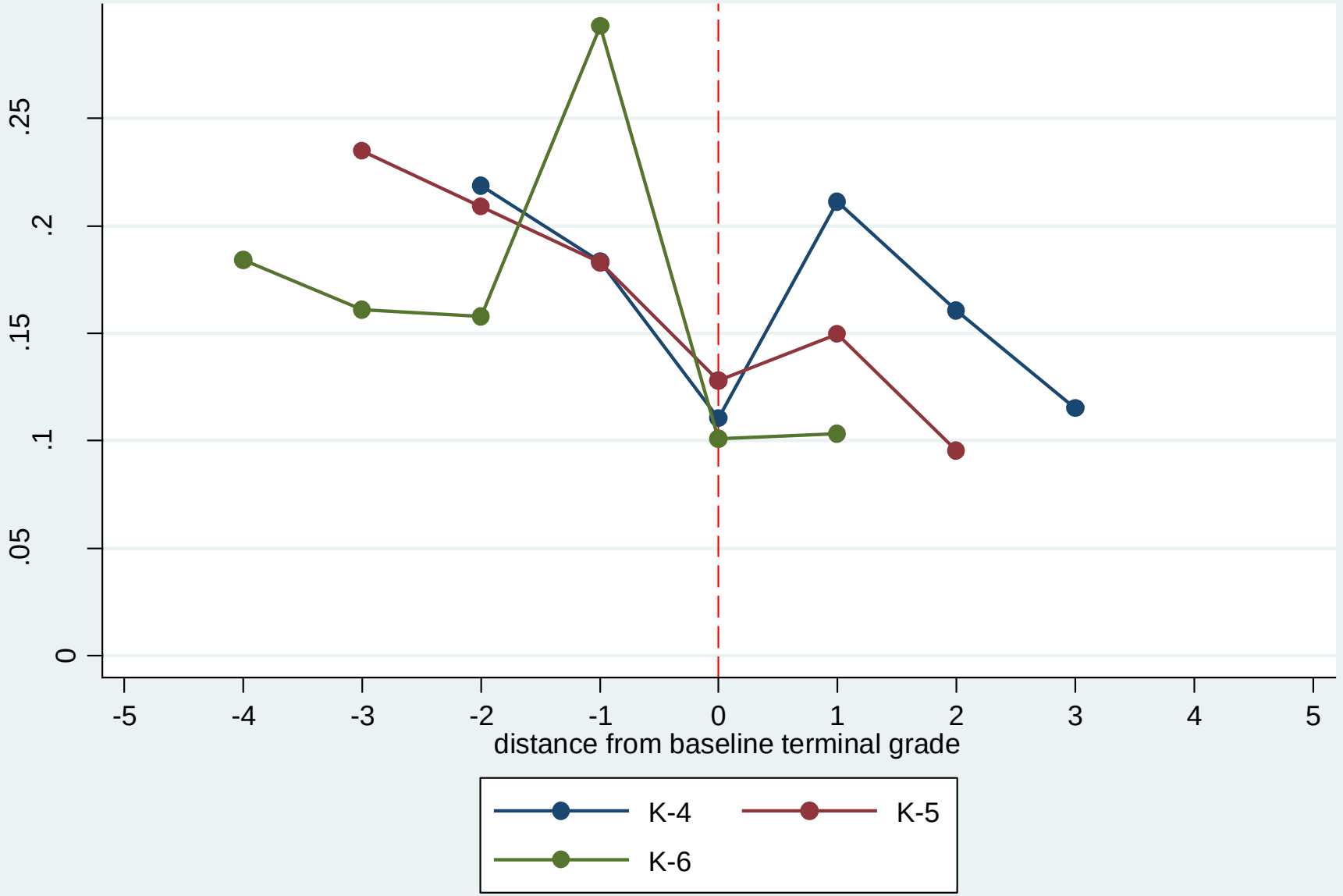


Figure 2c: Distribution of Non-structural Moves by Years from Baseline Terminal Grade



First stage results: structural move

Grade-span in 1st grade	4th grade	5th grade	6th grade	7th grade
K-4	-0.000	0.721***	0.031***	-0.014***
	(0.002)	(0.005)	(0.006)	(0.004)
K-5	-0.000	-0.004**	0.700***	-0.009***
	(0.001)	(0.002)	(0.003)	(0.002)
K-6	0.001	-0.006***	0.183***	0.373***
	(0.001)	(0.002)	(0.004)	(0.003)

The omitted categories are K-8 and 8th grade.

First stage results: non-structural move

Grade-span in 1st grade	4th grade	5th grade	6th grade	7th grade
K-4	-0.003	-0.045***	-0.165***	0.006
	(0.005)	(0.005)	(0.006)	(0.005)
K-5	0.007**	-0.009***	-0.200***	0.003
	(0.003)	(0.003)	(0.004)	(0.003)
K-6	-0.005	-0.013***	-0.111***	-0.018***
	(0.004)	(0.004)	(0.005)	(0.003)

The omitted categories are K-8 and 8th grade.

Moving negatively affects performance

Table A: Baseline regression models, ELA exam

	(1)	(2)	(3)	(4)
All moves	-0.107***	-0.041***	-0.061***	-0.042***
	(0.002)	(0.001)	(0.004)	(0.004)
Student characteristics	N	Y	Y	Y
Student FX	N	Y	Y	Y
IV	N	N	Y	Y
School quality	N	N	N	Y
Observations	1,092,491	1,092,491	1,092,488	1,092,488
Unique students			185,196	185,196
R-squared	0.028	0.744	---	---

Impact of structural and non-structural moves differs

Table B: Structural and non-structural moves, ELA exam

	(1)
Structural move	-0.014***
	(0.005)
Non-structural move	0.191***
	(0.033)
Student characteristics	Y
Student FX	Y
IV	Y
School quality	Y
Observations	1,092,488
Unique students	185,196

Timing matters; articulation matters

Table C: Structural, articulated, and non-articulated moves, ELA exam

	(1)
Structural	-0.030***
	(0.009)
Articulated	0.186***
	(0.035)
Non-artic between-year	-0.212
	(0.143)
Non-artic within-year	-0.048***
	(0.016)
Student characteristics	Y
Student FX	Y
IV	Y
School quality	Y
Observations	1,092,488
Unique students	185,196

Results show:

- Short-term impact of structural moves is negative and relatively small (~0.03)
- Impact of non-structural moves is larger…sign depends upon timing and articulation
  - Articulated moves have positive effects
  - Non-articulated moves have negative effects
- Longer-term effects (not shown) of structural moves are dampened; impacts of non-structural moves again depends on articulation

Summary and conclusions

- We estimate credibly causal effects of mobility on student performance
  - Addressing differences between movers and non-movers, heterogeneity of impacts, and endogeneity of moves
- Persistent negative effects of structural moves "built in" to the school structure
- Also negative effects of non-articulated between or within year moves
- Articulated moves, however, have positive effects

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More tables...

Table 2: Cumulative number of structural and non-structural moves wih row percentages

		total # non-structural moves				
		0	1	2	3 +	Total
total # structural moves	0	8,298 *28.2%*	13,250 *45.1%*	4,751 *16.2%*	3,082 *10.5%*	29,381 *100.0%*
	1	101,039 *67.7%*	30,885 *20.7%*	10,001 *6.7%*	7,229 *4.9%*	149,154 *100.0%*
	2+	4,225 *63.4%*	1,522 *22.8%*	559 *8.4%*	359 *5.4%*	6,665 *100.0%*
	Total	113,562 *61.3%*	45,657 *24.7%*	15,311 *8.3%*	10,670 *5.8%*	185,200 *100%*

Notes: cells include the frequency and row percentage.

First stage results: structural move

Grade-span in 1st grade	3rd grade	4th grade	5th grade	6th grade	7th grade
K-1	0.037***	0.012**	0.213***	0.382***	0.067***
	(0.007)	(0.005)	(0.014)	(0.017)	(0.011)
K-2	0.806***	0.004	0.020***	0.331***	0.230***
	(0.006)	(0.003)	(0.004)	(0.009)	(0.008)
K-3	0.018***	0.474***	0.188***	0.345***	0.143***
	(0.005)	(0.012)	(0.011)	(0.012)	(0.011)
K-4	0.000	-0.000	0.721***	0.031***	-0.014***
	(0.002)	(0.002)	(0.005)	(0.006)	(0.004)
K-5	0.001	-0.000	-0.004**	0.700***	-0.009***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)
K-6	0.001	0.001	-0.006***	0.183***	0.373***
	(0.001)	(0.001)	(0.002)	(0.004)	(0.003)
K-7	0.002	0.001	-0.003	0.010	0.069***
	(0.004)	(0.004)	(0.005)	(0.011)	(0.010)

The omitted categories are K-8 and 8th grade.

First stage results: non-structural move

Grade-span in 1st grade	3rd grade	4th grade	5th grade	6th grade	7th grade
K-1	-0.003	0.004	-0.027**	-0.182***	0.007
	(0.012)	(0.012)	(0.011)	(0.012)	(0.011)
K-2	-0.039***	0.030***	-0.011	-0.162***	-0.011*
	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)
K-3	0.004	-0.002	0.004	-0.171***	0.005
	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)
K-4	0.010*	-0.003	-0.045***	-0.165***	0.006
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
K-5	0.008**	0.007**	-0.009***	-0.200***	0.003
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
K-6	0.000	-0.005	-0.013***	-0.111***	-0.018***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.003)
K-7	0.005	0.042***	-0.020**	0.023	0.035***
	(0.011)	(0.011)	(0.010)	(0.015)	(0.011)

The omitted categories are K-8 and 8th grade.

Table 7: Long run impacts, OLS and IV results, ELA exam

	(1)	(2)	(3)
Panel A: A year later			
Structural move	-0.012***	0.010**	0.013**
	(0.002)	(0.005)	(0.005)
Non-structural move	-0.010***	0.142***	0.130***
	(0.002)	(0.032)	(0.034)
Grade, boro, year effects	Y	Y	Y
Student characteristics	Y	Y	Y
Student FX	Y	Y	Y
IV	N	Y	Y
School quality	N	N	Y
Observations	915,500	915,496	915,496
Unique students		185,195	185,195
R-squared	0.763	---	---

Table 7: Long run impacts, OLS and IV results, ELA exam

	(1)	(2)	(3)	(4)
Panel B: Long change				
Total # moves	-0.071***			
	(0.008)			
Total # structural moves		-0.060***	-0.008	-0.011
		(0.008)	(0.012)	(0.012)
Total # non-structural moves		0.109***		
		(0.025)		
Total # non-struct articulated			0.433***	0.253***
			(0.062)	(0.058)
Total # non-struct non-artic			-0.315***	-0.228***
			(0.078)	(0.078)
Boro and year effects	Y	Y	Y	Y
Student characteristics	Y	Y	Y	Y
3rd grade test scores	Y	Y	Y	Y
IV	Y	Y	Y	Y
School quality	N	N	N	Y
Observations	183,744	183,744	183,744	183,744
R-squared	0.435	0.422	0.342	0.408

Table A: Baseline regression models, math exam

	(1)	(2)	(3)	(4)
All moves	-0.133***	-0.058***	-0.077***	-0.035***
	(0.002)	(0.001)	(0.003)	(0.003)
Student characteristics	N	Y	Y	Y
Student FX	N	Y	Y	Y
IV	N	N	Y	Y
School quality	N	N	N	Y
Observations	1,102,440	1,102,440	1,102,440	1,102,440
Unique students	185,200	185,200	185,200	185,200
R-squared	0.033	0.771	---	---

Table B: Structural and non-structural moves, math exam

	(1)
Structural move	-0.001
	(0.005)
Non-structural move	0.260***
	(0.030)
Student characteristics	Y
Student FX	Y
IV	Y
School quality	Y
Observations	1,102,440
Unique students	185,200

Table C: Structural, articulated, and non-articulated moves, math exam

	(1)
Structural	-0.013*
	(0.007)
Articulated	0.271***
	(0.030)
Non-artic between-year	-0.131
	(0.117)
Non-artic within-year	-0.069***
	(0.013)
Student characteristics	Y
Student FX	Y
IV	Y
School quality	Y
Observations	1,102,440
Unique students	185,200

Appendix Table X: Long run impacts, OLS and IV results, math exam

	(1)	(2)	(3)	(4)
Panel A: A year later				
Structural move	-0.018***	-0.003	0.008*	
	(0.002)	(0.004)	(0.005)	
Non-structural move	-0.012***	0.173***	0.167***	
	(0.002)	(0.028)	(0.029)	
Grade, boro, year effects	Y	Y	Y	
Student characteristics	Y	Y	Y	
Student FX	Y	Y	Y	
IV	N	Y	Y	
School quality	N	N	Y	
Observations	920,505	920,504	920,504	
Unique students		185,199	185,199	
R-squared	0.797	---	---	
Panel B: Long change				
Total # moves	-0.098***			
	(0.008)			
Total # structural moves		-0.089***	0.010	0.010
		(0.008)	(0.016)	(0.013)
Total # non-structural moves		0.048**		
		(0.024)		
Total # non-struct articulated			0.666***	0.417***
			(0.079)	(0.064)
Total # non-struct non-artic			-0.748***	-0.464***
			(0.102)	(0.087)
Boro and year effects	Y	Y	Y	Y
Student characteristics	Y	Y	Y	Y