The Effects of Public Prekindergarten for 3-Year-Olds on Early Elementary School Enrollment

Evidence from the DC Centralized Lottery

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Evidence from the DC Centralized Lottery

Breno Braga, Justin B. Doromal, Erica Greenberg, Tomás Monarrez, Leonardo Restrepo, & Rachel Lamb

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Motivation

- Universal public Pre-K programs are becoming popular

  - 6 states & DC offer universal public Pre-K

    - Mostly focused on 4-year-olds

- DC is the exception offering Pre-K for 3-year-olds (Pre-K3)

  - Serves about 69% of District 3-year-old population (NIEER, 2023)

- Little is known about its effect of Pre-K3 on students

  - This project aims to fill this gap

Motivation

- Declines in K-12 public school enrollment exacerbated during the pandemic

  - More than 1.2 million students drop from public schools

- Enrollment losses are prominent in kindergarten (Goldstein and Parlapiano, 2021)

  - Increase in homeschooling explains part of the decline (Dee 2023)

  - Questions about the quality of these alternative learning environments and resulting financial and operational challenges for school districts

- Can universal public pre-K offer a solution?

Primary Research Questions

- Are school-based Pre-K3 students more likely to:

  - enroll in a public kindergarten program?

  - persist in the public school system?

  - be assigned special education status in kindergarten?

  - switch public schools?

  - be retained in a grade?

Secondary Research Questions

- Do students furthest from opportunity benefit the most from Pre-K3?

  - Residents of communities of color and lower-income communities

- Which program models are the most effective?

  - Dual language and Montessori

How do we answer these questions?

1. Leverage the DC centralized admissions lottery for public Pre-K3

   • Mimics an RCT for some students

2. Restrict sample to PK-3 applicants whose lottery draw determines a match

   • About 24% of all applicants

3. Compare later outcomes of students with the same probability of a match

DC Public Pre-K

DC Pre-K3

- Academic year schedule & 5 days a week & 6.5 hours per day

- Most programs offer before and after care

- Ongoing professional development and pay parity for teachers

- 14 authorized curricula aligned with DC's comprehensive Early Learning Standards

- In 2021-22, DC spent $20,442 per child enrolled—the highest in the nation (NIEER, 2023)

DC Pre-K3

- Mixed-delivery system with 3 sectors

1. DCPS
   - Teachers require at least a BA
   - Max class size is 16
   - Undergoing curriculum reforms

2. Public Charter Schools
   - Operators choose their own program and standards

Participate in the My School DC lottery; included in treatment group

3. CBOs
   - Operators generally follow DCPS standards and use a variety of curricula

Do not participate in the My School DC lottery; included in control group

My School DC Lottery for Pre-K3

- All 3-year-old DC residents are eligible and about 75% apply (Greenberg, 2021)

  - Applicants rank up to 12 programs

  - Programs can give admission preferences based on several factors, including

    - In-boundary residence (DCPS)

    - Siblings

    - Transfers & children of staff

  - Fill slots using deferred acceptance algorithm

    - Lottery number break ties

  - From 2014-17, about 87% of applicants are matched to a program & 79% enroll

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Data

My School DC Lottery data

- All 2014 to 2017 applications to DC public Pre-K3 Programs

  - Students' unique student identifier and application id

  - Ranked choice, school priority and random lottery draw

  - Gender, Home address, and language of application (Spanish or English)

  - Whether student was matched to a program or waitlisted

DC Public School Enrollment data

- 2014 to 2019 students enrolled in DC public schools – before the pandemic

  - Students' unique student identifier

  - Grade of enrollment and school

    - PK3 and later grades

  - Special education status

2010 U.S. Census data

- Census block characteristics

  - Median Income

    - Lower income neighborhoods

  - Racial and ethnic composition

    - Communities of color

      - More than 50% of residents are of color

Method

Deferred Acceptance Propensity Score

- Applicants with the same ranked list & priority status → same chance of a match

    - Depends solely on their lottery draw

- Abdulkadiroğlu et al. (Econometrica 2017): estimate the probability of each student obtaining a match ($PScore$)

    - Based on all students' rankings and priority statuses

    - Applicants with the same ranked list & priority status → same chance $PScore$

- Comparing students with the same $PScore$ is as good as random assignment

Estimation Method

- Restrict sample to applicants whose lottery draw could determine a match

$$0 < PScore < 1$$

- Instrumental Variable to recover TOT

  - First Stage

$$Enroll_i = \alpha Matched_i + PScore_i + X_i + e_i$$

  - Second Stage

$$Y_i = \beta \widehat{Enrolled}_i + PScore_i + X_i + u_i$$

Comparing All Applicants with the Evaluation Sample

Evaluation sample includes treatment and control groups

	All Applicants	Evaluation Sample
Applicant Characteristics		
# Programs Ranked	5.53	6.14
Spanish Applications	4.5%	5.3%
Female	49.4%	48.8%
Census Block Average Characteristics		
Median HH Income ($)	81,152	106,938
Education		
HS or Less	35.5%	24.4%
Some College & Bachelor	40.4%	40.8%
Graduate	24.1%	34.8%
Race & Ethnicity		
Asian	2.6%	4.0%
Black	57.4%	37.1%
Hispanic	11.0%	13.2%
Multiracial	3.8%	4.5%
White	24.4%	40.5%
PK3 Enrollment		
DC Public School	78.5%	63.1%
# Applicants	19,528	4,683

Primary Outcome Definitions

Available for all Pre-K3 lottery applicants

- Kindergarten enrollment in the DC Public system

    - Indicator for whether student is enrolled in kindergarten in a public school in DC

- Persistence in the DC Public system

    - Indicator for whether student was enrolled in a school-based PK4 previous year & enrolled in KG in the current year

Secondary Outcome Definitions

- Special Education

  - Indicator for special education status

- Moved to a new DC Public School

  - Indicator for whether student is at a new DC public school in KG in relation to their school previous year

- Retained in kindergarten

  - Indicator for whether KG student was enrolled in KG in a previous year (following OSSE)

Available for Pre-K3 lottery applicants who later enroll in KG in a public school in DC

Results

The Effects of Pre-K3 Enrollment on Kindergarten Outcomes

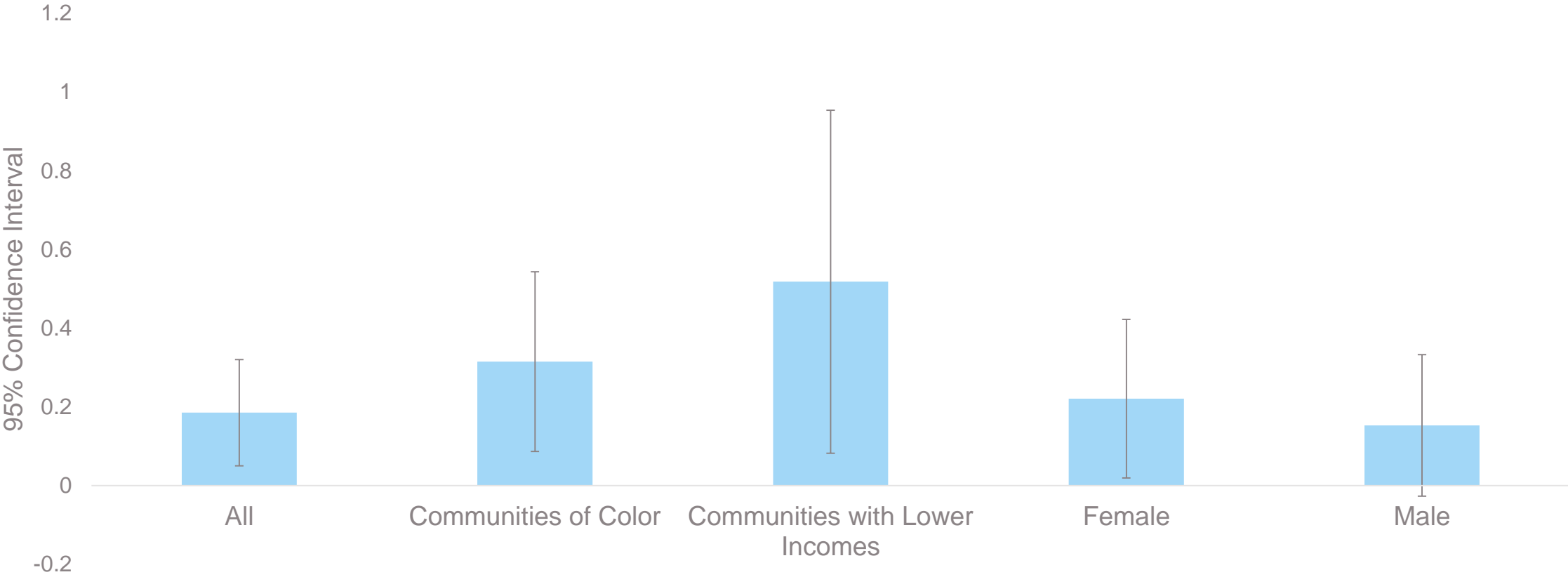# Pre-K3 increases KG Enrollment and Persistence in DC System

Dependent Variable	Kindergarten enrollment in the DC Public system	Persistence in the DC Public system
Enrolled in a DC Public School PK3 Program	0.185	0.372
	[0.069]***	[0.068]***
Year FE & Covariates	Yes	Yes
DA formula P-score X Year Effects	Yes	Yes
Observations	4,683	4,683
Dep var mean	0.717	0.644
Kleibergen-Paap F-statistic	170.4	170.4

# Pre-K3 Decreases School Mobility & Increases KG Special Education

Dependent Variable	Kindergarten Special Education	Moved to a New DC Public School	Retained in Grade	Ever Retained
Enrolled in a DC Public School PK3 Program	0.104	-0.199	-0.026	0.04
	[0.059]*	[0.087]**	[0.021]	[0.047]
Year FE & Covariates	Yes	Yes	Yes	Yes
DA formula P-score X Year Effects	Yes	Yes	Yes	Yes
Observations	3,360	3,360	3,360	3,360
Dep var mean	0.090	0.234	0.009	0.050
Kleibergen-Paap F-statistic	128.4	128.4	128.4	128.4

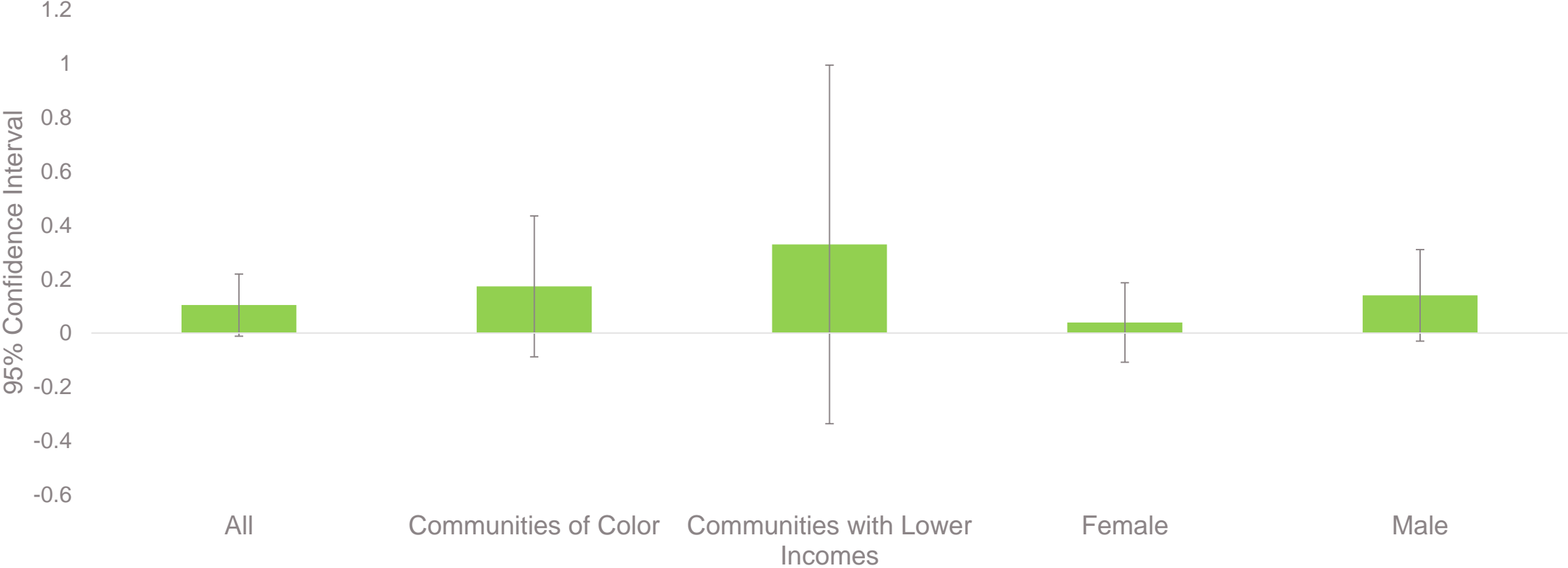# Which Groups Benefit the Most from Pre-K3?

Effect of Pre-K3 on Kindergarten Enrollment in the DC Public System

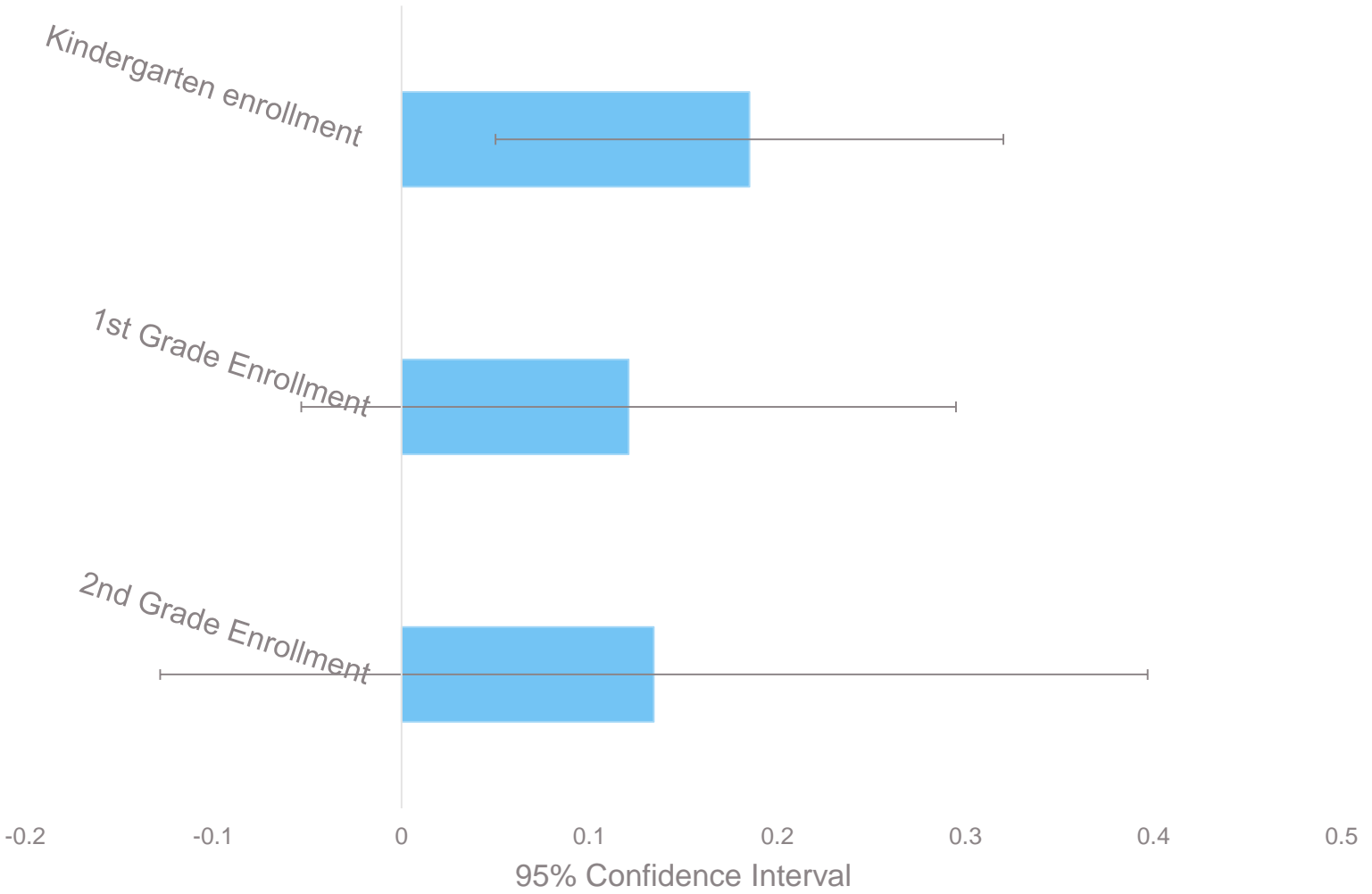# Effect of Pre-K3 on Persistence in the DC Public System
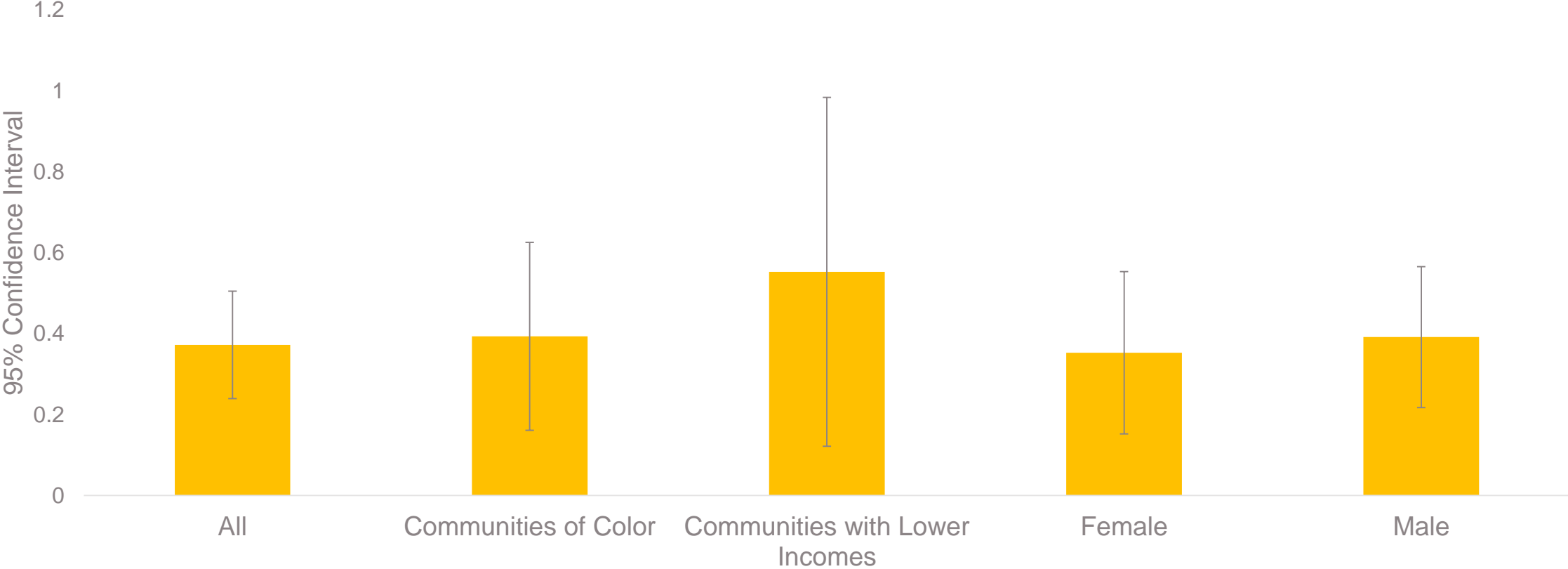
Effect of Pre-K3 on Kindergarten Special Education Status

Do Enrollment Effects Persist after Kindergarten?

Effect of Pre-K3 on Later Enrollment in a DC Public System

95% Confidence Interval

The Effect of Dual Language Pre-K3 on Kindergarten Outcomes

Pre-K3 Dual Language Enrollment increases Persistence in DC System

Dependent Variable	Kindergarten enrollment in the DC Public system	Persistence in the DC Public system
Enrollment in DC Pre-K3 DLP Program	0.005	0.114
	[0.049]	[0.051]**
Year FE & Covariates	Yes	Yes
DA formula P-score X Year Effects	Yes	Yes
Observations	3,125	3,125
Dep var mean	0.752	0.686
Kleibergen-Paap F-statistic	329.3	329.3

Pre-K3 Dual Language Enrollment Decreases School Mobility

Dependent Variable	Kindergarten Special Education	Moved to a new DC Public School	Retained in grade	Ever retained
Enrollment in DC Pre-K3 DLP Program	-0.022	-0.251	-0.010	0.009
	[0.032]	[0.043]***	[0.006]*	[0.020]
Year FE & Covariates	Yes	Yes	Yes	Yes
DA formula P-score X Year Effects	Yes	Yes	Yes	Yes
Observations	2,350	2,350	2,350	2,350
Dep var mean	0.085	0.236	0.006	0.042
Kleibergen-Paap F-statistic	391.6	391.6	391.6	391.6

The Effect of Montessori Pre-K3 on Kindergarten Outcomes

No Effect of Pre-K3 Montessori on KG Enrollment & Persistence in DC System

Dependent Variable	Kindergarten enrollment in the DC Public system	Persistence in the DC Public system
Enrollment in DC Pre-K3 Montessori Program	0.003	0.063
	[0.049]	[0.050]
Year FE & Covariates	Yes	Yes
DA formula P-score X Year Effects	Yes	Yes
Observations	2,236	2,236
Dep var mean	0.726	0.673
Kleibergen-Paap F-statistic	396.9	396.9

No Effect of Pre-K3 Montessori on Other KG Outcomes

Dependent Variable	Kindergarten Special Education	Moved to a new DC Public School	Retained in Grade	Ever Retained
Enrollment in DC Pre-K3 Montessori Program	0.035	-0.044	-0.006	0.036
	[0.034]	[0.050]	[0.012]	[0.026]
Year FE & Covariates	Yes	Yes	Yes	Yes
DA formula P-score X Year Effects	Yes	Yes	Yes	Yes
Observations	1,624	1,624	1,624	1,624
Dep var mean	0.086	0.246	0.011	0.039
Kleibergen-Paap F-statistic	373.3	373.3	373.3	373.3

Conclusions

Conclusion

- Students enrolled in a DC public Pre-K3 are more likely to persist in the DC public system

    - The are also less likely to switch schools

- Evidence that persistence effects are stronger for students furthest from opportunity

    - Residents of communities with lower incomes and communities of color

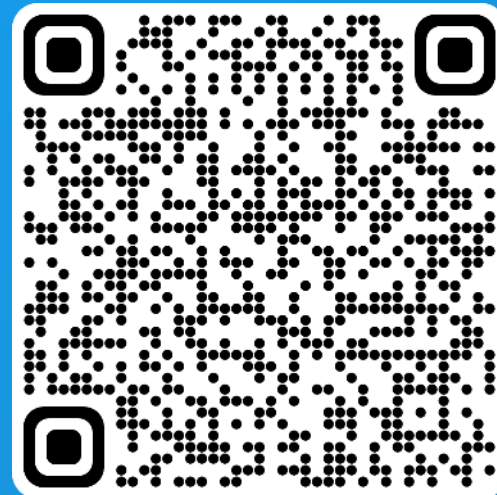- Dual language Pre-K3 students are more likely to persist in the system & stay in the same school

Are these findings positive, and for whom?

- School mobility increases the risk of poor achievement, behavior problems, and grade retention (Reynolds, Chen, and Herbers, 2009; Schwartz, Stiefel, and Cordes, 2017)

- Early educational stability facilitates secure attachment and the development of foundational academic and social skills (Sandstrom and Huerta, 2013)

- Questions about quality of alternative learning environments outside the public system
    - Homeschooling and private sector

- Financial health of families facing rising costs and school districts grappling with a decline in enrollment

Thank You!

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For more information, see our project homepage

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