Enclaves, Peer Effects and Student Learning Outcomes in British Columbia

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Overview

- Our work is at the intersection of two fairly broad questions
  - How do enclave communities affect immigrant families?
  - How does a student's peer group (at school) affect his or her academic outcomes?
- Our question: How do enclave schools affect academic outcomes of BC Grade 4 and Grade 7 students who speak a language other than English at home?

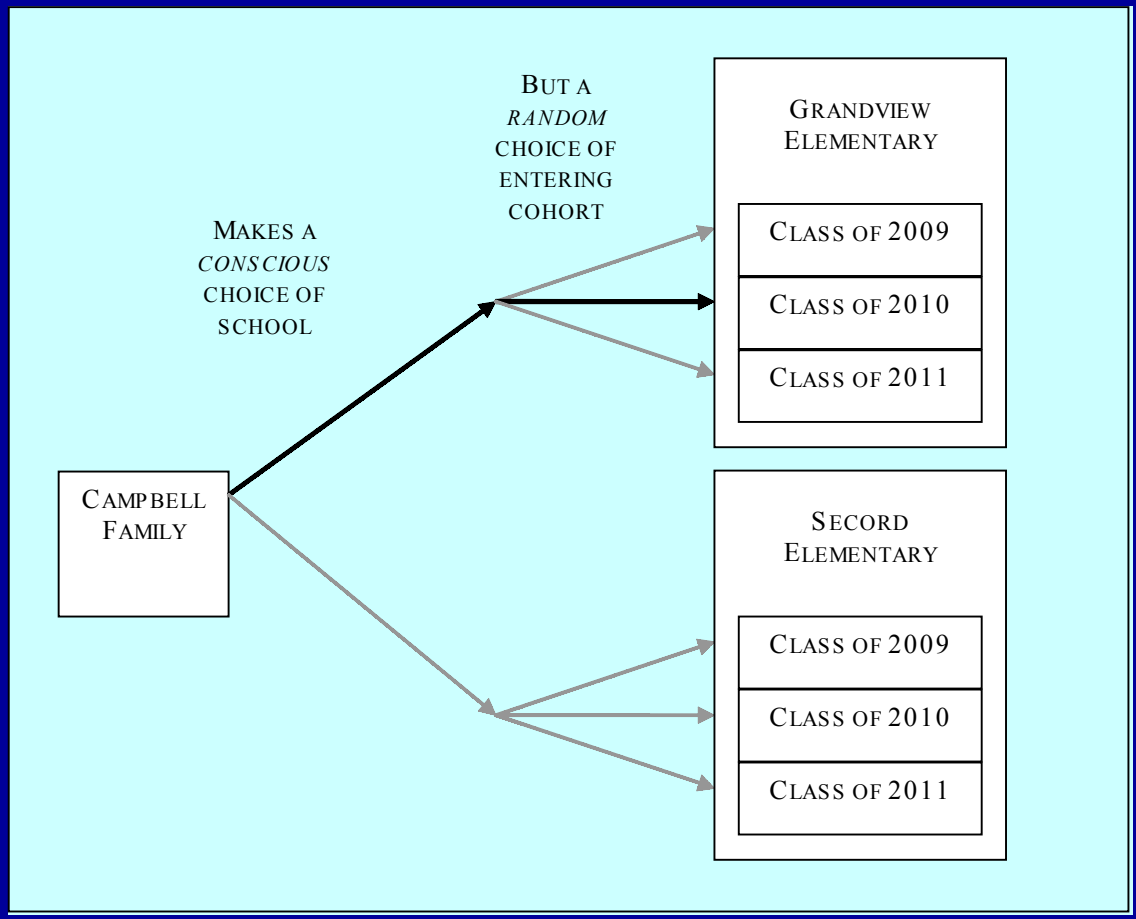
Identifying Peer Group Effects

- To identify the *effect* of peer group composition, it's not enough to compare students in schools with different compositions (Manski 1993)
  - Variation in composition across schools is not random, because families *choose* schools.
- For example, suppose that:
  - Punjabi HL families have below-average income/wealth.
  - All parents value school quality, and are willing to pay extra for housing in catchment areas for good schools
  - Result: Schools with large numbers of Punjabi HL students will tend to have below-average quality.

Research Design

- What we need to do is find and isolate sources of random variation in peer group composition
  - Hoxby (2000): Use (plausibly random) cohort-to-cohort variation *within* each school.
- The peer group under analysis is same-grade schoolmates

Our Model in Pictures



Our Model in Equations

- Standard linear fixed effects model

$$y_i = \beta_{individual} X_i + \beta_{peer} \overline{X}_i + \delta_{year(i)} + a_{school(i)} + u_i$$

$$E\left(u_i \middle| X_i, \overline{X}_i, year\ \ (i), school\ \ (i)\right) = 0$$

- Allows unobserved differences across schools and/or students that are correlated with overall composition of student body in that school – families make a conscious choice of school.
- Requires that cohort-to-cohort variation in school effectiveness is uncorrelated with cohort-to-cohort variation in student body composition - families make a random choice of cohort.

Data

- BC Grade 4 and Grade 7 students from 1999-2000 through 2003-2004 school year.
- Linked standardized test (FSA) score and enrollment data
- To maintain focus on language issues, we estimate model from non-Aboriginal population.
  - Equivalent to allowing all coefficients (including school fixed effect) to vary by Aboriginal status

Our Variables

- Outcome (y_i)
  - FSA exam score (Grades 4 & 7, Reading & Numeracy)
- Individual characteristics (X_i):
  - Gender
  - Home language (English, Chinese, Punjabi, Other)
  - ESL status
  - Aboriginal status (sort of)
- Group characteristics:
  - % male
  - % Aboriginal
  - % in each HL group
  - Effects of group composition will be allowed to vary by individual characteristics (especially HL). For example, effect of %Chinese will be different for Chinese HL students.

Caveats and Limitations

- Each of our individual-level variables is a proxy for many relevant but unobserved attributes
  - Example: Chinese HL is proxy for culture, family income, ethnicity, family educational background, child-rearing practices, etc.
  - Effect of % Chinese in peer group is combination of all these
  - But that's OK – when policy affects allocation of students to schools we bring the whole student!

Caveats and Limitations

- We will be doing a lot of extrapolation
- Linearity of the model is a more critical assumption than usual
  - We are able to identify peer group effects through small random variation across cohorts within each school
  - But we will be using our coefficient estimates to estimate the effect of large changes in composition
  - If there are any major nonlinearities, we will miss them
- We are isolating the effect of a particular type of peer group: same-grade school mates
  - We will identify effect of same-grade schoolmates without "contamination" from school or neighborhood quality
  - But if the main peer effects operate at the school or neighborhood level, we will miss them

Selected Summary Statistics

Language	%	Exposure Index	Mean Reading Score	Mean Numeracy score
English	81.9	88.6	507.3	508.6
(non-Aboriginal)	73.7		513.5	514.2
(Aboriginal)	8.9		450.7	456.9
Chinese	6.4	34.0	515.5	569.1
Punjabi	3.5	30.9	466.8	487.0
Other	8.6	26.7	483.7	506.9

Data Issues

- Exam scores standardized.
- % ESL in a school in a particular year is the result of both random compositional variation (good) and systematic variation in school/district policies (bad)
  - Example #1: 5-year funding limit.
  - Example #2: Aboriginal students in ESL
  - So we estimate each model with and without measures of %ESL in peer group.

Regression Results

- Too many! See the paper for details
- General trends in results:
  - Individual-level variables have coefficients one would expect from the cross-tabs.
  - % Male, % aboriginal usually (but not always) associated with lower scores
  - Home-language effects are quite complex, and it is not necessarily the case that higher-achieving groups have more positive spillovers.

Measuring Enclave Effects

- Our models necessarily include a rich set of interaction terms in order to get at questions about enclaves
  - But that results in lots of coefficients
  - Is there a simpler way to summarize the results?
- Our approach: Consider a counterfactual
  - Suppose that Chinese HL students had their peer group composition change from the composition observed in the data (i.e., their current enclave) to one that matched the province as a whole (i.e., complete integration). By how much does the model predict their exam score would decline?
  - We call this quantity the "enclave benefit" of Chinese HL students
  - Enclave benefits also calculated for English and Punjabi HL students, as well as ESL/non-ESL students.

Estimated Enclave Benefits

Home Language	Grade 4 Reading	Grade 4 Numeracy	Grade 7 Reading	Grade 7 Numeracy
English	0.55	-0.15	-0.43	*-0.80*
Chinese	-0.86	*6.34*	-4.46	3.18
ESL	-0.27	*7.11*	-5.17	*7.32*
non-ESL	3.72	*7.02*	*-4.84*	1.92
Punjabi	*8.96*	*10.18*	0.74	-2.61
ESL	*12.31*	*11.09*	*15.94*	-4.38
non-ESL	*11.51*	*12.86*	-0.29	-1.38

Notes: Benefits measured in % of a standard deviation on exam

Statistically significant (at 5%) coefficients are in *italics*.

Back to Our Question

- How do enclave schools affect academic outcomes of BC Grade 4 and Grade 7 students who speak a language other than English at home?
- They provide some benefit to Grade 4 students.
  - Chinese HL students gain about 6% of a standard deviation on the numeracy exam
  - Punjabi HL students gain about 10% of a standard deviation on reading and numeracy exams
- But those benefits largely dissipate by Grade 7

Robustness Checks

- Our basic results don't change if we:
  - Add a school-specific unobserved trend
  - Drop the 25% of schools with the most variation
  - Add % special education or % excused from exam as explanatory variables
  - Estimate separate models (with different school fixed effects) for English/non-English or ESL/non-ESL students.

Conclusion

- Overall results: enclaves are beneficial to Grade 4 students but benefits disappear by Grade 7.
- Subject to a few caveats and limitations
  - Only identifying effect of same-grade schoolmates
  - Only identifying effects that appear in test scores
  - Only identifying a “local” effect of small changes