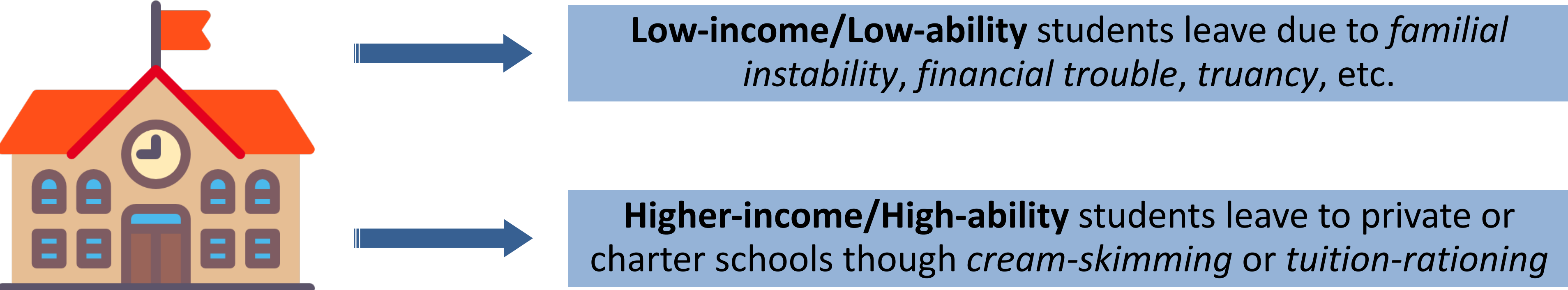


Peer Effects & Differential Attrition: Evidence from Tennessee's Project STAR

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Introduction


The presence of a **highly engaged peer** in early education may have a lasting impact on a student’s achievement, *even if* said peer were to move or leave **after just one year of school**. If certain peers are provided a channel to depart the public school system, **it may have an adverse effect on the students they leave behind**. An understanding of **which students are likely to leave public schools** in addition to measuring the **potential effects of such students' departures** may provide researchers with a better understanding of the drivers of educational attainment.




Project STAR

Project STAR was a **class-size randomization experiment** across grades K-3 in Tennessee between 1985-1989. 11,600 students across 79 schools voluntarily participated in the study. Students and teachers were randomized into one of the three following class types at the beginning of the 1985 school year:


Small Classes (13—17 students)

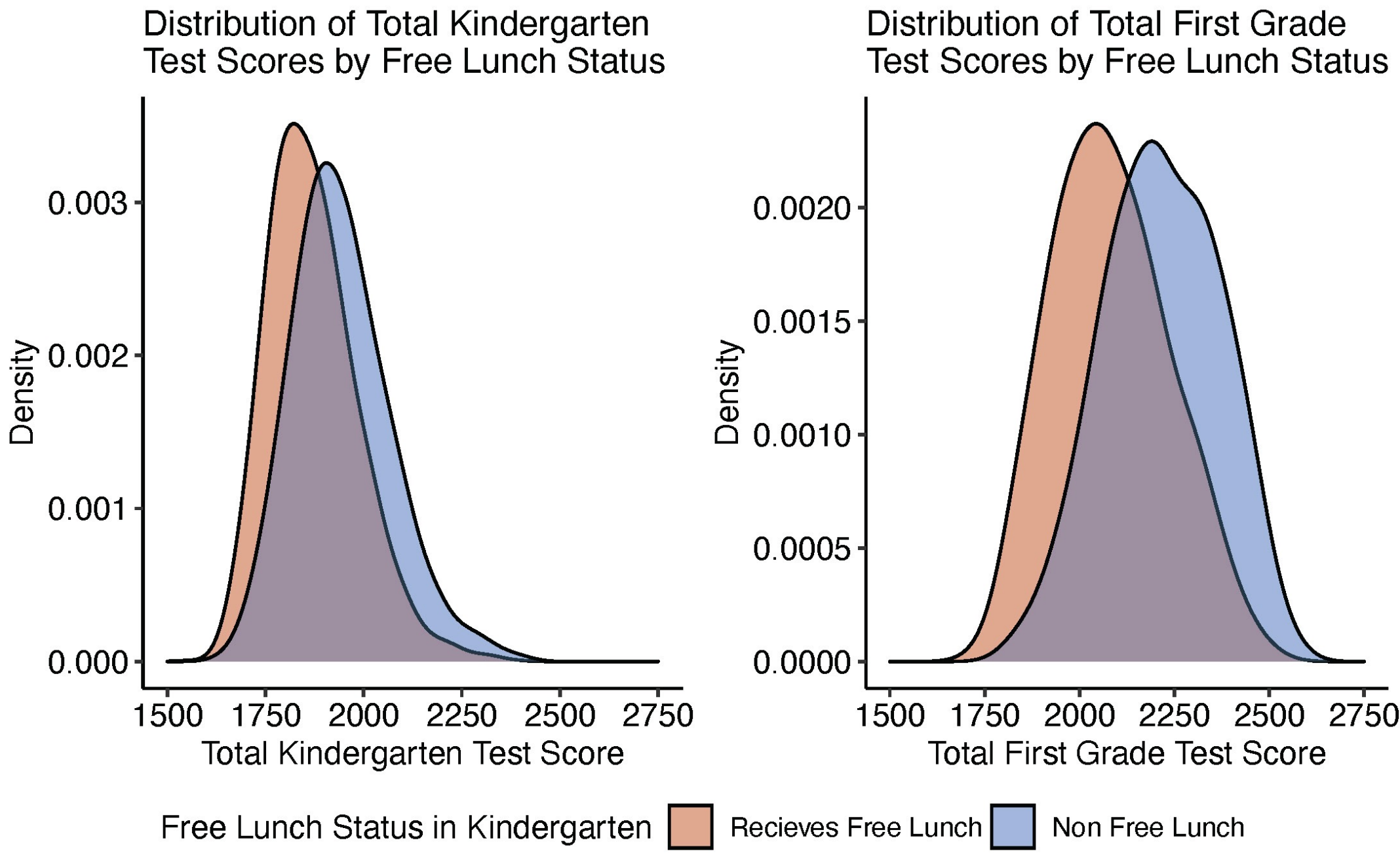


Regular Classes (22—25 students)



Regular Classes w/ Aide





There exists a **positive** relationship between a student’s **income** and **ability** in STAR and this relationship persists **throughout** the experiment.

The Effects of Attrition

	Dependent Variable: Total 1st Grade Test Score			
	(1)	(2)	(3)	(4)
Total Kindergarten Test Score	0.905*** (0.024)	0.897*** (0.024)	0.889*** (0.023)	0.880*** (0.022)
Proportion of Departed Peers in Kindergarten Class	12.934 (8.243)	6.955 (7.397)		0.483 (0.330)
Mean Test Score of Departed Peers in Kindergarten Class	-0.074 (0.199)	-0.118 (0.090)	-0.131*** (0.041)	
Mean Test Score of Non-Departed Peers in Kindergarten Class	-0.287*** (0.083)	-0.314*** (0.070)	-0.359*** (0.066)	-0.470*** (0.056)
Not Free Lunch	39.369*** (6.950)	39.962*** (6.194)	40.000*** (5.802)	39.962*** (6.194)
Mean ± SD of Response	2159 ± 170	2159 ± 170	2159 ± 169	2159 ± 170
Controls	Yes	Yes	Yes	Yes
School Fixed Effects	No	Yes	Yes	Yes
Observations	2,228	2250	2481	2710
R ²	0.606	0.674	0.662	0.663

Note: *p<0.1; **p<0.05; ***p<0.01

Utilizing a peer-effects model, I estimate **own 1st grade test scores** as a function of **own kindergarten test scores**, the **proportion of departed peers**, the **leave-one-out mean test score of non-departed peers**, the **mean test score of departed peers**, and controls at the kindergarten-class level. Although I find potential evidence of bias in these estimates, I identify a **positive** relationship between own and peer outcomes. It seems that the total effect of peer background on own achievement is a **combination** of the effect of **lagged own achievement**, **lagged peer achievement**, and **departed peer achievement**.

Who Leaves?

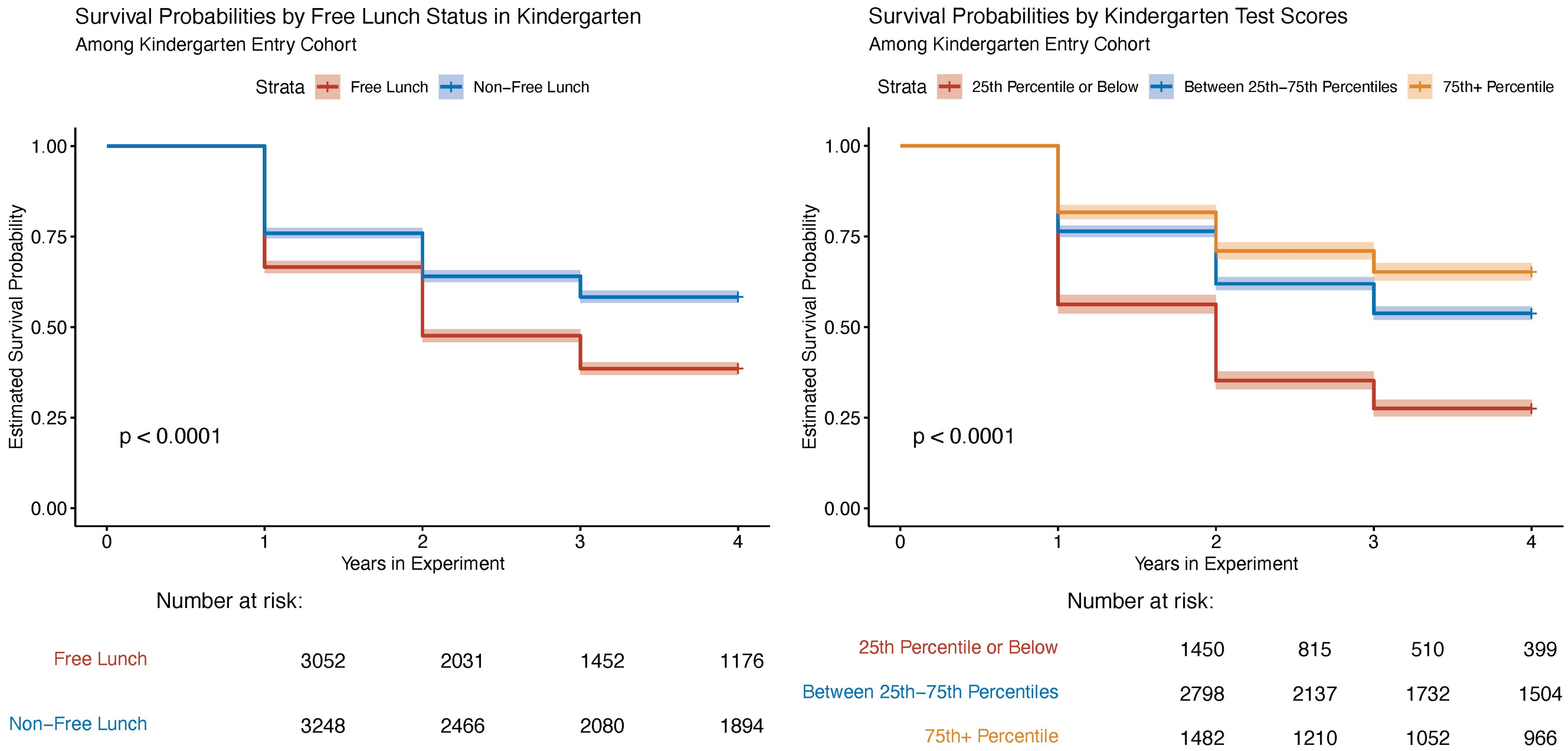
To quantify the effect of student ability on attrition, I turn to **survival analysis**. Survival analysis allows for the identification of factors which may be correlated with the amount of time a student stayed in the experiment. The following AFT model estimates survival time as a function of **test scores**, **income**, **class-size**, and **controls**:

$$\log(T_i) = \beta_0 + \beta_1(TS_{i,g,c,s}) + \beta_2(CT_{i,g,c,s}) + \beta_3(FL_{i,g,c,s}) + \beta_4(X_{i,g,c,s}) + \epsilon_{i,g,c,s}$$

	Dependent Variable: Years Until First Exit	
	All Students in Kindergarten-Cohort (1)	Students Who Stayed Past 1st Grade (2)
Non-Free Lunch	0.287*** (0.037)	0.249*** (0.035)
1st Grade Test Score Between 25th-75th Percentile	0.506*** (0.034)	0.307*** (0.032)
1st Grade Test Score Above 75th Percentile	0.741*** (0.045)	0.482 (0.044)
Not Special Education	-0.022 (0.080)	-0.020 (0.080)
Not Pulled Out for Special Instruction	0.189*** (0.067)	0.150** (0.063)
Controls	Yes	Yes
Parametric Form	Weibull	Weibull
Observations	5,354	4,077

Note: *p<0.1; **p<0.05; ***p<0.01

In general, **low-income** and **low-ability** students are *more likely* to exit the public school system than their counterparts. The presence of this channel begins to **diminish** as the experiment went on. Differential attrition based on class size seems to not be significant after controlling for income. There exists **strong evidence** that attrition of **low-income** and often **low-ability** students was the dominant channel of attrition in Project STAR, though attrition of **high-income** and often **high-ability** students was also present.



Given that I am unable to directly track where students went after leaving Project STAR, I estimate the groupings of departed students utilizing **clustering**. I employ a novel clustering method for both categorical and numerical variables using the **Gower Distance**:

$$d(i,j) = \frac{1}{p} \sum_{i=1}^p \frac{|x_{if} - x_{jf}|}{R_f}$$

- Through this analysis, I find evidence of two pathways for departure:
- (1)

A pathway of attrition among **high-income** and/or **higher-ability** students
- (2)

A pathway of attrition among **low-income** and/or **lower-ability** students (**the dominant pathway**)