

Hong, G., & Raudenbush, S. W. (in press). Evaluating kindergarten retention policy: A case study of causal inference for multi-level observational data. *Journal of the American Statistical Association*.

## Specification of the Propensity Models

### Covariates included in the model for $Q$ :

#### School-level covariates

1. School aggregate of Spring, K teacher rating of child's science/social studies skills
2. Proportion of Hispanic children in school
3. Kindergarten assignment based on children's preschool experience
4. School aggregate of Spring, K teacher report on frequency of borrowing books from library
5. Number of kindergarten children with disabilities in Spring, K
6. Spring, K school computers with LAN access
7. Spring, K school with ungraded classroom or transitional grade
8. Years of bilingual services in school
9. Spring, K principal input for choosing textbooks
10. Principal years of experience teaching kindergarten
11. Hours per week principal meeting with students
12. Sign-in policies in school

## **Covariates included in the model for $q_0$ :**

### Child-level covariates

1. Fall, K math IRT scale score
2. Spring, K reading IRT scale score
3. Squared Spring, K reading IRT scale score
4. Fall, K child math ARS score
5. Fall, K child general knowledge ARS score
6. Squared Fall, K child general knowledge ARS score
7. Spring, K child math ARS score
8. Spring, K teacher rating on child approaches to learning
9. Spring, K teacher report on child falling behind due to health
10. Spring, K teacher report on child receiving individual tutored reading
11. Spring, K teacher rating on child language skills
12. Spring, K teacher rating on child science/social studies skills
13. Spring, K teacher report on parent coming for informal meetings
14. Spring, K parent report on child being sad/lonely
15. Spring, K teacher report on child being in the lowest reading group
16. Child age at kindergarten entry
17. Fall, K parent report on child reading books outside school
18. Spring, K parent report on child receiving special service/education
19. Proportion of 3 and 4 year olds in Fall, K class
20. Proportion of children in Fall, K class repeating kindergarten
21. Spring, K teacher's educational degree
22. Fall, K teacher experience of having taken ESL courses
23. Spring, K teacher frequency of having conferences with parents

### School-level covariates

24. Spring, K school adequacy of facility
25. Spring, K school instructional level
26. Spring, K school with ungraded classroom or transitional grade
27. Spring, K school with Kindergarten
28. Spring, K school lowest annual teacher salary
29. Spring, K school highest annual teacher salary
30. Spring, K school percentage of Asian teachers
31. Spring, K school with decorated hallways
32. School aggregate of Fall, K reading IRT scale score
33. School aggregate of Spring, K general knowledge IRT scale score

**Covariates included in the model for  $q_1$ :**Child-level covariates

1. Spring, K reading IRT scale score
2. Fall, K general knowledge ARS score
3. Spring, K general knowledge ARS score
4. Spring, K parent rating of child approaches to learning
5. Spring, K teacher report of child in the lowest reading group
6. Child age at kindergarten entry
7. Gender
8. Spring, K parent report of paying tuition for child education
9. Fall, K parent report of child with disability
10. Proportion of boys in fall, K class
11. Fall, K teacher report of emphasizing importance of home-assisted kindergarten learning

School-level covariates

12. Spring, K principal report of teacher union and administration working together
13. School aggregate of Spring, K reading IRT scale score