Appendix

Persistent Effects of Teacher-Student Gender Matches

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This Appendix is a supplement to "Persistent Effects of Teacher-Student Gender Matches." It contains the following tables, each of which is referenced in the main body of the paper:

- Appendix Table 1 examines whether the student-teacher gender match is related to a linear prediction of 7th grade test scores. This tests for sorting.
- Appendix Table 2 examines whether the proportion of female teachers in other subjects has an impact on performance in that subject. This tests for spillover effects.
- Appendix Table 3 examines the effect of student-teacher gender interaction replacing Korean, math, and English teachers with English, Korean, and math teachers, respectively. This is a further test for spillover effects.
- Appendix Table 4 examines the likelihood of attrition by each year in school, using the full sample throughout. This measures the effect of the student-teacher gender interaction on the cumulative likelihood of attrition.
- Appendix Table 5 examines the likelihood of attrition, interacting the proportion of female teachers with student gender and the student's previous-year test scores. This measures whether the student-teacher gender interaction has a differential effect on the likelihood of attrition for students of differing academic performance.
- Appendix Table 6 examines the likelihood of attrition including an interaction term for each subject. This measures whether the effect of the student-teacher gender interaction on attrition differs by subject.
- Appendix Table 7 examines results dividing the sample by within-student variation in teacher gender. This measures whether the results are driven by a subset of the sample with such variation.
- Appendix Table 8 examines results with a full set of interactions by subject. This measures the gender gap effect for each subject.
- Appendix Table 9 examines the effect of student-teacher gender interactions on an index of STEM outcomes. This measures whether the effect on STEM outcomes differs by the gender of each subject teacher.

Table 1: Test of Sorting to Teachers

	(1)	(2)	(3)
FS	0.003	0.030	0.020
	(0.024)	(0.019)	(0.019)
FT in 7th Grade	0.020	0.050*	0.041
	(0.025)	(0.030)	(0.031)
FS × FT in 7th Grade	−0.031	−0.033*	−0.027
	(0.022)	(0.017)	(0.017)
Observations	7,695	7,695	7,570
R^2	0.002	0.229	0.282
Sch × Sbj FEs		Yes	
Sch × Sbj × Abg FEs			Yes

Notes: Each column represents a separate regression. Dependent variables are predicted standardized test scores in 7th grades, which are fitted values from linear regressions of the 7th grade test scores on student and teacher characteristics. The student characteristics include family income, number of siblings, and indicators for parents living together, both parents working, at least one parent having college degree or higher, and the student having attended a private elementary school. The teacher characteristics include teacher's age and indicators for having less than five years' experience, graduating from a teachers college, having a graduate degree, and having administrative teacher responsibility. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 2: Spillover Effects

	Dep. Var. = Standardized Test Scores in					
	7th Grade (1)	8th Grade (2)	9th Grade (3)	10th Grade (4)	11th Grade (5)	12th Grade (6)
FS	0.045	0.012	−0.001	0.006	0.146	0.038
	(0.083)	(0.113)	(0.102)	(0.165)	(0.124)	(0.101)
FT	0.025	−0.106	−0.151**	−0.121	−0.085	−0.049
	(0.071)	(0.069)	(0.062)	(0.078)	(0.075)	(0.073)
Pct. FTs in other Subj.	−0.093	−0.089	−0.079	−0.065	−0.050	−0.118*
	(0.112)	(0.108)	(0.109)	(0.083)	(0.086)	(0.068)
FS × FT	0.145**	0.150**	0.158**	0.138	0.137**	0.159**
	(0.055)	(0.067)	(0.073)	(0.084)	(0.069)	(0.066)
FS × Pct. FTs in other Subj.	0.033	0.085	0.065	0.090	−0.037	0.048
	(0.075)	(0.092)	(0.087)	(0.117)	(0.104)	(0.096)
Observations	9,611	9,238	8,790	7,154	7,048	6,916
R^2	0.393	0.348	0.252	0.102	0.131	0.133

Notes: Each column represents a separate regression, controlling for school in 7th grade by subject by ability group in 7th grade fixed effects. Dependent variables in Columns 1 through 6 are, respectively, standardized test scores in 7th through 12th grades. The percent female teachers in other subjects is constructed as the proportion of female teachers in other subjects, using available values only in teacher gender. For example, for math, it is the percent female teachers in Korean and English language. If the value of Korean language teacher gender is missing, it is female teacher indicator for English. If values of both subject teachers are missing, it is coded as missing and dropped. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 3: Student-Teacher Gender Interaction with Switched Teachers

	Dep. Var. = Standardized Test Scores in					
	7th Grade (1)	8th Grade (2)	9th Grade (3)	10th Grade (4)	11th Grade (5)	12th Grade (6)
FS	0.164***	0.178***	0.188***	0.188***	0.197***	0.239***
	(0.044)	(0.049)	(0.050)	(0.064)	(0.062)	(0.064)
FT in 7th Grade	−0.061	−0.033	−0.057	−0.024	−0.028	−0.025
	(0.065)	(0.060)	(0.074)	(0.052)	(0.058)	(0.050)
FS × FT in 7th Grade	−0.002	−0.015	−0.016	−0.067	−0.037	−0.087
	(0.045)	(0.051)	(0.055)	(0.064)	(0.067)	(0.066)
Observations	10,068	9,685	9,253	7,514	7,393	7,201
R^2	0.435	0.349	0.249	0.181	0.179	0.152

Notes: Each column represents a separate regression, controlling for school in 7th grade by subject by ability group in 7th grade fixed effects. We replace Korean, math,and English teachers with English, Korean, and math teachers, respectively. Dependent variables in Columns 1 through 6 are standardized test scores in 7th through 12th grades. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 4: Attrition Using Constant Sample

	Dep. Var. = Likelihood of Attrition in					
	8th Grade	9th Grade	10th Grade	11th Grade	12th Grade	Post Secondary
	(1)	(2)	(3)	(4)	(5)	(6)
FS	−0.009	0.042	0.045	0.010	0.046	0.008
	(0.026)	(0.058)	(0.077)	(0.084)	(0.082)	(0.107)
Pct. FTs in 7th Grade	0.038	0.003	0.083	0.022	0.117	0.085
	(0.036)	(0.059)	(0.121)	(0.127)	(0.130)	(0.154)
FS ×	0.014	−0.036	−0.105	−0.055	−0.125	−0.033
Pct. FTs in 7th Grade	(0.029)	(0.068)	(0.103)	(0.108)	(0.108)	(0.140)
Observations	2,292	2,292	2,292	2,292	2,292	2,292
R^2	0.114	0.161	0.252	0.236	0.233	0.179

Notes: Each column represents a separate regression, controlling for school by math ability group by English ability group by Korean ability group in 7th grade fixed effects. The dependent variables for Columns 1 through 6 are, respectively, indicators for students dropping from the sample in 8th through 12th grades and postsecondary period. The percent female teachers is defined the proportion of female teachers in three subject of math, English, and Korean, conditional on no missing values in teacher gender. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 5: Attrition with Test Score Interactions

	Dep. Var. = Likelihood of Attrition in					
	8th Grade (1)	9th Grade (2)	10th Grade (3)	11th Grade (4)	12th Grade (5)	Post Secondary (6)
FS	−0.009	0.057	0.034	−0.009	−0.012	−0.048
	(0.027)	(0.051)	(0.084)	(0.044)	(0.029)	(0.112)
Pct. FTs in 7th Grade	0.040	−0.043	0.082	−0.048	0.069	0.026
	(0.036)	(0.047)	(0.120)	(0.052)	(0.067)	(0.170)
FS × Pct. FTs in 7th Grade	0.013	−0.050	−0.101	0.013	−0.020	0.114
	(0.030)	(0.063)	(0.105)	(0.052)	(0.040)	(0.143)
Avg. Std. Score in 7th Grd	−0.010					
	(0.009)					
FS × Pct. FTs in 7th Grade	0.013					
× Avg. Std. Score in 7th Grd	(0.012)					
Avg. Std. Score in 8th Grd		−0.029**				
		(0.012)				
FS × Pct. FTs in 7th Grade		−0.028				
× Avg. Std. Score in 8th Grd		(0.020)				
Avg. Std. Score in 9th Grd			−0.031			
			(0.019)			
FS × Pct. FTs in 7th Grade			−0.011			
× Avg. Std. Score in 9th Grd			(0.034)			
Avg. Std. Score in 10th Grd				−0.004		
				(0.011)		
FS × Pct. FTs in 7th Grade				−0.008		
× Avg. Std. Score in 10th Grd				(0.020)		
Avg. Std. Score in 11th Grd					0.000	
					(0.010)	
FS × Pct. FTs in 7th Grade					−0.006	
× Avg. Std. Score in 11th Grd					(0.016)	
Avg. Std. Score in 12th Grd						−0.116***
						(0.014)
FS × Pct. FTs in 7th Grade						−0.003
× Avg. Std. Score in 12th Grd						(0.025)
Observations	2,290	2,204	2,100	1,676	1,642	1,633
R^2	0.114	0.196	0.294	0.190	0.196	0.243

Notes: Each column represents a separate regression, controlling for school by math ability group by English ability group by Korean ability group in 7th grade fixed effects. The dependent variables for Columns 1 through 6 are, respectively, indicators for students dropping from the sample in 8th through 12th grades and postsecondary period. The percent female teachers is defined the proportion of female teachers in three subject of math, English, and Korean, using available values only in teacher gender. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 6: Attrition by Subject

	Dep. Var. = Likelihood of Attrition in					
	8th Grade (1)	9th Grade (2)	10th Grade (3)	11th Grade (4)	12th Grade (5)	Post Secondary (6)
A. Math						
FS	−0.009	0.014	−0.032	−0.032*	−0.031**	0.007
	(0.014)	(0.012)	(0.030)	(0.016)	(0.015)	(0.047)
Math FT in 7th Grade	−0.013	−0.000	−0.007	−0.025	−0.018	0.035
	(0.018)	(0.018)	(0.028)	(0.027)	(0.020)	(0.050)
FS ×	0.015	−0.018	−0.011	0.030*	0.012	−0.015
Math FT in 7th Grade	(0.015)	(0.016)	(0.033)	(0.017)	(0.018)	(0.056)
Observations	3,282	3,142	3,017	2,525	2,457	2,411
R^2	0.056	0.063	0.219	0.058	0.057	0.094
B. English Language						
FS	−0.017	0.022	0.032	−0.002	0.005	−0.023
	(0.011)	(0.035)	(0.056)	(0.028)	(0.019)	(0.071)
Eng FT in 7th Grade	−0.033**	−0.012	−0.084**	−0.010	0.028	0.005
	(0.013)	(0.042)	(0.039)	(0.022)	(0.019)	(0.094)
FS ×	0.021	−0.022	−0.080	−0.009	−0.023	0.037
Eng FT in 7th Grade	(0.013)	(0.037)	(0.060)	(0.030)	(0.020)	(0.079)
Observations	3,220	3,088	2,958	2,442	2,376	2,335
R^2	0.060	0.090	0.223	0.081	0.089	0.110
C. Korean Language						
FS	0.025	0.018	−0.002	0.001	0.010	0.080
	(0.017)	(0.024)	(0.039)	(0.021)	(0.023)	(0.081)
Kor FT in 7th Grade	0.062***	−0.022	0.042	−0.010	0.020	0.061
	(0.017)	(0.023)	(0.050)	(0.021)	(0.021)	(0.051)
FS ×	−0.024	−0.024	−0.030	−0.019	−0.028	−0.089
Kor FT in 7th Grade	(0.018)	(0.024)	(0.043)	(0.024)	(0.023)	(0.084)
Observations	3,606	3,451	3,300	2,758	2,676	2,633
R^2	0.025	0.036	0.195	0.021	0.021	0.063

Notes: Each column represents a separate regression, controlling for school by ability group in 7th grade fixed effects. The dependent variables for Columns 1 through 6 are, respectively, indicators for students dropping from the sample in 8th through 12th grades and postsecondary period. We examine the correlation of gender match with attrition in math, Korean and English language in Panel A, B, C, respectively. In Columns 2 through 6, we use the sample in which the observations attritted in the previous Columns are dropped. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 7: Effects on 7th Grade Test Scores Using Within-Student Variation Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Effective Sample							
FS	0.035	0.060	0.073	0.065	0.089		
	(0.059)	(0.047)	(0.044)	(0.051)	(0.057)		
FT in 7th Grade	0.000	−0.045	−0.019	−0.018	−0.087	−0.194	
	(0.055)	(0.127)	(0.158)	(0.157)	(0.133)	(0.126)	
FS × FT in 7th Grade	0.130**	0.209***	0.120**	0.106*	0.106	0.184**	0.193***
	(0.062)	(0.055)	(0.060)	(0.062)	(0.065)	(0.073)	(0.067)
Observations	4,029	4,029	3,950	3,330	3,012	3,572	3,950
R^2	0.006	0.246	0.403	0.409	0.402	0.807	0.805
B. Balance of the Sample							
FS	0.017	0.393	0.072	0.034	0.053*		
	(0.103)	(0.312)	(0.057)	(0.030)	(0.030)		
FT in 7th Grade	−0.171*	0.025	0.327	0.295	0.548		
	(0.102)	(0.506)	(0.439)	(0.477)	(0.430)		
FS × FT in 7th Grade	0.153	−0.165	0.128*	0.177***	0.165***		
	(0.115)	(0.316)	(0.066)	(0.046)	(0.049)		
Observations	6,167	6,167	6,097	5,039	4,509		
R^2	0.008	0.223	0.415	0.428	0.416		
Sch × Sbj FEs		Yes					
Sch × Sbj × Abg FEs			Yes	Yes	Yes	Yes	Yes
Student Controls				Yes	Yes		
Teacher Controls					Yes	Yes	
Student FEs						Yes	Yes
Teacher FEs							Yes

Notes: Each column represents a separate regression, controlling for school in 7th grade by subject by ability group in 7th grade fixed effects. The dependent variable is standardized test scores in 7th grade. Panel A uses the sample in which teacher gender varies within a student. In Panel B, which uses the rest of the observations, we cannot include student fixed effects because there is no variation in teacher gender within a student. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 8: Effects by Subject

	Dep. Var. = Standardized Test Scores in					
	7th Grade (1)	8th Grade (2)	9th Grade (3)	10th Grade (4)	11th Grade (5)	12th Grade (6)
A. Main & Interaction Effects						
FS	0.248***	0.161	0.456***	0.453***	0.288**	0.201
	(0.088)	(0.140)	(0.106)	(0.149)	(0.144)	(0.163)
Math × FS	−0.276***	−0.161	−0.599***	−0.468***	−0.270*	−0.270
	(0.101)	(0.146)	(0.121)	(0.154)	(0.155)	(0.198)
English × FS	−0.091	0.109	−0.364**	−0.468**	−0.121	−0.003
	(0.110)	(0.187)	(0.163)	(0.185)	(0.183)	(0.197)
FT in 7th Grd	0.175*	−0.113	−0.057	0.076	−0.073	−0.089
	(0.103)	(0.111)	(0.098)	(0.115)	(0.118)	(0.117)
Math × FT in 7th Grd	−0.168	0.039	0.012	−0.216	0.008	0.169
	(0.118)	(0.133)	(0.117)	(0.142)	(0.156)	(0.156)
English × FT in 7th Grd	−0.257**	0.214	−0.288	−0.277	0.219	0.198
	(0.118)	(0.216)	(0.181)	(0.213)	(0.209)	(0.245)
FS × FT in 7th Grd (γ_1)	0.094	0.216	0.003	−0.060	0.122	0.281*
	(0.101)	(0.150)	(0.113)	(0.147)	(0.139)	(0.163)
Math × FS × FT in 7th Grd (γ_2)	0.039	−0.104	0.129	0.175	−0.024	−0.218
	(0.114)	(0.163)	(0.132)	(0.166)	(0.169)	(0.198)
English × FS × FT in 7th Grd (γ_3)	−0.069	−0.299	0.026	0.200	0.003	−0.382*
	(0.122)	(0.200)	(0.175)	(0.202)	(0.198)	(0.207)
B. Gender Gap Effects by Subjects						
Math ($\gamma_1 + \gamma_2$)	0.132**	0.112	0.132**	0.115	0.097	0.063
	(0.059)	(0.069)	(0.062)	(0.098)	(0.098)	(0.100)
English Language ($\gamma_1 + \gamma_3$)	0.024	−0.084	0.029	0.139	0.125	−0.101
	(0.080)	(0.129)	(0.162)	(0.155)	(0.143)	(0.139)
Korean Language (γ_1)	0.094	0.216	0.003	−0.060	0.122	0.281*
	(0.101)	(0.150)	(0.113)	(0.147)	(0.139)	(0.163)
Observations	10,047	9,653	9,190	7,504	7,342	7,132
R^2	0.387	0.344	0.256	0.100	0.110	0.142

Notes: Each column represents a separate regression, controlling for school in 7th grade by subject by ability group in 7th grade fixed effects. We control for academic track fixed effects as well in Columns 5 and 6. Math and English language dummies are excluded due to collinearlity. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 9: Effects on STEM Index

	Coefficient	S.E.
FS	−0.504	(0.575)
Math FT in 7th Grade	0.077	(0.305)
Eng FT in 7th Grade	−0.002	(0.489)
Kor FT in 7th Grade	0.424	(0.349)
FS × Math FT in 7th Grade	0.547**	(0.275)
FS × Eng FT in 7th Grade	−0.571	(0.353)
FS × Kor FT in 7th Grade	−0.118	(0.414)
Observations	952	
R^2	0.282	
Dep. Var. Mean	0.035	

Notes: We regress the STEM index on student's and teacher's gender and its interactions, controlling for school in 7th grade by 7th grade math group by 7th grade English group by 7th grade Korean group fixed effects. The STEM index is constructed in the following way: first, we extract common variation, using principal component analysis, for nine indicator variables: the choice of the math-science track in 11th grade, self-reporting the desire to seek a STEM postsecondary degree conditional on having decided a major, attending a STEM-oriented high school, and indicator variables for taking six math courses (Math 1, Math 2, Calculus 1, Calculus 2, Geometry & Vector, and Probabilities & Statistics). The first component is the STEM index. Standard errors in parentheses are clustered at school level.

* $p < .10$, ** $p < .05$, *** $p < .01$