A Appendix for "Troubled in School: Does Maternal Involvement Matter for Adolescents?"

A.1 School-Trouble Scale Measures and Factor Loadings

Table A.1. Summary Statistics for Measures of School Trouble

	Mean	SD	Min	Max
GPA	2.761	0.766	1.000	4.000
School Skips	1.620	4.219	0.000	30.000
Trouble with Teachers	0.856	0.959	0.000	4.000
Trouble with Students	0.857	0.978	0.000	4.000
Trouble Getting Homework Done	1.187	1.074	0.000	4.000
Frequency of Fighting	0.455	0.716	0.000	2.000
Been Suspended from School	0.132	0.339	0.000	1.000
Observations	19617			

Table A.2. Factor Loadings for School Trouble Scale

	(1) Baseline	(2) Female	(3) Male	(4) Grade 7	(5) Grade 8	(6) Grade 9	(7) Grade 10	(8) Grade 11	(9) Grade 12	(10) Omit GPA
Negative GPA	0.746	0.772	0.729	0.718	0.737	0.796	0.872	0.764	0.659	
	(0.023)	(0.037)	(0.033)	(0.054)	(0.055)	(0.051)	(0.066)	(0.062)	(0.066)	
Days Skipping School	0.472	0.458	0.525	0.128	0.277	0.468	0.801	0.732	0.823	0.461
	(0.018)	(0.027)	(0.028)	(0.015)	(0.026)	(0.035)	(0.064)	(0.064)	(0.085)	(0.020)
Trouble with Teachers	0.800	0.826	0.832	0.843	0.914	0.774	0.769	0.737	0.800	0.984
	(0.026)	(0.041)	(0.038)	(0.065)	(0.069)	(0.053)	(0.060)	(0.062)	(0.080)	(0.033)
Trouble with Students	0.630	0.739	0.623	0.637	0.634	0.559	0.667	0.622	0.698	0.823
	(0.022)	(0.038)	(0.032)	(0.056)	(0.055)	(0.043)	(0.055)	(0.057)	(0.074)	(0.030)
Home Work Done	0.767	0.758	0.821	0.698	0.839	0.744	0.815	0.753	0.875	0.818
	(0.026)	(0.039)	(0.039)	(0.058)	(0.067)	(0.052)	(0.066)	(0.066)	(0.089)	(0.030)
Fighting	0.576	0.535	0.568	0.508	0.575	0.557	0.620	0.646	0.575	0.639
	(0.019)	(0.027)	(0.029)	(0.044)	(0.047)	(0.040)	(0.051)	(0.054)	(0.059)	(0.023)
Suspension	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Observations	19617	9952	9665	2667	2665	3480	3820	3686	3204	19617

Notes: Standard errors are in parentheses. Each coefficient represents the factor loading for the measurement equation given by the row variable. Column 1 is our primary scale for analysis. The following factor analyses (columns 2-9) are on sub-samples given by the column except in the last column (10) which is on the full sample but drops GPA from the scale.

A.2 Maternal Involvement and Descriptive Statistics

Table A.3. Summary Statistics for Maternal Involvement Items

	Mean	SD	Min	Max
gone shopping	0.728	0.445	0.000	1.000
played a sport	0.086	0.280	0.000	1.000
gone to a religious service	0.382	0.486	0.000	1.000
talked about dating or party you went to	0.470	0.499	0.000	1.000
gone to a movie, play, etc.	0.257	0.437	0.000	1.000
spoke about a personal problem you are having	0.390	0.488	0.000	1.000
had a serious argument about your behavior	0.333	0.471	0.000	1.000
talked about school work or grades	0.640	0.480	0.000	1.000
worked on a project for school	0.135	0.341	0.000	1.000
talked about other things you are doing in school	0.548	0.498	0.000	1.000
Observations	18511			

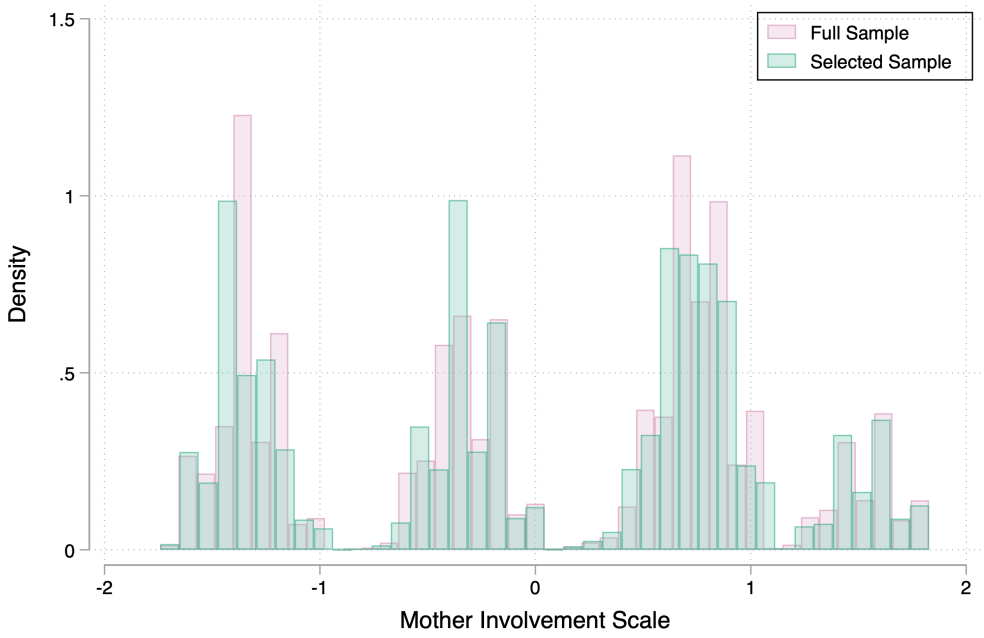
Notes: Each item is a binary yes/no and preceded by the following: "which of these things listed on this card have you done with your mother/adoptive mother/stepmother/foster mother/etc. in the past 4 weeks?"

Table A.4. PCA Rotated Loadings for Involvement Items

	Schooling Related	Activities Related	Communication
gone shopping	-0.000	**0.464**	0.087
played a sport	-0.066	**0.548**	-0.014
gone to a religious service	0.106	0.278	-0.144
talked about dating or party you went to	0.038	-0.007	**0.600**
gone to a movie, play, etc.	-0.024	**0.592**	0.017
spoke about a personal problem you are having	0.085	0.058	**0.569**
had a serious argument about your behavior	-0.113	-0.016	**0.526**
talked about school work or grades	**0.601**	-0.076	0.056
worked on a project for school	**0.463**	0.209	-0.087
talked about other things you are doing in school	**0.623**	-0.059	0.016
Eigenvalue	2.940	1.428	1.232

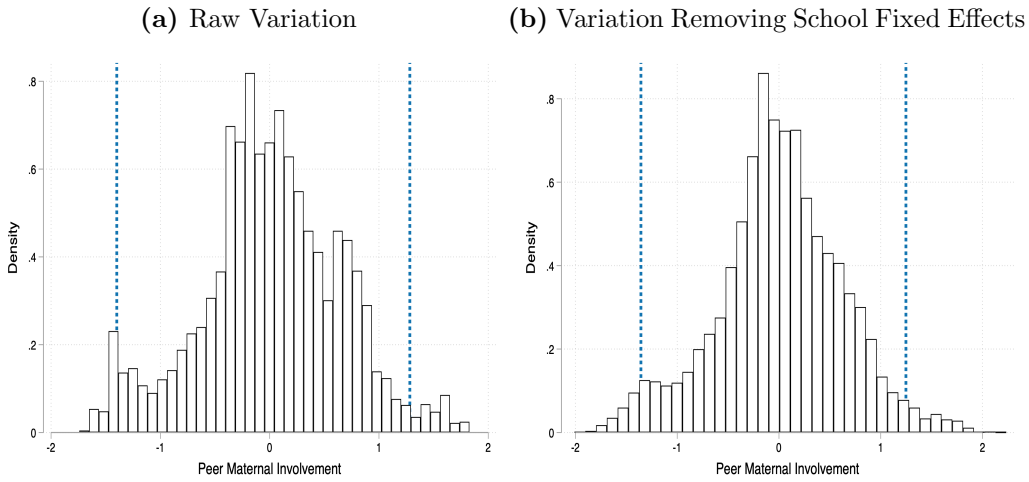
Notes: Three components returned an eigenvalue above 1 (prior to rotation). We use standard orthogonal varimax rotation returning component loadings such that the components are orthogonal to each other. The PCA is conducted using the polychoric correlation matrix for involvement items because of their binary nature. We assign interpretations to the scales (column headers) based on measures with loadings above 0.4 (in bold). We form indexes of maternal involvement by extracting the predicted components based on the rotated loadings of each component.

Figure A.1. Histogram of Mother's Schooling-Related Involvement Scale



Notes: This histogram is based on the school-related scale extracted from the first component of the PCA. The mother involvement scale has been standardized to a mean of zero and a standard deviation of one.

Figure A.2. Distribution of the Instrument: Peer Maternal Involvement



Notes: This figure presents a histogram of the standardized leave-one-out mean for the same school-grade-race-gender-mother's education peer maternal involvement. Panel (a) reports the raw variation in the sample, and panel (b) reports this variation after removal of school fixed effects with the sample mean added back to place it on the same scale as panel (a). Vertical lines denote the 2.5 and 97.5 percentiles.

Table A.5. Summary Statistics for Primary Covariates

	Full Sample	Selected Sample	*p-value*
School-Trouble	0.00	-0.02	0.00
Mother Involvement	0.00	0.01	0.02
Peer Mother Involvement	0.01	0.01	0.36
Mother's Characteristics			
No HS Diploma	0.17	0.16	0.00
HS Diploma	0.29	0.32	0.00
Some College	0.30	0.32	0.00
College Graduate	0.14	0.13	0.00
Post-College Training	0.09	0.07	0.70
Mother's Age	41.93	41.76	0.00
Household Characteristics			
Household Income	46.42	46.70	0.24
Number of Siblings in H.H.	1.46	1.47	0.00
Single Parent Home	0.32	0.29	0.00
Individual Characteristics			
Female	0.51	0.51	0.00
Hispanic	0.17	0.15	0.00
Black	0.22	0.21	0.39
Other	0.09	0.05	0.00
White	0.53	0.60	0.00
Grade-Level 7	0.13	0.14	0.00
Grade-Level 8	0.14	0.14	0.00
Grade-Level 9	0.18	0.18	0.00
Grade-Level 10	0.20	0.21	0.00
Grade-Level 11	0.19	0.19	0.00
Grade-Level 12	0.16	0.14	0.00
Summer Interview	0.33	0.34	0.06

Notes: This Table reports summary statistics for the Add Health In-home wave I survey on the key variables and controls used for the primary analysis. The original wave I in-home sample has 20,745 observations. In creating our dependent variable, we dropped those not in school (395), those aged greater than 19 (85), missing in the school trouble scale measures (412), and outliers in our measure of skipped school days (236). Column 1 as full sample references the sample post-construction of the dependent variable. Thus, there are no missing observations in the school-trouble scale. The selected sample in column 2 drops missing observations in mother's involvement (1,106), school-grade-race-gender-mother's education peer mothers' involvement (5,811), parental survey respondent listed as male (324), and parental survey respondent listed as not the biological mother when the biological mother lives in the home (60).

A.3 School Trouble and Links to Education and Labor Market Outcomes

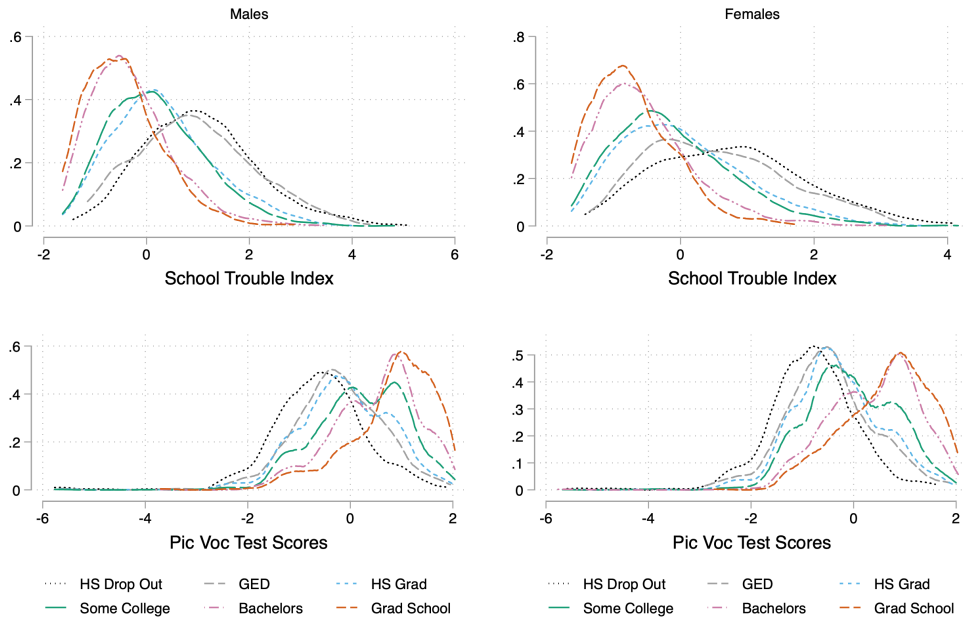
We test whether our school trouble scale links to later life outcomes. Primarily, we are interested in establishing that the patterns in our scale and in the picture vocabulary test scores match the patterns found in the literature for noncognitive and cognitive skills. Additionally, we are interested in testing for evidence that our scale has long-term implications. Table A.6 provides summary statistics for variables used this analysis. It also provides a list of the controls we incorporate in addition to school fixed effects.

Table A.6. Summary Statistics for Variables in Logged Income Analysis

	Mean	SD	Min	Max
Logged Income	10.184	1.027	0.693	13.816
School-Trouble	-0.025	0.987	-1.633	5.101
AH PVT	0.082	0.947	-5.766	2.040
HS Drop Out	0.058	0.233	0.000	1.000
GED or Certificate Holder	0.036	0.185	0.000	1.000
HS Diploma	0.233	0.423	0.000	1.000
Some College	0.344	0.475	0.000	1.000
College Graduate	0.249	0.432	0.000	1.000
Master's Degree or Better	0.080	0.272	0.000	1.000
Age at Wave IV	28.439	1.753	24.000	34.000
Labor Market Experience	8.074	3.572	0.000	17.000
Any Health Limitations	0.089	0.285	0.000	1.000
Census Tract Unemployment Rate	0.079	0.050	0.000	0.615
Urban Living	0.820	0.385	0.000	1.000
Female	0.535	0.499	0.000	1.000
Hispanic	0.152	0.359	0.000	1.000
Black	0.217	0.412	0.000	1.000
Other	0.076	0.265	0.000	1.000
North East Region	0.119	0.324	0.000	1.000
South Region	0.415	0.493	0.000	1.000
West Region	0.237	0.425	0.000	1.000
Midwest Region	0.229	0.420	0.000	1.000
Ever Married	0.500	0.500	0.000	1.000
Number of Children	0.923	1.138	0.000	7.000
Observations	13746			

Figure A.3 displays kernel density plots for school trouble (top panels) and

Figure A.3. Density Plots by Education Level and Gender of School-Trouble and Test Scores



PVT scores (bottom panels), stratified by sex and completed education level. For both males and females, the distributions of school trouble among those who dropped out of high school or received the GED are almost identical. Both groups tend to have higher school-trouble scores than individuals with a high school diploma or higher levels of education. For both males and females, obtaining a bachelor's or graduate degree is associated with the lowest school trouble scores. These results are highly consistent with the distribution of noncognitive skills by education level reported in Heckman et al. (2006) and Heckman et al. (2014).

The bottom panel of Figure A.3 shows that these patterns are reversed for the picture vocabulary test (PVT) scores. The PVT score distributions are similar for GED holders and high school graduates, and both groups tend to have slightly higher scores than high school dropouts. Individuals

with a bachelor's or graduate degree tend to have the highest PVT scores. Heckman et al. (2006), estimating the distribution of a cognitive skill factor with different data, find similar patterns.

In Table A.7, we report estimates from a regression of log wages in wave IV on the school trouble measure, PVT scores and a set of controls. All specifications are estimated using wave IV survey weights stratified by region. The specifications in columns 1-5 differ in the sets of covariates included (e.g., with or without school fixed effects). Columns 6 and 7 contain estimates based on a Heckman selection model for log wages. Across specifications the relation between school trouble and wages is consistently negative and highly significant. The estimates omitting the level of education – columns 1 through 3 – indicate that a standard deviation increase in school trouble is associated with a wage reduction of 14 to 15 percentage points. Including indicators for completed education level at wave IV (in columns 4 and 5), the negative impact is around 8 percentage points. Finally, the estimate from the selection model in column 6 is slightly smaller in magnitude, but still highly significant.

Heckman et al. (2006) estimate the effect of noncognitive and cognitive skills on wages. Our estimates for school trouble and the picture vocabulary test score are similar in magnitude, suggesting that these two variables are reasonable proxies for noncognitive and cognitive skills.[1]

1. The cognitive factor in Heckman et al. (2006) does appear to account for more wage variation than the test score here, which is to be expected because we only use a single test score.

Table A.7. School-Trouble and Wave IV Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
School-Trouble	-0.137***	-0.126***	-0.123***	-0.059***	-0.060***	-0.041***	-0.043***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)
AH PVT		0.116***	0.098***	0.041***	0.041***	0.022	0.018
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
GED or Certificate Holder				0.005	0.007	-0.028	-0.028
				(0.112)	(0.114)	(0.115)	(0.119)
HS Diploma				0.286***	0.286***	0.155**	0.156**
				(0.067)	(0.068)	(0.064)	(0.067)
Some College				0.399***	0.394***	0.213***	0.207***
				(0.076)	(0.077)	(0.075)	(0.077)
College Graduate				0.771***	0.747***	0.520***	0.493***
				(0.076)	(0.076)	(0.076)	(0.076)
Master's Degree or Better				0.931***	0.897***	0.668***	0.622***
				(0.089)	(0.087)	(0.089)	(0.087)
N	11775	11775	11775	11775	11775	13250	13250
R^2	0.116	0.124	0.161	0.165	0.195		
School FE	No	No	Yes	No	Yes	No	Yes

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses. Survey weight gswgt4_2 and strata region are used from the Add Health wave IV weight file. All specifications include controls for gender, ethnicity, age at wave IV, labor market experience, health limitations, the unemployment rate at the tract level from the 2000 census, an indicator for living in an urban area, and indicators for residence in northeast, south, or west of the US. Columns 6 and 7 contain estimates from a Heckman selection model with ever married and number of children excluded from the main equation. 5,491 observations are lost from sample attrition. We condition the sample on those with non-missing observations in all covariates. These are 2 from years of education, 681 from AH PVT, 222 from missing a school indicator, 37 from Hispanic, 18 from black, 15 from other, 26 from labor market experience, 1 from limitations, 6 from unemployment rate, 13 from ever married, and 1 from number of children. Also, we drop 89 observations whose school indicators contained at least less than 15 observations because these proved problematic for the estimation of the selection models with survey weights.

A.4 Additional Baseline Results

Table A.8. Baseline Gaps: Characteristics

	Maternal Involvement		School Trouble	
	(1)	(2)	(3)	(4)
Reference Category EDU: No High School	Ref.	Ref.	Ref.	Ref.
HS Diploma	0.122***	0.105***	-0.134***	-0.137***
	(0.030)	(0.029)	(0.044)	(0.048)
Some College	0.214***	0.194***	-0.171***	-0.184***
	(0.031)	(0.033)	(0.041)	(0.039)
College Graduate	0.296***	0.274***	-0.358***	-0.343***
	(0.037)	(0.039)	(0.054)	(0.054)
Post-College Training	0.365***	0.352***	-0.462***	-0.428***
	(0.040)	(0.045)	(0.054)	(0.056)
Mother's Age	0.001	0.000	-0.003**	-0.003**
	(0.002)	(0.002)	(0.002)	(0.002)
Number of Siblings in H.H.	-0.004	-0.004	-0.014	-0.021**
	(0.009)	(0.009)	(0.009)	(0.008)
Household Income	0.001***	0.000*	-0.000*	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
Single Parent Home	0.078***	0.079***	0.238***	0.220***
	(0.021)	(0.021)	(0.023)	(0.023)
Female	0.114***	0.114***	-0.410***	-0.409***
	(0.016)	(0.017)	(0.019)	(0.017)
Reference Category Race: White	Ref.	Ref.	Ref.	Ref.
Hispanic	0.060*	-0.020	-0.004	0.046
	(0.031)	(0.040)	(0.057)	(0.051)
Black	0.081***	0.048	0.159***	0.128***
	(0.027)	(0.043)	(0.046)	(0.043)
Other	0.016	-0.041	-0.004	-0.084**
	(0.034)	(0.042)	(0.046)	(0.042)
Reference Category Grade: 7th	Ref.	Ref.	Ref.	Ref.
Grade-Level 8	0.012	-0.002	0.030	0.046
	(0.042)	(0.042)	(0.041)	(0.042)
Grade-Level 9	0.015	-0.023	0.119**	0.073
	(0.036)	(0.043)	(0.048)	(0.055)
Grade-Level 10	0.050	0.009	0.024	-0.036
	(0.037)	(0.042)	(0.047)	(0.055)
Grade-Level 11	0.077**	0.038	0.008	-0.047
	(0.036)	(0.041)	(0.051)	(0.056)
Grade-Level 12	0.000	-0.036	-0.093**	-0.149**
	(0.039)	(0.044)	(0.047)	(0.060)
Summer	-0.656***	-0.652***	0.014	0.015
	(0.053)	(0.056)	(0.019)	(0.018)
School FE	No	Yes	No	Yes
N	12316	12316	12316	12316

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses and missing indicators are included for variables and observations where we have imputed. We do not include the instrument in the maternal involvement regressions, and we do not include maternal involvement in the school trouble regressions. This table reports the gaps for categorical variables in maternal involvement and school trouble by our baseline control set from OLS regressions. For continuous variables or those we treat this way, i.e., mother's age, number of siblings, and household income, we report the slope coefficients. Note that the reference group for mother's education level is no high school and the reference group for own-race/ethnicity is white.

Table A.9. School Trouble and Mother's Involvement: Full Results

	OLS	First-Stage	2SLS		
	(1)	(2)	(3)	(4)	(5)
Mother's Involvement	-0.109***		-0.474**		
	(0.010)		(0.224)		
Peer Mothers' Involvement		0.069***			
		(0.019)			
Mother's Involvement (Act.)				-0.488**	
				(0.239)	
Mother's Involvement (Comm.)					-0.203
					(0.289)
HS Diploma	-0.126***	0.099***	-0.087*	-0.071	-0.142***
	(0.047)	(0.028)	(0.052)	(0.061)	(0.048)
Some College	-0.163***	0.183***	-0.092	-0.075	-0.179***
	(0.038)	(0.031)	(0.059)	(0.072)	(0.040)
College Graduate	-0.313***	0.256***	-0.213***	-0.179*	-0.342***
	(0.052)	(0.037)	(0.080)	(0.097)	(0.054)
Post-College Training	-0.390***	0.330***	-0.261***	-0.243**	-0.425***
	(0.053)	(0.042)	(0.093)	(0.111)	(0.056)
Mother's Age	-0.003**	0.000	-0.003**	-0.006***	-0.006
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)
Number of Siblings in H.H.	-0.021**	-0.004	-0.023**	-0.018**	-0.029**
	(0.008)	(0.009)	(0.009)	(0.009)	(0.014)
Household Income	-0.001**	0.000*	-0.000	-0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Single Parent Home	0.229***	0.080***	0.258***	0.210***	0.262***
	(0.023)	(0.021)	(0.030)	(0.024)	(0.064)
Female	-0.396***	0.106***	-0.355***	-0.311***	-0.320***
	(0.018)	(0.016)	(0.029)	(0.051)	(0.124)
Hispanic	0.044	-0.018	0.037	0.038	0.018
	(0.050)	(0.038)	(0.048)	(0.055)	(0.064)
Black	0.134***	0.041	0.151***	0.103**	0.091
	(0.044)	(0.040)	(0.054)	(0.046)	(0.067)
Other	-0.089**	-0.036	-0.104***	-0.131***	-0.159
	(0.041)	(0.039)	(0.037)	(0.047)	(0.109)
Grade-Level 8	0.046	-0.001	0.045	-0.006	0.077
	(0.041)	(0.039)	(0.040)	(0.044)	(0.064)
Grade-Level 9	0.071	-0.019	0.063	-0.066	0.135
	(0.055)	(0.041)	(0.053)	(0.085)	(0.109)
Grade-Level 10	-0.035	0.011	-0.032	-0.245**	0.044
	(0.054)	(0.039)	(0.054)	(0.116)	(0.137)
Grade-Level 11	-0.043	0.038	-0.029	-0.306**	0.064
	(0.055)	(0.039)	(0.056)	(0.138)	(0.180)
Grade-Level 12	-0.153**	-0.031	-0.166***	-0.428***	-0.027
	(0.059)	(0.041)	(0.056)	(0.146)	(0.197)
summer	-0.056**	-0.650***	-0.294**	0.057**	0.012
	(0.023)	(0.056)	(0.150)	(0.029)	(0.020)
miss_page	0.019	0.213**	0.098	0.016	0.023
	(0.111)	(0.102)	(0.124)	(0.111)	(0.126)
miss_phhinc	-0.017	-0.007	-0.020	0.010	-0.029
	(0.022)	(0.027)	(0.025)	(0.026)	(0.029)
miss_hispanic	-0.112	-0.029	-0.130	-0.213	-0.101
	(0.160)	(0.210)	(0.166)	(0.184)	(0.174)
miss_other	-0.024	-0.218	-0.110	0.147	-0.085
	(0.279)	(0.568)	(0.429)	(0.399)	(0.264)
N	12316	12316	12316	12316	12316
K-P F			13.461	8.174	7.094
AR Weak IV Robust p			0.015	0.019	0.431

Table A.10. School-Trouble (no GPA) and Maternal Involvement

	(1)	(2)	(3)
Mother's Involvement (School)	-0.461**		
	(0.225)		
Mother's Involvement (Act.)		-0.425*	
		(0.234)	
Mother's Involvement (Comm.)			-0.217
			(0.302)
School FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
N	12316	12316	12316
K-P F	13.461	8.174	7.094
AR Weak IV Robust p	0.020	0.042	0.417

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level. All specifications include school fixed effects, our base set of controls, and missing indicators for missing observations in our control set. This table reports 2SLS results corresponding to the results in main-text Table 1 but omitting GPA from the school-trouble scale.

A.5 Balancing Tests for Selection Checks

In Table A.11, we further check against selection effects via balancing tests on our observable controls that are not part of the peer reference group definition. Under an assumption of no selection effects conditional on school fixed effects we expect peer mothers' involvement to be uncorrelated with these controls. To properly conduct the test, it is important that we control for both the school fixed effects and the variables used in defining the reference group. For example, mother's education is likely correlated with these variables and by definition is correlated with our peer reference group.

Table A.11. Selection Robustness Checks: Balancing Tests

	(1) Single Parent Home	(2) Number of Siblings in H.H.	(3) Log H.H. Income	(4) Mother's Age	(5) AH PVT	(6) First Born	(7) Birth Weight	(8) Peers Low Trouble	(9) Peers High Trouble
Peer Mothers' Involvement	-0.016	0.001	0.000	0.001	0.011	-0.001	-0.000	0.001	-0.022
	(0.013)	(0.005)	(0.000)	(0.001)	(0.007)	(0.012)	(0.000)	(0.080)	(0.098)
School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ref. Group Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12316	12316	12316	12316	12316	12316	12316	12316	12316
Mean	0.287	1.475	46.702	41.756	0.074	0.492	117.294	0.086	0.067

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses and are clustered at the school level. We regress peer mother's involvement on each column header. We impute where this variable is missing and control for a missing indicator. All specifications include school fixed effects and controls that define the peer reference group grade-level indicators, race indicators, gender, and mother's education indicators. These are necessary as otherwise they may induce mechanical correlation. Also, for the share of SGRGE peers with low trouble and the share of SGRGE peers with high trouble we also control for the leave-one-out mean of peer school trouble as omitting it may induce correlation between our IV and these shares that is actually between the IV and the mean. The row for with means reports the means of the variable in the column header.

We run our balancing tests over each of the column headers in Table A.11. We regress the instrument, peer mothers' involvement at our specified reference group, on each of these variables, the reference group controls, and school fixed effects.[2] In each case, we find peer mothers' involvement to be insignificant and near zero consistent with the our instrument being as good

2. To maintain our baseline sample, we impute the column header and control for a missing indicator where needed.

as randomly assigned conditional on school fixed effects.

A.6 Mother's Religious Denomination Category Definitions

We draw these categorizations from Fruehwirth et al. (2019) whose primary reference group for defining their instrument is at the same school-grade-race-gender-denomination level. One key difference is that we use the mother's report of her religious denomination since our focus is on mother involvement. In main-text Section 4.2.2, we use mother's religious denomination to redefine our peer reference group at the same school-grade-race-gender-mother's denomination as a robustness check.

Table A.12. Mother's Religious Denomination Category Definitions

	Included Religions	Percent Full Sample
None		6.47%
Catholic	Catholic	30.76%
Liberal Protestant	Episcopal, Friends/Quakers, Methodist, Presbyterian, Unitarian	12.36%
Moderate Protestant	Christian Church (Disciples of Christ), Lutheran, other Protestant	13.91%
Conservative Christian	Adventist, AME, AME Zion, CME, Assemblies of God, Christian Science, Jehovah's Witness, Congregational, Holiness, Latter Day Saints (Mormons), Pentecostal, Baptist	36.50%
Set to missing if	Buddhist, Eastern Orthodox, other religion, Hindu, Islam, Moslem, Muslim, Jewish	3.60%

A.7 Alternative Forms of Mother's Involvement

We aim to examine whether peer mothers' schooling-related involvement affects alternative forms of maternal involvement. If this is the case, the exclusion restriction may be violated. In Table A.13, we report the first-stage estimates from regressing alternative forms of mother's involvement on the peer mothers' average schooling-related involvement. Column 1 repeats the

baseline first-stage. Column 2 reports estimates from regressing the activities scale on peer mothers' schooling-related involvement and our baseline controls, and column 3 repeats this using the communication scale. We find no evidence that peer mothers' involvement at our selected SGRGE reference group and based on primary schooling-related scale is related to either of the two additional scales.

Table A.13. First-Stage: Schooling-Related IV and Alternative Scales

	Schooling-Related Scale	Activities Scale	Comm. Scale
Peer Mothers' Involvement	0.069***	0.014	0.007
	(0.019)	(0.014)	(0.016)
N	12316	12316	12316

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level. Peer mother involvement is held at the average of schooling-related scale amongst the same school-grade-race-gender-mother's education reference group. All specifications include school fixed effects, our base set of controls, and missing indicators for missingness in control variables. The schooling-related scale corresponds to the first component of the PCA based on the rotated loadings – our preferred involvement scale we focus on throughout. The activities scale corresponds to that used in column 5 of the main-text table 1 and the communication (comm.) scale to that used in column 6 of main-text table 1.

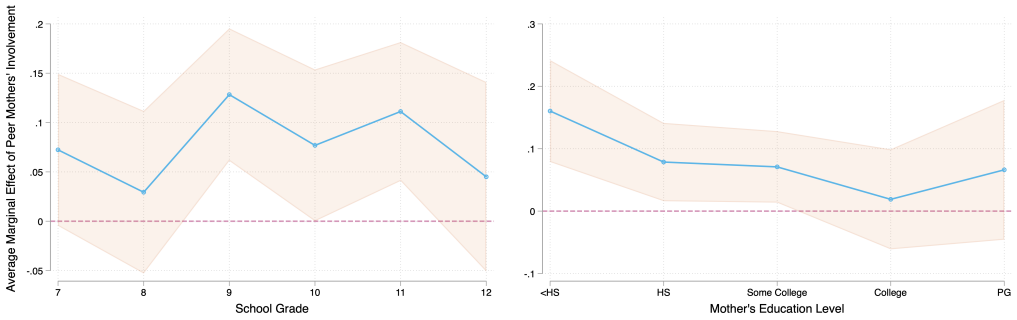
A.8 Heterogeneity Results

In the left panel of Figure A.4, we report the average marginal effect of peer mothers' involvement on a mother's involvement at each grade-level. The confidence intervals are quite wide because the sample sizes by grade-level are relatively small. Nevertheless, we see no clear heterogeneity across grades. In the right panel we report similar results stratified by the mother's education level. The pattern provides no evidence that the baseline first-stage estimate is driven by mothers with greater education levels. If anything, the

point estimates suggest that mothers with less education respond more to peer mothers' involvement.

Figure A.4. Heterogeneity: Mother's and Peer Mother's Involvement

(a) By Grade **(b)** By Maternal Education



In Table A.14, we explore heterogeneity in the effect of mother's involvement across grade level and mother's education. In column 1, we interact mother's involvement with a grade-level variable – where grade 7 is normalized to 1 and so on – and instrument this interaction with the interaction between our main instrument and grade level. The interaction effect is not significant. In this specification, however, the instruments are weaker: the K-P F statistic is nearly 8, although we do pass the AR weak instrument robust test that the effects of mother's involvement and its interaction are jointly equal to zero. To probe this question further, we restrict the sample by dropping middle schoolers. In column 2, we find that the effect of mother's involvement is similar to the baseline result. Thus, our results are at least not driven by the 7th and 8th graders in the data.

In columns 3 and 4, we turn to test for heterogeneity by mother's education-level. In column 3, we interact mother's involvement with mother's education and again instrument it with the interaction of our instrument and mother's education. The results here suggest a strong effect of involvement that declines as mother's education increases. In other words, a substantial part of

Table A.14. Heterogeneity by Grade Level and Mother's Education

	(1)	(2)	(3)	(4)
Mother's Involvement	-0.320	-0.417**	-0.679***	-0.501**
	(0.413)	(0.199)	(0.213)	(0.222)
Mother's Involvement × Grade	-0.028			
	(0.097)			
Mother's Involvement × Education			0.208*	
			(0.111)	
N	12316	8866	12316	9810
K-P F	7.994	17.542	2.821	12.631
AR Weak IV Test	0.045	0.027	0.002	0.006

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level. All specifications include the full set of controls and school fixed effects. In column 1, the instruments are peer mother involvement and its interaction with grade-level. Grade-level here is shifted such that grades 7-12 are represented by values of 1-6. We instrument both mother involvement and its interaction with grade-level. In column 3, we follow a similar approach for mother's education level. In column 2, we restrict the sample to those in 9th grade or above (in high school). In column 4, we restrict the sample to observations with mother's who have less than a college degree.

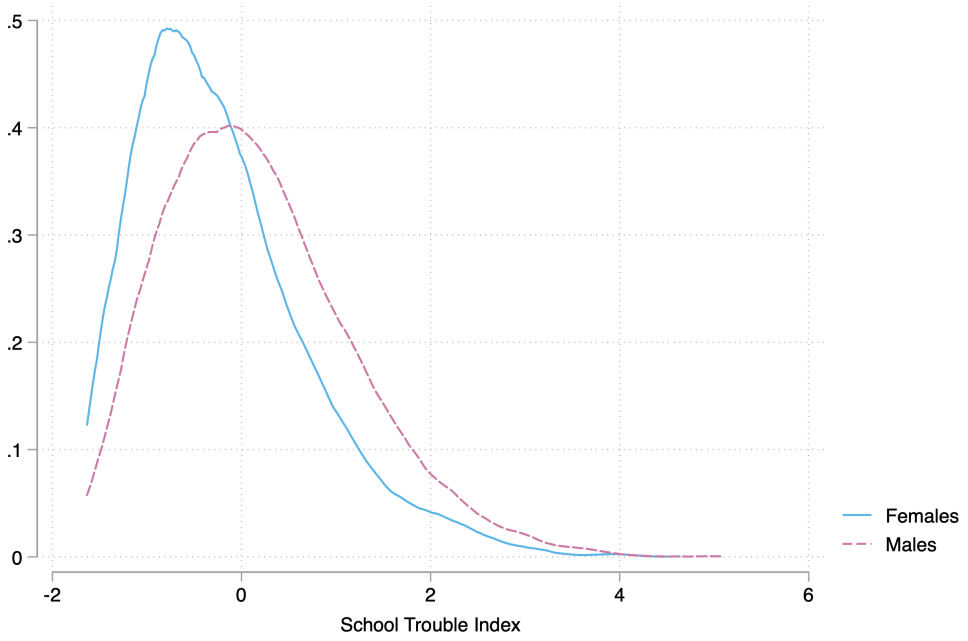
our baseline estimate may be driven by mothers with less than a completed college education. Weak instruments, however, may again be a problem and we caution against drawing strong conclusions. Nevertheless, we pass the AR weak IV test.

In column 4, we restrict the sample to mothers with less than a completed college education.Here the K-P F is near 10 and the effect of mother's involvement remains very close to our baseline estimate. Overall, these results suggest that for mothers with less education, schooling-related involvement can indeed be effective. One potential explanation is that adolescents from less educated households are more likely to experience trouble in school and thus represent the individuals likely to receive the most benefit from intervention by the mother.

Finally, we examine heterogeneity across gender. Figure A.5 shows that males in general exhibit much more school trouble. To test for heterogeneity by gender, we interact gender with mother's involvement and instrument

the interaction with an interaction between our instrument and gender. One concern is that the interaction instrument may be too correlated with peer mothers' involvement itself to effectively identify the gender-specific effects of involvement on school trouble. Also, because our instrument is not very strong, splitting the sample by gender may reduce the sample size too much. Thus, we explore the interaction of mother's involvement with a female indicator for different constructions of the peer reference group. First, we keep our original reference group definition. Second, we drop gender, defining the reference group by school, grade, race (SGR) and mother's education. Third, we refine the SGR peer group further, by matching on the mother's religious denomination. This further reduces the sample size ($N = 11,299$). And, fourth, we use the SGR and mother's religious denomination reference group and the instrument at our original definition to obtain multiple instruments and overidentification.

Figure A.5. School-Trouble Empirical Density Plots by Gender



In Table A.15, we report the results. In column 1, using our instrument and its interaction with a female indicator, we find no evidence for a differential effect. In column 2 and 3, we redefine the peer reference group and find similar results. The estimated effects of involvement are similar in magnitude but less precise. The interactions are not significant and the K-P F statistics remain small. In column 4, we use the SGR-mother's religious denomination reference group and its interaction with female as instruments, in addition to our baseline instrument (and its interaction with gender). The estimates are again similar to the baseline results.

With multiple instruments, the K-P F increases but only slightly. We also report a range of weak instrument robust tests and find that in general we can reject the null that mother's involvement and its interaction with female are jointly equal to zero. Thus, overall the evidence here consistently points to a lack of heterogeneity by gender in the effect of involvement.

Table A.15. Heterogeneity by Gender

	(1) Original IV	(2) SGR-Mother's EDU IV	(3) SGR-Mother's RD	(4) Multiple IVs
Mother's Involvement	-0.438**	-0.569*	-0.631*	-0.566**
	(0.174)	(0.315)	(0.344)	(0.231)
Mother's Involvement × Female	0.093	0.130	0.155	0.145
	(0.227)	(0.204)	(0.215)	(0.207)
Female	-0.369***	-0.357***	-0.345***	-0.352***
	(0.025)	(0.035)	(0.041)	(0.028)
N	12316	12316	11299	11299
K-P F	2.747	3.281	4.071	6.059
AR Weak IV Test	0.020	0.061	0.128	0.065
CLR Weak IV Test				0.017
Lagrange K Weak IV Test				0.027
Over-ID p-value				0.775

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses and are clustered at the school level. All specifications include the full set of controls and school fixed effects. Each specification includes two endogenous variables: mother's involvement and its interaction with female. Column headers indicate the instrument employed. In each case, the instrument set is the main IV and its interaction with female.Original IV is the average of mother's involvement at our primary reference group level: the same school-grade-race-gender-mother's education. SGR-Mother's EDU cuts gender from the reference group definition and is the same school-grade-race-mother's education level. SGR-Mother's RD defines the reference group at the same school-grade-race-mother's religious denomination. Some additional observations are lost using this reference group. Multiple IVs employs the SGR-Mother's RD, its interaction with female, and our original reference group definition to obtain overidentification. Weak IV robust tests are tests of that the effect of mother's involvement and its interaction with female are jointly equal to zero. CLR is the conditional likelihood ratio test. Lagrange K is the Lagrange Multiplier test.

A.9 Variable Definitions for Mechanism Section

Table A.16. Variable Definitions for Aspirations and Mental Health

Variable definitions for college attitudes and mental health	
College Attitudes	Construction: Normalized sum of scales
Scale: (1-5) higher is better. 1. How much do you want to go to college? 2. How likely is it that you will go to college?	
CES-D	Construction: Normalized sum of scales
How often was each of the following things true during the past week? Scale: (0-3) Higher is more often. Positive feelings recoded to keep scale consistent 1. You were bothered by things that usually don't bother you. 2. You didn't feel like eating, your appetite was poor. 3. You felt that you could not shake off the blues, even with help from your family and your friends. 4. You felt that you were just as good as other people. 5. You had trouble keeping your mind on what you were doing. 6. You felt depressed. 7. You felt that you were too tired to do things. 8. You felt hopeful about the future. 9. You thought your life had been a failure. 10. You felt fearful. 11. You were happy. 12. You talked less than usual. 13. You felt lonely. 14. People were unfriendly to you. 15. You enjoyed life. 16. You felt sad. 17. You felt that people disliked you. 18. It was hard to get started doing things. 19. You felt life was not worth living.	
Self-Esteem	Construction: Normalized sum of scales
Four item scale (1-6 each variable). Higher values indicate higher esteem. 1. You have a lot of good qualities. 2. You have a lot to be proud of. 3. You like yourself just the way you are. 4. You feel like you are doing everything just about right.	
Suicidal Ideation	Binary (Yes, No)
During the past 12 months, did you ever seriously think about committing suicide?	

Table A.17. Variable Definitions for Parenting Style Variables

Family Warmth	Construction: Normalized sum of scales
Scale: (1-5) higher is better.	
1. How much do you feel that your parents care about you?	
2. How much do you feel that you and your family have fun together?	
3. How much do you feel that your family pays attention to you?	
Control	Sum of Yes, No questions then normalized
Scale: flipped ordering so that =1 implies more control	
1. Do your parents let you make your own decisions about the time you must be home on weekend nights?	
2. Do your parents let you make your own decisions about the people you hang around with?	
3. Do your parents let you make your own decisions about what you wear?	
4. Do your parents let you make your own decisions about how much television you watch?	
5. Do your parents let you make your own decisions about which television programs you watch?	
6. Do your parents let you make your own decisions about what time you go to bed on week nights?	
7. Do your parents let you make your own decisions about what you eat?	
Autonomy Granting	Scale: 1-5 (5 is higher) and standardized
1. Your mother encourages you to be independent	

A.10 Peer Effects and Bias

In this section, we elaborate on the possibility of bias in the IV estimates of Table 1 and Table 3 when a peer effect in school trouble is present. Consider the following model, where, for simplicity, we ignore the presence of other covariates:

$$Y_i = aD_i + bX_i + e_i. \tag{1}$$

Here, Y_i is school trouble, D_i is mother's involvement and X_i is peer average school trouble. We assume that Z_i is an instrument for D_i that satisfies the exogeneity condition $E(Z_i e_i) = 0$. In particular, since Z_i is peer mothers' involvement, it is reasonable to expect that Z_i and X_i are correlated, so that $E(Z_i X_i) \neq 0$. We now consider IV estimates of a from two approaches: (1) Regress Y_i on D_i, using instrument Z_i; and (2) Regress Y_i on D_i and X_i, using Z_i as instrument for D_i. These approaches roughly correspond to the estimates in Tables 1 and 3, respectively. If there is a peer effect in school trouble, then $b \neq 0$, and approach (1) will suffer from omitted variable bias. Approach (2) will also result in biased estimates of a and b if X_i is endogenous.

The estimator of a under approach (1) is $\hat{\alpha} = [\sum_{i=1}^{n} Z_i D_i]^{-1} \sum_{i=1}^{n} Z_i Y_i$. Asymptotically, under standard assumptions, it follows that

$$\hat{\alpha} \xrightarrow{p} a + \frac{E(Z_i X_i) b}{E(Z_i D_i)}. \tag{2}$$

If X_i does not measure a relevant margin of peer effects, then $b = 0$ and $\hat{\alpha}$ is (asymptotically) unbiased. This is one of our identifying assumptions discussed in Section 3. If, on the other hand, X_i is a relevant margin of a peer effect, then presumably $b > 0$. From the first-stage, $E(Z_i D_i) > 0$. It is reasonable to expect (and this can be checked empirically) that increased involvement among peer mothers leads to less school trouble among the adolescent's peers, so that $E(Z_i X_i) < 0$. It follows from (2) that the bias in $\hat{\alpha}$ is negative. We demonstrate this in Figure A.6, where we report $\hat{\alpha}$

fixing the value of b over a grid and estimating a 2SLS regression at each grid point using our specification from Table 3, column (3). Indeed, a true positive effect from peer mean school trouble would lead to smaller estimates of the effect of maternal involvement. Thus, for our baseline estimates to be consistent, we require that either $E(Z_i X_i) = 0$, which is not true, or that the effect from the peer mean of school trouble is null. Note that our simulated results do suggest that our conclusion about the effect of maternal involvement on school trouble is qualitatively robust even if there is a fairly large and positive true effect from peer mean school trouble. Our evidence from Table 3, where we include different measures of peer school trouble, strongly suggests that the effect of the peer mean is null or small in size.

Now, we consider approach (2). Let $(\tilde{a}, \tilde{b})$ be the estimator of (a, b) under approach (2). The estimator can be written as

$$\begin{pmatrix} \tilde{a} \\ \tilde{b} \end{pmatrix} = \left[\sum_{i=1}^{n} \begin{pmatrix} Z_i D_i & Z_i X_i \\ X_i D_i & X_i^2 \end{pmatrix} \right]^{-1} \sum_{i=1}^{n} \begin{pmatrix} Z_i Y_i \\ X_i Y_i \end{pmatrix}.$$

If (a^*, b^*) is the probability limit of $(\tilde{a}, \tilde{b})$, then

$$\begin{pmatrix} a^* \\ b^* \end{pmatrix} = \begin{pmatrix} a \\ b \end{pmatrix} + \begin{bmatrix} E(Z_i D_i) & E(Z_i X_i) \\ E(X_i D_i) & E(X_i^2) \end{bmatrix}^{-1} \begin{bmatrix} E(Z_i e_i) \\ E(X_i e_i) \end{bmatrix}. \tag{3}$$

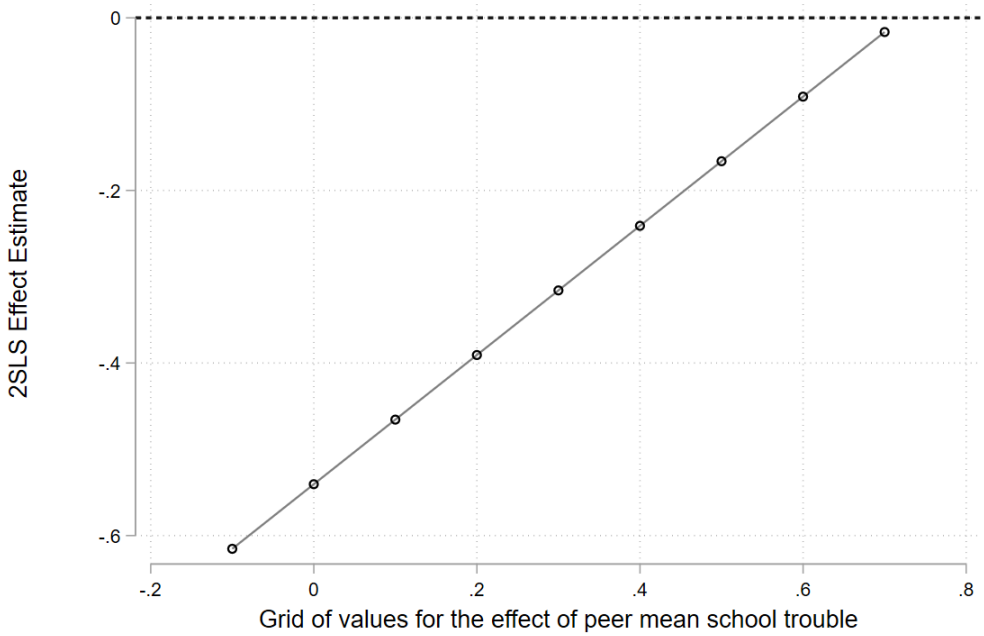
Assuming, as before, that $E(Z_i e_i) = 0$, it now follows that

$$\tilde{a} \xrightarrow{p} a^* = a - \frac{E(Z_i X_i) E(X_i e_i)}{E(Z_i D_i) E(X_i^2) - E(Z_i X_i) E(X_i D_i)}. \tag{4}$$

Equation (4) shows that $\tilde{a}$ is biased due to the correlation between Z_i and X_i and the endogeneity of X_i, regardless of whether b is zero or not. If $b = 0$, then $\hat{a}$ in (2) is unbiased, whereas $\tilde{a}$ in (4) remains biased.

Considering the standard errors of $\hat{a}$ and $\tilde{a}$ in Tables 1 and 3, both estimates are essentially the same. If $\hat{a}$ and $\tilde{a}$ are close to their probability

Figure A.6. Simulated 2SLS Results Fixing b



Notes: Plotted y-axis values are 2SLS estimates for the effect of maternal involvement on school trouble fixing the value of b for the effect of peer mean school trouble to a value given by the x-axis.

limits, then the bias terms in equations (2) and (4) are roughly the same. This implies that b satisfies

$$b \approx -\frac{E(Z_i D_i)E(X_i e_i)}{E(Z_i D_i)E(X_i^2) - E(Z_i X_i)E(X_i D_i)}.$$

In other words, if one is concerned that our baseline estimates are biased, then all peer effect robustness checks corresponding to Table 3 yield more or less the same amount of bias. Our stylized example here shows that this only happens if the peer effect (b) has a very specific magnitude, which seems unlikely. Instead, the estimates of b in Table 3 suggest that the effect

of peer average school trouble is very close to zero, mitigating the concern that the baseline estimate of a in Table 1 is biased. Moreover, the robustness of the estimates of a in Table 3 combined with Equation 4 suggest that the endogeneity of X_i, as measured by $E(X_i e_i)$, is limited in terms of its potential to induce bias.

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