

## Race and Track Assignment in Public School

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Table 1 -- Selected Studies of Race and Curricular Assignment in Secondary School

Study	Sample	Dependent Variable	Key Controls	Statistical Model	Key Finding
<i>Social-Psychological</i>					
Gamoran and Mare 1989	HS&B	College/non-college dichotomy	SES, Achievement, Gender	Endogenous Switching Regression	Black Advantage
Jones, Vanfossen, and Ensminger 1995	HS&B	General, College Prep, Vocational Trichotomy	SES, Gender, Achievement	Multinomial Logit	Black Advantage
<i>Structural Track</i>					
Oakes 1985	National Representative	Vocational and Remedial Courses versus Others	None	None <sup>1</sup>	Black and Latino/a Disadvantage
Garet and DeLany 1989	Four CA districts	Math and Science Courses	Gender	Multinomial Logit	Black and Asian Advantage
Mickelson 2001	Charlotte, NC	English Courses	SES, Cultural Capital, Gender	Multi-level Regression	Black Disadvantage
Lucas and Gamoran 2002	HS&B and NELS	College/non-college dichotomy	Disaggregated SES, Achievement, Gender	Endogenous Switching Regression	Consistent black-white parity; 1980 Latino Disadvantage, 1990 Asian Advantage

<sup>1</sup> No explicit statistical model is provided.

## Multi-level Logistic Regression Models

$$\begin{aligned} 1a) \log\left(\frac{P_{ij}}{1-P_{ij}}\right) &= \beta_{1j} + \beta_{2j} \text{Black}_{ij} + \beta_{3j} \text{Latino}_{ij} + \\ &\quad \beta_{4j} \text{Asian}_{ij} + \beta_{5j} \text{OtherRace}_{ij} + \sum_{k=6}^K \beta_k X_{ijk} + \epsilon_{ijk} \\ 1b) \quad \beta_{1j} &= \gamma_{01} + \delta_{1j} \\ 1c) \quad \beta_{2j} &= \gamma_{02} + \delta_{2j} \\ 1d) \quad \beta_{3j} &= \gamma_{03} + \delta_{3j} \\ 1e) \quad \beta_{4j} &= \gamma_{04} + \delta_{4j} \\ 1f) \quad \beta_{5j} &= \gamma_{05} + \delta_{5j} \end{aligned}$$

where  $p_{ij}$  signifies the probability student  $i$  in school  $j$  will be in the college track, and Black, Latino/a, Asian, and Other Race are mutually exclusive race/ethnicity dummies with White as the omitted category,  $X_{ijk}$  signifies additional observed individual-level factors,  $\epsilon_{ij}$  is an individual-level logistically distributed error term with mean zero and variance  $\pi^2/3$ ,  $\delta_j$ 's signify school-level normally distributed error terms with mean zero and variance-covariance matrix  $\Gamma$ , and  $\text{cov}(\epsilon, \delta_k) = 0$ . Equation 1a is at the student-level and captures individual-level factors expected to matter for track placement. Equations 1b through 1f are school-level equations in which the school-level intercept and the intercept-shift for different racial/ethnic groups are all allowed to vary across schools.

Multi-level Multinomial Logit Models

$$2a) \log(p_{1ij}/p_{3ij}) = \beta_{11j} + \beta_{12j} \text{Black}_{ij} + b_{13j} \text{Latinoa}_{ij} + \beta_{14j} \text{Asian}_{ij} + b_{15j} \text{OtherRace}_{ij} + \sum_{k=6}^K \beta_k X_{ijk} + \epsilon_{1ij}$$

$$2b) \quad \beta_{11j} = \gamma_{011} + \delta_{11j}$$

$$2c) \quad \beta_{12j} = \gamma_{012} + \delta_{12j}$$

$$2d) \quad \beta_{13j} = \gamma_{013} + \delta_{13j}$$

$$2e) \quad \beta_{14j} = \gamma_{014} + \delta_{14j}$$

$$2f) \quad \beta_{15j} = \gamma_{015} + \delta_{15j}$$

$$3a) \log(p_{2ij}/p_{3ij}) = \beta_{21j} + \beta_{22j} \text{Black}_{ij} + b_{23j} \text{Latinoa}_{ij} + \beta_{24j} \text{Asian}_{ij} + b_{25j} \text{OtherRace}_{ij} + \sum_{k=6}^K \beta_k X_{ijk} + \epsilon_{2ij}$$

$$3b) \quad \beta_{21j} = \gamma_{021} + \delta_{21j}$$

$$3c) \quad \beta_{22j} = \gamma_{022} + \delta_{22j}$$

$$3d) \quad \beta_{23j} = \gamma_{023} + \delta_{23j}$$

$$3e) \quad \beta_{24j} = \gamma_{024} + \delta_{24j}$$

$$3f) \quad \beta_{25j} = \gamma_{025} + \delta_{25j}$$

where  $p_{3ij}$  signifies the probability student  $i$  in school  $j$  will be in the college prep math,  $p_{2ij}$  signifies the probability student  $i$  in school  $j$  will be in the non-college prep math,  $p_{1ij}$  signifies the probability student  $i$  in school  $j$  will not take math, Black, Latino/a, Asian, and Other Race are mutually exclusive race/ethnicity dummies with White as the omitted category,  $X_{ijk}$  signifies additional observed individual-level factors,  $\epsilon_{1ij}$  and  $\epsilon_{2ij}$  are individual-level logistically distributed error terms with mean zero and variance  $\pi^2/3$ ,  $\delta_j$ 's signify school-level normally distributed error terms with mean zero and variance-covariance matrix  $T$ , and  $\text{cov}(\epsilon_{cij}, \delta_{ck}) = 0$ . Equations 2a and 3a are at the student-level; other equations are school-level equations in which the school-level intercept and the intercept-shift for different racial/ethnic groups are all allowed to vary across schools. In this model the omitted dependent variable category is the college preparatory track. With this model it becomes possible to assess whether there are racial differences in assignment to some specific locations, allowing a more fine-grained analysis of race and track assignment.

Table 2 -- Independent Variables

All variables are recoded to the midpoint for missing cases. In the models a control for missing on each particular variable is used.

#### STUDENT LEVEL

**Black, White, Latino/a, Asian, Other** are mutually-exclusive categorizations of students' racial/ethnic group drawn from student reports.

**Female** is a dummy variable drawn from student self-reports.

**Mother's and Father's Education** was measured by student reports of mother's and father's education, scored ranging from 10 years to 18 years of schooling.

**Father's Occupation** was measured by student responses to a 17 category question, which were recoded to the 1980 SEI score of the mean of the illustrative occupations in the questionnaire using Stevens and Cho's (1985) updated occupational scores for total labor force based on the 1980 census. Homemakers and military were coded as missing given that there is no SEI code for those pursuits.

**Family Income** was measured by student reports of family income, recoded to the mid-point of categories.

**Siblings** is the number of brothers and sisters reported by the student.

**Broken Family** is scored 0 if the child lived with mother and father in sophomore year, and zero otherwise.

Seven 10th grade tests in **Math 1** (range 0-28), **Math 2** (0-10), **Reading** (0-19), **Vocabulary** (range 0-21), **Writing** (0-17), **Science** (0-20), and **Civics** (0-10) are used to measure prior achievement.

#### SCHOOL LEVEL

##### School Poverty

Principal reports of 1)whether the school is a **Title 1** school, 2)the natural log of the number of **Library Volumes per child**, 3)whether the school has a **Library or Not**, and 3)the **Expenditures Per Student**. (No library)

##### Governance

Dummy variables for **Urban, Rural, and South**. **Size** of school is the principal's report of the total enrollment of students; we use the natural log of the total enrollment.

##### Faculty Sponsorship

Principal reports of the percentage of faculty who are **Black**.

##### Legacy of Racial Conflict

Principal reports of 1)the proportion of students **Bused** into the school for racial balance and 2)whether the school is under a **Desegregation** order.

##### Racial/Ethnic Diversity

Principal reports of the proportion of students who are white, Black, Latino/a, Asian, or Native American, coupled with principal reports of the number of students in the school, is used to construct a measure of the incidence of racial/ethnic diversity, calculated as follows. If  $k > 1$  then  $D_s = (k(N^2 - \sum f_{sk}^2)) / (N^2(k-1))$ ; if  $k=1$  then  $D_s = 0$ , where  $k$  is the number of racial groups in the school,  $N$  is the total number of students in the school, and  $f_{sk}$  is the number of persons of race  $k$  in school  $s$ .

Table 3 -- Unconditional Multi-Level Multinomial Logistic Regression Model and Tests of Varying Race/Ethnicity Coefficients, Trichotomous Mathematics Track Assignment, Public Schools (n=798) and Students (n=11211)

Panel 1--Model Coefficients

Unconditional Model	Parameter	Coeff	S.E.	Var Component	P-val
College Prep Math vs. No Math					
	<i>Intercept</i>	-1.379*	0.055	1.0231	>0.500
	<i>Black</i>	0.301	0.111	0.1864	>0.500
	<i>Latino/a</i>	0.491*	0.086	0.1825	>0.500
	<i>Asian</i>	-1.818*	0.342	0.1740	>0.500
	<i>Other</i>	0.651*	0.215	0.1264	>0.500
College Prep Math vs. Non-College Prep Math					
	<i>Intercept</i>	-0.534*	0.044	0.7448	0.001
	<i>Black</i>	0.939	0.076	0.0122	0.168
	<i>Latino/a</i>	0.819*	0.063	0.0016	0.310
	<i>Asian</i>	-1.528*	0.226	0.0240	0.428
	<i>Other</i>	0.971*	0.163	0.0157	>0.500

Italics denote varying coefficients, \* signifies parameter discernibly different from zero at or below  $\alpha=.05$

Panel 2 -- Probabilities of Track Assignment

	No Math	Non-Coll Prep	Coll Prep
<i>Intercept</i>	.201	.370	.429
<i>Black</i>	.254	.600	.146
<i>Latino/a</i>	.292	.571	.138
<i>Asian</i>	.039	.113	.848
<i>Other</i>	.326	.608	.067

Numbers may not add up to 1 due to rounding.

Table 4 -- Conditional Multi-Level Multinomial Logistic Regression Models and Tests of Trichotomous Mathematics Track Assignment, Public Schools (n=798) and Students (n=11211)

Panel 1--Selected Model Coefficients, Conditional Model 1

	Parameter	Coeff	S.E.	Var Component	P-val
Model 1 -- College Prep Math vs. No Math					
	<i>Intercept</i>	-1.380*	0.080	1.3007	0.128
	<i>Black</i>	-0.490*	0.125	0.5442	>0.500
	<i>Latino/a</i>	-0.197*	0.097	0.1895	>0.500
	<i>Asian</i>	-1.187*	0.353	0.0937	>0.500
	Other	0.018	0.227	-----	-----
Model 1 -- College Prep Math vs. Non-College Prep Math					
	<i>Intercept</i>	-0.504*	0.064	0.7448	0.002
	<i>Black</i>	0.068	0.093	0.0122	0.025
	<i>Latino/a</i>	0.082	0.075	0.0016	>0.500
	<i>Asian</i>	-1.066*	0.262	0.0240	>0.500
	Other <sup>1</sup>	0.323*	0.181	-----	-----

Italics denote varying coefficients, \* signifies parameter discernibly different from zero at or below  $\alpha=.05$

<sup>1</sup> Could not allow Other to vary in this model, for to do so would have allowed no degrees of freedom for the test of school-level variance.

Panel 2 -- Conditional Probabilities of Track Assignment

	No Math	Non-Coll Prep	Coll Prep
<i>Intercept</i>	.201	.377	.422
<i>Black</i>	.134	.393	.474
<i>Latino/a</i>	.171	.397	.433
<i>Asian</i>	.071	.172	.756
Other	.204	.455	.341

Numbers may not add up to 1 due to rounding.

Panel 3--Selected Model Coefficients, Conditional Model 2

	Parameter	Coeff	S.E.	Var Component	P-val
Model 2 -- College Prep Math vs. No Math					
	<i>Intercept</i>	-1.387*	0.079	1.4511	≤0.001
	<i>Black</i>	-0.483*	0.123	0.3887	>0.500
	<i>Latino/a</i>	-0.211*	0.092	-----	-----
	<i>Asian</i>	-1.257*	0.329	-----	-----
	<i>Other</i>	0.020	0.209	-----	-----
Model 2 -- College Prep Math vs. Non-College Prep Math					
	<i>Intercept</i>	-0.503*	0.063	1.0560	≤0.001
	<i>Black</i>	0.063	0.092	0.1900	0.004
	<i>Latino/a</i>	0.053	0.070	-----	-----
	<i>Asian</i>	-1.006*	0.245	-----	-----
	<i>Other</i>	0.329*	0.170	-----	-----

Italics denote varying coefficients, \* signifies parameter discernibly different from zero at or below  $\alpha=.05$

Panel 4 -- Conditional Probabilities of Track Assignment

	No Math	Non-Coll Prep	Coll Prep
<i>Intercept</i>	.200	.377	.423
<i>Black</i>	.134	.392	.475
<i>Latino/a</i>	.168	.389	.442
<i>Asian</i>	.067	.181	.753
<i>Other</i>	.203	.457	.340

Numbers may not add up to 1 due to rounding.



Table 5 -- Selected Coefficients, Conditional Multi-Level Multinomial Logistic Regression Models of Trichotomous Mathematics Track Assignment, Public Schools (n=798) and Students (n=11211)

Col Prep Omitted	No Math		Non-College Prep	
Parameter	Coeff	S.E.	Coeff	S.E
<b>School Poverty Model</b>				
<i>Intercept</i>	-1.447*	0.124	-0.425*	0.101
Title 1	0.100	0.117	-0.051	0.099
Ln (Lib Vols/Child)	0.208*	0.096	-0.168*	0.082
No Library	0.466	1.058	0.301	0.904
\$1000/child	0.168	0.096	0.110	0.082
<i>Black</i>	-0.488*	0.126	-0.108	0.161
Title 1	-----	-----	0.050	0.160
Ln (Lib Vols/Child)	-----	-----	-0.130	0.133
No Library	-----	-----	-2.214	1.469
\$1000/child	-----	-----	0.081	0.128
<b>Governance Model</b>				
<i>Intercept</i>	1.427*	0.607	-0.852	0.557
Ln(size)	-0.365*	0.084	0.077	0.077
Urban	-0.097	0.140	-0.175	0.121
Rural	0.046	0.136	-0.203	0.119
South	-0.904*	0.121	-0.280*	0.101
<i>Black</i>	-0.320*	0.128	-1.357	1.028
Ln(size)	-----	-----	0.208	0.138
Urban	-----	-----	-0.049	0.175
Rural	-----	-----	0.077	0.236
South	-----	-----	-0.003	0.166
<b>Faculty Sponsor Model</b>				
<i>Intercept</i>	-1.431*	0.084	-0.493*	0.067
% Black Faculty	-0.019*	0.004	-0.001	0.004
<i>Black</i>	-0.256	0.131	0.274*	0.010
% Black Faculty	-----	-----	-0.014*	0.004
<b>Legacy of Racial Conflict Model</b>				
<i>Intercept</i>	-1.296*	0.085	-0.485*	0.069
% Bused	0.002	0.007	-0.000	0.007

Col Prep Omitted	No Math		Non-College Prep	
Parameter	Coeff	S.E.	Coeff	S.E
Desegregation Order	-0.598*	0.145	-0.131	0.122
<i>Black</i>	-0.394*	0.127	0.073	0.115
% Bused	-----	-----	0.007	0.006
Desegregation Order	-----	-----	-0.055	0.160
<b>Racial Diversity Model</b>				
<i>Intercept</i>	-1.431*	0.084	-0.515*	0.067
Index of Racial Diversity	-0.970*	0.195	-0.265	0.164
<i>Black</i>	-0.382*	0.129	0.066	0.114
Index of Racial Diversity	-----	-----	0.262	0.277

Italics denote varying coefficients, \* signifies parameter discernibly different from zero at or below  $\alpha=.05$

Table 6 -- Tests of Varying Race/Ethnicity Coefficients in Multi-level Binary Logistic Regression Models of Dichotomous Track Assignment, Public Schools (n=798) and Public School Students (n=11211)

Model	Parameter	Coeff	S.E.	Prob Col Prep	Var Component	P-val
Uncond Varying 1	<i>Intercept</i>	-0.552*	0.046	.365	1.0215	≤0.001
	<i>Black</i>	-0.681*	0.084	.226	0.5964	0.091
	<i>Latino/a</i>	-0.767*	0.067	.211	0.2367	0.030
	<i>Asian</i>	1.567*	0.237	.734	0.2278	≥0.500
	<i>Other</i>	-1.063*	0.192	.166	0.5264	≥0.500
Uncond Varying 2	<i>Intercept</i>	-0.555*	0.046	.365	1.0407	≤0.001
	<i>Black</i>	-0.676*	0.085	.226	0.6790	≤0.001
	<i>Latino/a</i>	-0.759*	0.067	.212	0.2517	≥0.500
	<i>Asian</i>	1.501*	0.217	.720	-----	-----
	<i>Other</i>	-0.975*	0.173	.178	-----	-----
Uncond Varying 3	<i>Intercept</i>	-0.553*	0.046	.365	1.0332	≤0.001
	<i>Black</i>	-0.689*	0.084	.224	0.4816	0.071
	<i>Latino/a</i>	-0.751*	0.063	.213	-----	-----
	<i>Asian</i>	1.502*	0.217	.721	-----	-----
	<i>Other</i>	-0.979*	0.173	.178	-----	-----
Cond Varying 1	<i>Intercept</i>	-0.883*	0.068	.293	1.7610	≤0.001
	<i>Black</i>	0.159	0.100	.327	1.1879	0.228
	<i>Latino/a</i>	-0.019	0.075	.289	0.3761	0.162
	<i>Asian</i>	1.002*	0.272	.530	0.5726	≥0.500
	<i>Other</i>	-0.449*	0.209	.209	0.8424	≥0.500
Cond Varying 2	<i>Intercept</i>	-0.885*	0.068	.292	1.7688	≤0.001
	<i>Black</i>	0.160	0.101	.326	1.2927	≤0.001
	<i>Latino/a</i>	-0.013	0.076	.289	0.4473	0.396
	<i>Asian</i>	0.987*	0.240	.525	-----	-----
	<i>Other</i>	-0.373*	0.189	.221	-----	-----
Cond Varying 3	<i>Intercept</i>	-0.871*	0.067	.295	1.6537	≤0.001
	<i>Black</i>	0.143	0.099	.326	0.9243	0.008
	<i>Latino/a</i>	-0.058	0.072	.283	-----	-----
	<i>Asian</i>	0.981*	0.238	.527	-----	-----
	<i>Other</i>	-0.375*	0.188	.223	-----	-----

Varying coeffs italicized, \*=parameter discernibly differs from zero  $\alpha \leq 0.05$

Table 7 -- Multi-level Logistic Regression Models of Between-School Factors in Race and Track Assignment, Public Schools (n=798) and Students (n=11211)

	I-level Model		School Poverty		Governance	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
<i>Intercept</i>	-0.871*	0.067	-0.867*	0.111	-1.025*	0.095
Title 1			-0.038	0.113		
Ln(Lib Vols/Child)			0.009	0.094		
No Library			0.111	1.039		
\$1000/child			-0.086	0.093		
Ln(Size)					0.189*	0.086
Urban					0.057	0.138
Rural					0.075	0.134
South					0.395*	0.115
<i>Black</i>	0.143	0.099	0.363*	0.184	0.260	0.185
Title 1			-0.209	0.192		
Ln(Lib Vols/Child)			0.518*	0.163		
No Library			4.140*	1.549		
Ln(\$/child)			-0.187	0.155		
Ln(Size)					-0.598*	0.163
Urban					-0.007	0.213
Rural					-0.262	0.279
South					-0.088	0.202
Latino/a	-0.058	0.072	-0.061	0.072	-0.080	0.072
Asian	0.981*	0.238	0.976*	0.238	0.969*	0.238
Other	-0.375*	0.188	-0.383*	0.188	-0.380*	0.189
Female	0.400*	0.050	0.400*	0.050	0.400*	0.050
Father's Ed	0.021	0.014	0.021	0.014	0.021	0.014
Mother's Ed	0.057*	0.015	0.057*	0.015	0.058*	0.015
Fathers Occ	0.001	0.001	0.001	0.001	0.001	0.001
Family Income	0.011*	0.003	0.011*	0.003	0.011*	0.003
Siblings	-0.042*	0.017	-0.042*	0.017	-0.040*	0.017
Broken Family	-0.172*	0.069	-0.172*	0.069	-0.172*	0.069
Math 1	0.144*	0.008	0.145*	0.008	0.145*	0.008
Math 2	0.018	0.017	0.018	0.017	0.018	0.017
Reading	0.017	0.011	0.016	0.011	0.017	0.011

	I-level Model		School Poverty		Governance	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
Vocabulary	0.025*	0.009	0.026*	0.009	0.025*	0.009
Writing	0.058*	0.011	0.057*	0.010	0.058*	0.010
Science	0.002	0.011	0.002	0.011	0.004	0.011
Civics	0.074*	0.016	0.074*	0.016	0.073*	0.016

Italics denote varying coefficients, \* signifies parameter discernibly different from zero at or below  $\alpha=.05$

Table 7, continued

	Faculty Sponsor Model		Legacy of Racial Conflict		Racial Diversity	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
<i>Intercept</i>	-0.881*	0.069	-0.892*	0.072	-0.864*	0.069
% Black Fac	0.015*	0.004				
% Bused			-0.001	0.007		
Deseg Order			0.120	0.140		
Diversity					0.703*	0.184
<i>Black</i>	0.008	0.113	0.208	0.124	0.223	0.123
% Black Fac	0.004	0.005				
% Bused			-0.007	0.009		
Deseg Order			-0.078	0.201		
Diversity					-0.856*	0.339
Latino/a	-0.070	0.072	-0.060	0.072	-0.097	0.072
Asian	0.979*	0.238	0.983*	0.238	0.942*	0.237
Other	-0.385*	0.189	-0.380*	0.188	-0.390*	0.188
Female	0.399*	0.050	0.400*	0.050	0.400*	0.050
Father's Ed	0.022	0.014	0.021	0.014	0.021	0.014
Mother's Ed	0.057*	0.015	0.057*	0.015	0.057*	0.015
Fathers Occ	0.001	0.001	0.001	0.001	0.001	0.001
Family Income	0.011*	0.003	0.011*	0.003	0.011*	0.003
Siblings	-0.042*	0.017	-0.042*	0.017	-0.041*	0.017
Broken Family	-0.179*	0.069	-0.171*	0.069	-0.173*	0.069
Math 1	0.145*	0.008	0.144*	0.008	0.144*	0.008
Math 2	0.019	0.017	0.018	0.017	0.018	0.017
Reading	0.016	0.011	0.017	0.011	0.016	0.011
Vocabulary	0.025*	0.009	0.025*	0.009	0.024*	0.009
Writing	0.058*	0.010	0.058*	0.010	0.058*	0.010
Science	0.004	0.011	0.002	0.011	0.003	0.011
Civics	0.074*	0.016	0.074*	0.016	0.075*	0.016

Italics=varying parameters, \*=estimate discernibly different from zero  $\alpha \leq .05$

Table 8 -- Selected Coefficients from Omnibus Multi-level Logistic Regression Model of Within-School Factors in Race and Track Assignment, Public Schools (n=798) and Students (n=11211)

	Omnibus Model	
	Coeff	S.E.
<i>Intercept</i>	-0.948*	0.079
Ln(Lib Vols/Child)	0.159	0.112
No Library	0.704	1.068
Ln(Size)	0.195*	0.092
South	0.299*	0.121
Diversity	0.499*	0.198
<i>Black</i>	0.270	0.151
Ln(Lib Vols/Child)	0.204	0.197
No Library	2.745	1.594
Ln(Size)	-0.342	0.176
South	0.040	0.204
Diversity	-0.898*	0.345

Italics=varying parameters, \*=estimate discernibly different from zero  $\alpha \leq .05$