Abstract Title Page

Title: Motivational Predictors of Math Course Persistence

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Abstract Body

Background / Context:

Given the growing economic returns to education (Psacharopoulos & Patrinos, 2004) and the overwhelmingly high educational expectations of American high school students (Domina et al., 2011; Goyette, 2008), one might expect nearly all U.S. high school students to take as many academic courses as they can. Consistent with this expectation, much research on inequalities in course completion focuses on structural inequalities in "opportunities to learn" (Catsambis, 1994; Oakes, 1990; Schneider et al., 1998; Stevenson et al., 1994). This research demonstrates that students' current and future math opportunities are unequal and linked to inequalities formed in the past. However, less attention has been given to the fact that nearly 40 percent of U.S. high school students opt out of one or more years of high school mathematics (authors computations ELS: 2002). This estimate is even grimmer when we include high school dropouts and exclude retaken math courses. For this reason, this study focuses on students' agency to choose (or not) to take four years of math while accounting for a web of influences such as social background, math track, prior performance, and state policies. Drawing upon youth academic motivation research, this paper investigates the factors that influence student decisions to complete four years of high school mathematics.

When investigating motivational factors that influence students' decisions, it is imperative to account for their current situation and opportunities. High school math courses are hierarchical, where prerequisites position some students above others with the advantage of starting higher in the sequence (Schneider et al., 1998). Student placement in the hierarchy of course-taking limits how far they may reach in the math series in four years. Furthermore, research on math course-taking demonstrates that the most disadvantaged students tend to take the least math courses. Students that begin in the lower math tracks tend to enroll in fewer math courses in subsequent years (Riegle-Crumb, 2006; Schiller et al., 2010; Updegraff et al., 1996). Given that lower math tracks have a disproportionate overrepresentation of Hispanic, African American, low income and low math achieving students (Oakes & Guition, 1995), this suggests these students are also less likely to take a math course during all four years of high school. It is important we maximize all students' opportunities in high school, regardless of math level placement, because all students can benefit from taking another year of math. Taking more math courses has been found to improve high school math standardized scores (Cool & Keith, 1991; Long et al., 2012), the likelihood of graduating from high school and entering college (Attewell & Domina 2008), as well as increase labor force earnings (Rose & Betts, 2004).

Purpose / Objective / Research Question / Focus of Study:

High school students may opt to take additional math courses because they are interested in math, may believe math is useful for their future, or may consider themselves skillful in math (Eccles-Parson, 1983). Students may also be motivated to take additional math courses because they have high college expectations and want to meet or exceed college entrance requirements. We seek to understand which motivational mechanisms most strongly encourage high school students to take a math course continuously during all four years in high school. However, we also recognize that students differ markedly in mathematics skills, knowledge, and prior achievement. When we examine students' decisions to take four years of math courses, we assess four motivational constructs: self-efficacy, utility, interest, and college expectations. Thus, the study is motivated by two major research questions: First, what is the relationship between students' motivation and the decision to take four years of math? Second, to what extent does this relationship vary by math track and whether a student fails a math course or not?

Setting:

This study utilizes the nationally representative Education Longitudinal Study (ELS: 2002). Researchers used a two-stage sample selection process to have a national representative sample, and they ended with 752 schools including public, Catholic and other private schools in the United States (the 50 states and the District of Columbia).

Population / Participants / Subjects:

The dataset consists of high school sophomores (n = 16,200). We restricted the data to students who completed high school in 2004 (92%) and students with complete transcript data (77%). We also removed a few students (4%) who failed their math courses in 10th, 11th and 12th grades, because we can suppose these students only reason to retake a math course was to meet minimum graduation requirements. Students were then categorized into three math levels of math placement low-, on-, and above-track. For analysis purposes, math placement begins in 10th grade due to students responding to motivation questions in their sophomore year and most students (95%) enrolled in a math course in 9th and 10th grade. The few students (5%) that did not take a math course in 9th or 10th grade were removed. After these restrictions, the final sample contains 10,560 students. In 10th grade, about 19.5% of students were enrolled in algebra I or lower, 48.1% in geometry, and 32.3% in algebra II or higher.

Program / Practice:

ELS: 2002 base-year sample is comprised of 10th graders who were followed in two year intervals for six years.

Research Design:

ELS: 2002 is a secondary dataset-- restricted access version. Data collectors also surveyed participants' parents, math and English teachers, and school administrators, but this study does not incorporate this data. In the first follow-up (2004), they requested academic transcripts for all participants (were most participants were 12th graders) along with follow-up surveys and one additional math exam.

Data Collection and Analysis:

To address our research questions, we conducted several logistic regression models to determine the log odds that a student would take four years of math (or not) while accounting for social demographics, state policies, and math abilities. All logit models have transcript weights to account for missing transcript data. The first model (F1) is to determine the relationship between students' motivation (self-efficacy, utility, interest, and college expectations) with their decision to take four years of math (RQ1). In Table 4, Model 1 only includes students' motivation and Model 2 incorporate control variables (i.e., prior achievement, math track and demographics). Thus, the log odds a student would take four years of math can be expressed as:

$$\ln\left[\frac{p\,(4YRS)}{1-p(4YRS)i}\right] = \beta_0 + \beta_1\, Mot_i + \beta_2\, Track_i + \beta_3\, Fail_i + \beta_4\, Achi_i + \beta_5\, Demo_i + F\delta_{s(i)} + e_i \quad \text{(F1)}$$

In (F1), $\ln\left[\frac{p\,(4YRS)}{1-p(4YRS)i}\right]$ is a variable that represents student *i*'s log odds of taking four years of math in high school. Mot_i is a variable that represents four motivation measures collected in 10th grade: self-efficacy, utility, interest and college expectations. $Track_i$ is based on students' placement in either low-, on-, or above-track math course in 10th grade. $Fail_i$ is based on whether or not a student failed a math course between 10th and 12th grade. Ach_i is student *i*'s prior 10th grade math standardized achievement scores. $Demo_i$ are time-invariant characteristics such as race, gender, SES, and family composition. B_i is the estimated increase in the log odds of the outcome per unit increase in the value for each given covariate variable. State policies $F\delta_{s(i)}$ were controlled for in the analysis with state fixed effects using Stata's *xtlogit,fe* command. These policies can lead students, under the same circumstances, to make similar choices when selecting math courses.

The second model (F2) and the third model (F3) are moderated models to determine to what extent the relationship between students' motivation and taking four years of math varies by math track and students prior math course performance (RQ2). To compare the relation between students' motivation with students' decisions to take four years of math (F2) we used model F1 and incorporated an interaction between students' motivation and students' math track ($Mot_i \times Track_i$). To compare the relation between students' motivation and those who have failed at least once to students that have never failed a math course (F3) we also used model F1 and incorporated a triple interaction between students' motivation, math track, and students' prior math course performance ($Mot_i \times Track_i \times Fail_i$). Covariates, weights, and state fixed effects were the same as model F1 and the interactions were the only new factors. For simplicity, effect sizes (β_i) were provided separately for each math track instead of presenting the interactions in one model (see Table 4, Model 3-5 & see Table 5, Model 1-3). Table 4 and 5, however, provide p-values that identify the statistically significant differences in effect sizes between low- and on-track students, and above- and on-track students.

Log odds are presented (Table 4 and 5) as odds ratios to ease interpretation. Odds ratios (OR) are exponential functions of the regression coefficient ($e^{\beta 1}$). OR represent the odds that the outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure (covariates). Log odd models can be found in the appendix.

Findings / Results:

Results show student's motivation (e.g., self-efficacy, interest, and college expectations) had main effects on students' decision to take four years of math. The same motivation components continued to predict taking four years of math as expected (RQ1) once we accounted for students' demographics, family background, math abilities (e.g., math test and failing math courses), and state policies. Students with high self-efficacy in math, interest in math, and college expectations had higher odds that they would take four years of math (OR 1.11, $p < .05$; 1.19, $p < .001$ and 1.66/1.87, $p < .001$). We hypothesized that all four motivational constructs would be predictive, particularly utility value, which prior studies found to be the strongest and most consistent predictor. One possible explanation for having different findings may be that our study sample includes a greater variety of students, than prior studies, by race, social demographics, and math abilities. Thus, the data was further desegregated to examine different sets of students by math track and prior math course performance.

As previously stated, students from the low-, on-, and above-tracks are students in different situations. Model 3-5 (Table 4) shows the relationship between motivation and math course selection separately for each math track (RQ2). Students' math level placement matters when it comes to the relationship between motivation and choice; only some motivational mechanisms matter for some groups of students. Low-track (Model 3) and on-track (Model 4) students' expectation of attending a four-year college or graduate school (versus a two-year college or less) was the strongest predictor in taking four years of math. Low-track students that reported higher college expectations increased students' odds ratios in taking four years of math (OR 1.80, $p < .01$; 1.94, $p < .01$). On-track students with higher college expectations also had higher odds that they would take four years of math (OR 1.81 $p < .001$; 1. 99 $p < .001$). In contrast to above-track students' (Model 5) whose strongest motivation predictors were their self-efficacy (OR 1.21, $p < .05$) and interest (OR 1.41, $p < .001$) in math. Interaction analyses (motivation by math track) determined that the effect sizes were only different between on- and above-track students (see Table 4). Predicted probability of taking four years of math were also conducted to provide further evidence of the relationship between students' motivation and choice by math track. Fig.1 demonstrates how students' predicted probability of taking four years of math increases as students' motivation [(1a) self-efficacy, (1b) utility, (1c) interest, and (1d) college expectation] increases but the strength differs by math track.

Table 5 further disaggregates the data by math placement level and students who failed versus those who never failed to address the second part of the research question 2. Interactions were conducted to determine if effect sizes were different between students who failed at least one math course versus those who never failed within a math track (available upon request). The relationship between students' motivation and taking four years of math did not change greatly as a result of failing. The only statistically significant difference was for on-track students. College expectations are a stronger predictor of taking four years of math for students who never failed a math course compared to students who did fail a math course ($p < .05$).

Conclusions:

This study demonstrates that students' motivation contributes to students' decision-making process. The relationship between students' different motivational constructs and course selection differs by math placement and to some extent, whether or not a student has ever failed a math course. Our results suggest that low- and on-track students would benefit from learning how taking additional math courses can lead them to realize their college goals. Educators can discuss with these students how current and future math courses can lead them to the colleges to which they aspire to attend and, ultimately, to obtain the careers they seek to achieve. These conversations can be particularly impactful for low- and on-track students who aspire to attend community colleges, which admit students regardless of the courses students complete in high school (Cohen, 2009). It must become apparent to students why taking more years of math courses in high school directly impacts their college goals, in addition to simply meeting entrance requirements. Above-track students are the only students who benefit from having an increase in math self-efficacy and interest. This study suggests that this is true regardless of whether a high achieving student has ever failed a math course or not. College expectations may not be as pertinent to differences between above-track students because most of these students hold high college expectations, where only 4.8% aspired to 2 years of college or less.

Parents, teachers, and counselors can encourage high school students to take more years of math (Oakes, 1990; Schukajlow et al., 2012; Siegle & McCoach, 2007) and help all students maximize their opportunities in high school by considering the specific motivational components that influence different sets of students differently. This is more likely to be effective than a one-size-fits-all approach.

Appendices

Appendix A. References

References are to be in APA version 6 format.

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Appendix B. Tables and Figures

Not included in page count.

Table 1

Distribution of Students by Math Placement Level

	N	Total %	Low- % or Mean	On- % or Mean	Above- % or Mean	X^2
Failing Course						
Never Failed	6,330	59.9	37.5	57.7	76.7	X^2 (4, N = 10,560) = 881.0, p = .00
Failed 1	2,580	24.5	34.6	25.9	16.1	
Failed 2	1,650	15.6	27.8	16.4	7.2	
Four Years Math						
Yes	7,710	63.5	54.4	63.7	68.8	X^2 (2, N = 10,560) = 114.9, p = .00
No	3,850	36.9	45.5	36.2	31.2	
Race						
White	6,330	62.6	57.8	62.9	65.1	
Hispanic	1,210	12.0	16.2	12.2	9.1	X^2 (2, N = 7,540) = 61.8, p = .00
African American	1,040	10.3	12.3	12.3	6.0	X^2 (2, N = 7,370) = 89.6, p = .00
Asian American	1,020	10.1	7.2	7.9	15.1	X^2 (2, N = 7,350) = 83.6, p = .00
Other	500	4.9	6.3	4.6	4.5	X^2 (2, N =6,830) = 15.3, p = .00
Gender						
Male	4,860	47.9	50.4	47.3	47.3	X^2 (2, N =10,140) = 6.1, p = .04
Female	5,280	52.1	49.5	52.7	52.6	
SES			-.35	-.00	.27	
Std.Dev.	10,610	100	(.72)	(.76)	(.80)	
Total	10,100	100	19.5	48.1	32.3	

Note. Low-track students were enrolled in Algebra I (or lower) in 10th grade. On-track students were enrolled in Geometry in 10th grade. Above-track students were enrolled in Algebra II (or higher) in 10th grade. Socioeconomic status (SES) is a combination of parents' highest education and family income.

Table 2

Students' Motivation and Math Placement

	Low-		On-		Above-	
	Mean or %	SD or N	Mean or %	SD or N	Mean or %	SD or N
Expectancy-Value						
Self-Efficacy	-.17***	.91	-.01	.96	.42***	.99
Utility-instrumental	-.15***	.96	.11	.96	.29***	1.0
Interest-intrinsic	-.10	.97	-.09	.96	.25***	1.03
College Expectations						
2 Year or Less	30.3	500	10.0	440	4.8	150
4 Year College	41.5	690	44.4	1,970	34.1	1,040
Graduate School	28.1	470	45.5	2,020	61.1	1,860
Total	100	1,660	100	4,430	100	3,050

Note. Low-track students were enrolled in Algebra I (or lower) in 10th grade. On-track students were enrolled in Geometry in 10th grade. Above-track students were enrolled in Algebra II (or higher) in 10th grade. T-test was conducted and low- and above-track students were compared to on-track students. Significant differences are denoted in the low- and above-track columns * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Similar comparisons were made when comparing college expectation and low- and on-track, which were statistically significant different X^2 (2, N =6,090) = 760.78, p = .001, as were on- and above-track X^2 (2, N =7,480) = 194.22, p = .001

Table 3

Portion of Students that Take Four Years Relative to Math Placement Level

	N	Total %	Low n = 1,130 % or Mean	On n = 3,240 % or Mean	Above n = 2,350 % or Mean	X^2
Failing Course						
Never Failed	4,310	67.5	54.1	68.5	71.9	
Failed 1	1,370	52.6	46.7	55.0	55.1	X^2 (4, N = 6,710)= 665.5, p=.00
Failed 2	1,030	62.3	62.6	61.0	65.8	
Race						
White	3,960	62.5	49.6	63.4	68.2	
Hispanic	710	58.7	53.7	59.2	63.0	X^2 (2, N = 4,670)= 54.8, p = .00
African American	660	63.5	66.8	61.8	65.4	X^2 (2, N = 4,620) = 91.6, p = .00
Asian American	760	74.5	64.1	76.6	76.4	X^2 (2, N = 4,720)= 42.6, p = .00
Other	320	63.8	59.6	63.1	69.1	X^2 (2, N =4,280)= 19.1, p = .00
Gender						X^2 (2, N = 6,440)= 2.8, p =.23
Male	3,100	63.8	53.0	63.5	71.1	
Female	3,340	63.2	55.1	64.1	66.5	
SES	6,420	100	-.29	.09	.39	
Std. Dev.			(.76)	(.77)	(.78)	
Total	6,640	63.0	54.4	63.7	68.8	

Note. Low-track students were enrolled in Algebra I (or lower) in 10th grade. On-track students were enrolled in Geometry in 10th grade. Above-track students were enrolled in Algebra II (or higher) in 10th grade. This table represents the portion of student that took four years of math relative to students in their category. For instance, 54.1% of low track students who never failed a math course took four years of math compared to 46.7% of low track students who failed one math course. Socioeconomic status (SES) is a combination of parents' highest education and family income.

Table 4

Odds Ratios that Students will Choose to Take Four Years of Math (Math Track Interaction)

	(1) Motivation	(2) All Students	(3)[a] Low-	(4) On-	(5)[b] Above-	(6) P-value
Expectancy-Value						
Self-Efficacy	**1.29*****	**1.11***	1.02	1.11	**1.21**^{b*}	$p < .05^{b}$
Utility-instrumental	1.02	1.05	1.16	1.06	1.04	NS
Interest-intrinsic	**1.13****	**1.19*****	1.00	1.10	**1.41**^{b***}	$p < .001^{b}$
College Expectations *(Omitted: 2 Year Degree or Less)*						
4 Year Degree	**2.16*****	**1.66*****	**1.80****	**1.81*****	1.80	NS
Graduate School	**2.65*****	**1.87*****	**1.94****	**1.99*****	**1.94***	NS
Controls						
Never Failed (vs. Failed)		0.96	0.76	1.01	1.04	
10^{th} Grade Math Test		1.48***	1.34*	1.52***	1.42***	
Race (Omitted: White)						
Hispanic		1.56**	1.82*	1.38	1.77*	
African American		1.58**	4.03***	1.27	1.33	
Asian American		1.99***	2.88*	2.43***	1.86**	
Other		1.29	1.72	1.13	1.16	
Math Track (Omitted: Low Track)						
On Track		0.83	---	----	----	
Above Track		0.69**	---	----	----	
State Fixed Effects		+	+	+	+	
N	6430	6380	1040	3080	2240	
df_m	5.00	67.00	63.00	63.00	62.00	
chi2	231.16	578.92	186.87	265.62	275.00	
pr2	.04	.11	.19	.11	.18	

Note. + State fixed effects and demographic (e.g. gender, SES, and family composition) are not listed in the table to conserve space. A complete model is available upon request. Models are odds ratios and significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Effect sizes from Model 3 (low math track) and 5 (on math track) are compared to Model 2 (above math track) students. Statistically significant differences are listed in p-value column where the letter “a” denotes differences between low- and on- track and “b” denotes differences between on- and above-track. Interaction analyses between track differences are available upon request.

Table 5

Odds Ratios that Students will Choose to Take Four Years of Math (Students' Motivation, Math Track and Prior Math Course Performance Interaction)

	(1) Low-		(2) On-		(3) Above-	
	Fails at least one math course	Has Never Fail	Fails at least one math course	Has Never Fail	Fails at least one math course	Has Never Fail
Expectancy-Value						
Self-Efficacy	1.11	0.93	**1.25***	1.03	1.21	**1.23***
Utility-instrumental	1.12	1.23	0.99	1.11	0.81	1.10
Interest-intrinsic	0.98	1.00	0.98	**1.19***	1.19	**1.39*****
College Expectations *(Omitted: 2 Year Degree or Less)*						
4 Year Degree	1.51	**2.25***	1.42c	**2.50c*****	**15.75*****	1.11
Graduate School	1.46	**2.87***	**1.77***	**2.60*****	**15.00****	1.24
Controls						
10^{th} Grade Math Test	1.46*	1.37	1.39**	1.69***	1.76**	1.44**
Race (Omitted: White)						
Hispanic	3.01**	0.48	1.58	1.26	1.49	1.56
African American	3.54**	4.33	1.76*	0.83	0.67	2.13
Asian American	2.38	6.18*	2.52*	2.36**	1.10	2.17**
Other	2.60*	0.76	1.24	0.91	0.15***	4.09*
State Fixed Effects	+	+	+	+	+	+
N	600	380	1200	1850	450	1770
df_m	52.00	55.00	58.00	58.00	49.00	60.00
chi2	114.99	78.72	124.35	204.53	97.01	250.19
pr2	.19	.23	.11	.14	.25	.20

Note. + State fixed effects and demographic (e.g. gender, SES, and family composition) are not listed in the table to conserve space. A complete model is available upon request. Models are odds ratios and significance * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Effect sizes for fail vs. never failed were compared for each track [a] $p < 0.001$, [b] $p < 0.01$, [c] $p < 0.05$. Interaction analysis on failed versus not failed differences are available upon request.

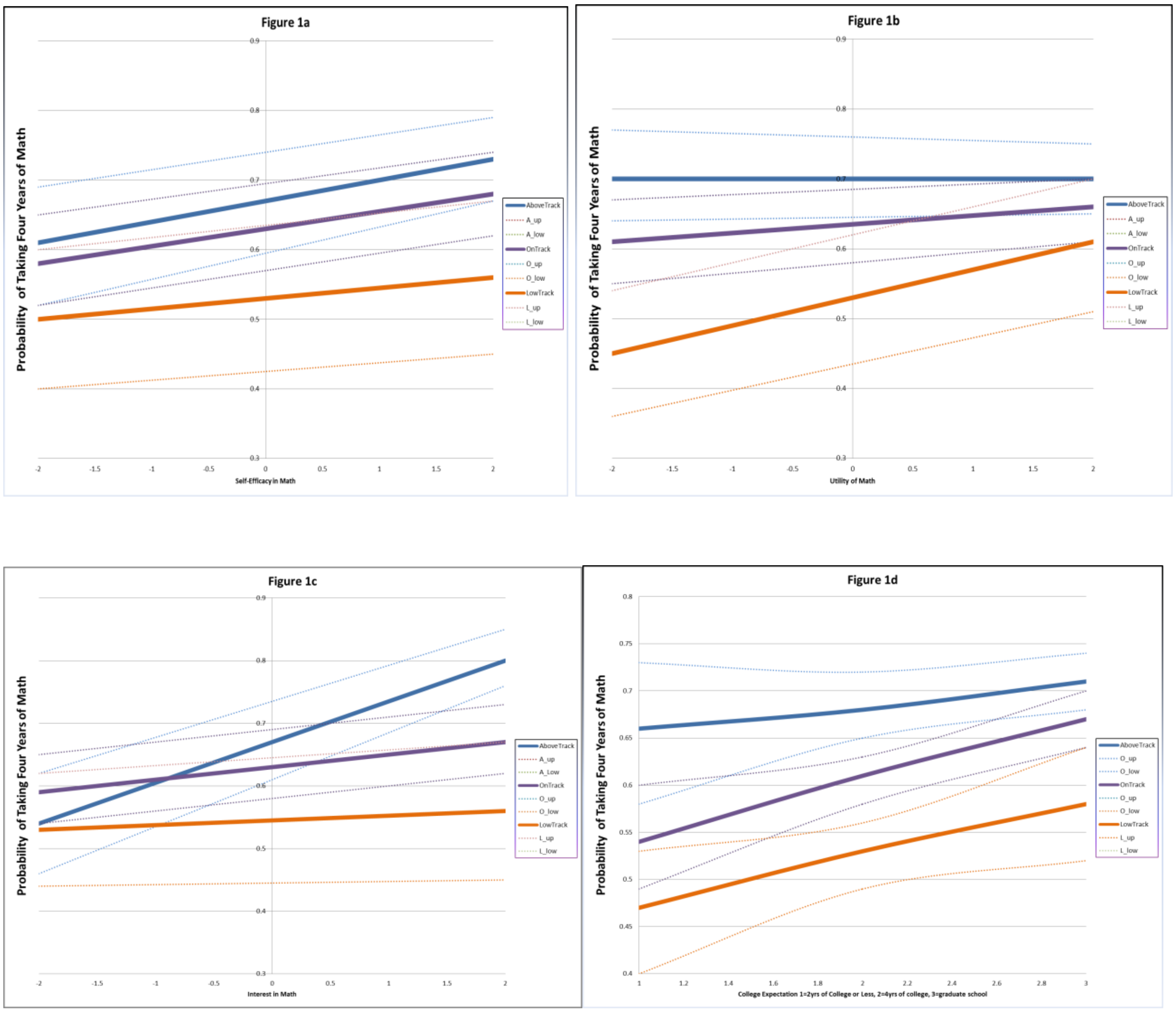

Figure 1

Predicted probability that students will take four years of math based on students' motivation. *Note*. Probability ranges from 0 to 1 (y-axis) and students' motivation ranges from -2 to 2 (x-axis) except for the last graph (1d). "College expectations" is a categorical variable where students either aspired to attend a: 1.) 2 years of college, 2.) 4 years of college, or 3.) Graduate school (x-axis). The blue line represents the probability for above-track, the purple line represents students who are on-track, and the orange line represents students who are low-track, and the dashed lines represent the confidence interval for each line (matched by color).

Appendix

Table A1

Motivation Scale Items

Survey Questions	Reliability
Self-Efficacy in Mathematics-Expectancy	α = .93
I'm confident that I can do an excellent job on my math tests	
I'm certain I can understand the most difficult material presented in math texts	
I'm confident I can understand the most complex material presented by my math teacher	
Utility –Instrumental Motivation Scale	α = .85
I study to get a good job	
I study to increase my job opportunities	
I study to secure that my future will be financially secure	
Interest-Intrinsic Interest Scale	α = .78
When I do mathematics, I sometimes get totally absorbed	
Because doing math is fun, I wouldn't want to give it up	
Mathematics is important to me personally	

Note. The first two sets of questions ask, "How often do these apply to you", with a scale of 1-4 (Almost never to Almost Always). The last set asks students, "How do you agree with the following statement", with a scale of 1-4 (Strongly Agree to Strongly Disagree).

Table A2

College Expectations

Survey Question
As things stand now, how far in school do you think you will get? a. High School Degree or Less b. 2 Year College Degree c. 4 Year College Degree d. Graduate School

Note. This question does not highly correlate with extrinsic questions listed in Table A1. Response a and b were combined in all logit models because very few 10th grade students from the sample (2.3%) stated that they expected to earn a high school degree or less.

Appendix A3

Odds Ratios That Students will Start in Low-, On-, or Above-Track

	Low Track (Algebra I or Lower)		Above Track (Algebra II or Higher)	
	(1) Demographics Only	(2) Controls Added	(1) Demographics Only	(2) Controls Added
On Track (Geometry)				
Race (Omitted: White)				
Hispanic	1.04	1.10	0.78**	0.82
	(0.10)	(0.13)	(0.07)	(0.09)
African American	0.92	0.98	0.56***	0.58***
	(0.10)	(0.12)	(0.06)	(0.06)
Asian American	0.78	0.69*	1.79***	1.89***
	(0.11)	(0.11)	(0.16)	(0.20)
Other	1.58**	1.53**	0.88	0.97
	(0.23)	(0.24)	(0.13)	(0.14)
Gender (Omitted: Male)				
Female	0.78***	0.78***	1.04	1.01
	(0.05)	(0.05)	(0.06)	(0.06)
SES	0.55***	0.54***	1.53***	1.49***
	(0.03)	(0.03)	(0.06)	(0.06)
Family Composition (Omitted: Two Biological Parents)				
1 Bio & 1 Guardian	1.30**	1.29**	0.70***	0.70***
	(0.12)	(0.12)	(0.06)	(0.06)
Guardians	1.36	1.38	0.99	1.09
	(0.27)	(0.30)	(0.23)	(0.26)
Single Parent	1.20*	1.18	0.96	0.97
	(0.10)	(0.11)	(0.08)	(0.08)
Passed 9th Grade Math Course		0.48***		2.43***
		(0.04)		(0.21)
State Fixed Effects		+		+
N			10230	10230
df_m			18.00	118.00
chi2			644.37	6769.26
pr2			.05	.10

Note. The table includes two models. The models are multinomial models where "Low Track" and "Above Track" students are compared to "On Track" students. Model 1 only includes demographic variables and Model 2 adds control variables (e.g. failing, state fixed effects). + State fixed effects are not listed in the table to conserve space. A complete model can be provided upon request. SES includes parents' highest education and family income. Exponentiated coefficients; Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A4

Log Odds Students will Choose to Take Four Years of Math (Math Track Interaction)

	(1) Motivation	(2) All Students	(3)[a] Low-	(4) On-	(5)[b] Above-	(6) P-value
Expectancy-Value						
Self-Efficacy	**0.25*****	**0.11***	0.02	0.10	**0.19**^{b*}	p < .05[b]
	(0.04)	**(0.05)**	(0.11)	(0.06)	(0.08)	NS
Utility-instrumental	0.02	0.05	0.15	0.06	0.04	p < .001[b]
	(0.04)	(0.04)	(0.10)	(0.06)	(0.07)	
Interest-intrinsic	**0.12****	**0.17*****	-0.00	0.10	0.**34**^{b***}	NS
	(0.04)	**(0.04)**	(0.10)	(0.06)	(0.07)	NS
College Expectations *(Omitted: 2 Year Degree or Less)*						
4 Year Degree	**0.77*****	**0.51*****	**0.59****	**0.59*****	0.59	
	(0.11)	(0.12)	(0.21)	(0.18)	(0.33)	
Graduate School	**0.97*****	**0.63*****	**0.66****	**0.69*****	0.66*	
	(0.11)	(0.12)	(0.24)	(0.18)	(0.32)	
Controls						
Never Failed (vs. Failed)		-0.04	-0.27	0.01	0.04	
		(0.08)	(0.18)	(0.11)	(0.16)	
10th Grade Math Test		0.39***	0.30*	0.42***	0.35***	
		(0.05)	(0.12)	(0.08)	(0.10)	
Race (Omitted: White)						
Hispanic		0.45**	0.60*	0.32	0.57*	
		(0.14)	(0.30)	(0.19)	(0.27)	
African American		0.46**	1.40***	0.24	0.29	
		(0.14)	(0.37)	(0.19)	(0.29)	
Asian American		0.69***	1.06*	0.89***	0.62**	
		(0.14)	(0.44)	(0.23)	(0.22)	
Other		0.26	0.54	0.12	0.15	
		(0.17)	(0.35)	(0.25)	(0.34)	
Math Track (Omitted: Low Track)						
On Track		-0.18				
		(0.10)				
Above Track		-0.38**				
		(0.12)				
Constant	-0.32***	0.70**	1.04*	0.71*	-0.89	
	(0.09)	(0.24)	(0.50)	(0.34)	(0.51)	
N	6430	6380	1040	3080	2240	
df_m	5.00	67.00	61.00	63.00	62.00	
chi2	215.79	553.47	184.05	251.22	275.00	
pr2	.04	.11	.19	.11	.18	

Note. + State fixed effects and demographic (e.g. gender, SES, and family composition) are not listed in the table to conserve space. A complete model can be provided upon request. Standard errors are in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Effect sizes from Model 3 (low math track) and 5 (on math track) are compared to Model 2 (above math track) students. Statistically significant differences are listed in the p-value column where the letter "a" denotes differences between low- and on- track and "b" denotes differences between on- and above-track. Interaction analyses between track differences are available upon request.

Table A5

Log Odds Students will Choose to Take Four Years of Math (Students' Motivation, Math Track, and Prior Math Course Performance Interaction)

	(1)		(2)		(3)	
	Low- Fails at least one math course	On- Has Never Fail	Above- Fails at least one math course	Low- Has Never Fail	On- Fails at least one math course	Above- Has Never Fail
Expectancy-Value						
Self-Efficacy	0.10	-0.07	**0.22***	0.03	0.19	**0.21***
	(0.15)	(0.20)	**(0.10)**	(0.09)	(0.17)	(0.10)
Utility-instrumental	0.11	0.21	-0.01	0.10	-0.22	0.10
	(0.13)	(0.18)	(0.09)	(0.08)	(0.16)	(0.08)
Interest-intrinsic	-0.02	-0.00	-0.02	**0.18***	0.18	**0.33*****
	(0.13)	(0.18)	(0.09)	**(0.09)**	(0.16)	(0.09)
College Expectations *(Omitted: 2 Year Degree or Less)*						
4 Year Degree	0.41	**0.81***	0.35^{c}	**0.91**^{c***}	**2.76*****	0.10
	(0.30)	(0.40)	(0.24)	(0.27)	(0.80)	(0.41)
Graduate School	0.38	**1.05***	**0.57***	**0.95*****	**2.71****	0.22
	(0.33)	(0.42)	(0.26)	**(0.27)**	(0.83)	(0.41)
Controls						
10th Grade Math Test	0.38*	0.31	0.33**	0.53***	0.56**	0.37**
	(0.16)	(0.22)	(0.11)	(0.11)	(0.18)	(0.12)
Race (Omitted: White)						
Hispanic	1.10**	-0.72	0.46	0.23	0.40	0.44
	(0.39)	(0.61)	(0.26)	(0.30)	(0.54)	(0.31)
African American	1.27**	1.47	0.57*	-0.19	-0.40	0.75
	(0.42)	(0.77)	(0.26)	(0.27)	(0.53)	(0.40)
Asian American	0.87	1.82*	0.92*	0.86**	0.09	0.77**
	(0.56)	(0.89)	(0.37)	(0.32)	(0.46)	(0.27)
Other	0.96*	-0.28	0.21	-0.10	-1.87***	1.41*
	(0.47)	(0.59)	(0.38)	(0.32)	(0.48)	(0.65)
N	590	380	1200	1850	450	1770
df_m	51.00	50.00	58.00	58.00	49.00	60.00
chi2	97.95	84.21	121.40	193.00	94.62	253.23
pr2	.19	.23	.11	.14	.25	.20

Note. + State fixed effects and demographic (e.g. gender, SES, and family composition) are not listed in the table to conserve space. A complete model is available upon request. Standard errors are in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Effect sizes for fail vs. never failed were compared for each track ^{a} $p < 0.001$, ^{b} $p < 0.01$, ^{c} $p < 0.05$. Interaction analyses on failed versus not failed differences are available upon request.