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TROUBLED IN SCHOOL: DOES MATERNAL INVOLVEMENT MATTER FOR ADOLESCENTS?

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Troubled in School: Does Maternal Involvement Matter for Adolescents?

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Abstract

We estimate the causal effect of mother's involvement on the amount of trouble an adolescent experiences in school. We use multiple measures of school-trouble and factor analysis to construct a composite and then link this composite with noncognitive skills. Our measure of mother's involvement encompasses discussing school-related matters and providing help with school projects. Using an instrumental variable constructed from a suitably chosen peer group, our main finding is that an increase in maternal involvement leads to a significant decrease in school trouble. We find this result to be robust across a large number of sensitivity tests designed to account for possible selection effects, shocks at the peer group level, and further potential violations of the exclusion restriction. Additionally, we present evidence suggesting that the effect of maternal involvement may operate through its effect on adolescents' college aspirations, mental health, and the perception of parental warmth.

Keywords: noncognitive skills, maternal involvement
JEL Codes: C26, I31, J13, J31

1 Introduction

Despite significant policy efforts in the U.S. to increase parental involvement, empirical evidence about the causal effects of involvement remains limited (Avvisati et al. 2010).[1] In the fields of education and psychology, there is a large literature regarding the effects of parental involvement on children's academic achievement. Studies in these areas, however, have generally not been able to address the issues of endogeneity and reverse causality, and the results they present are therefore not necessarily causal (e.g., Jeynes 2007; Boonk et al. 2018). In economics, there is a more recent focus studying the impact of parental involvement on child development and inequality. The research to date suggests parental investments during early childhood are important for a child's skill acquisition (Heckman and Mosso 2014). Much less is known about the efficacy of investments during adolescence. The main contribution of our paper is to provide new causal evidence on the effect of maternal involvement on adolescent skill development.

Many theoretical and empirical studies in economics have emphasized the important role of noncognitive or "soft" skills. Examples of such skills include perseverance, impulse control, trust, empathy, goal setting and team-work (Heckman and Kautz 2014). Noncognitive skills yield returns in the labor market that have been rising in the recent past and are associated with future life success across numerous dimensions (Heckman and Kautz 2012; Deming 2017). Moreover, the limited evidence currently available implies that these skills may remain the most malleable into adolescence (Heckman and Mosso 2014; Hoeschler et al. 2018).

Our second contribution is related to the outcome that we study. We construct a measure of the trouble an adolescent experiences in school, using data from the National Longitudinal Study of Adolescent to Adult Health

1. The No Child Left Behind Act of 2002 and the Every Student Succeeds Act of 2015 are good examples as both require States to promote parental involvement.

(Add Health).[2] In our analysis, we consider low levels of trouble in school equivalent to high levels of (a form of) noncognitive skills, and vice versa. We use follow up waves of the survey to examine the association between school trouble and subsequent education and wage outcomes. Our results are similar to the associations between noncognitive skills and later-in-life outcomes found elsewhere in the literature and suggest that our measure of school trouble accounts for a significant component of noncognitive skills.

Our study provides a better understanding of the role mothers play in noncognitive skill development among adolescents. We focus on mothers for a number of reasons. First, previous studies have highlighted the importance of maternal investments during early childhood and the link between mother's education and child development (Heckman and Mosso 2014; Carneiro et al. 2013). Second, we use data from the Add Health parental survey, which focused primarily on mothers because they were expected to be the most involved in their children's day-to-day lives. Third, survey data was missing for fathers much more often than for mothers. In our robustness checks, we do test against potential bias from involvement by fathers and find a high degree of robustness in our estimate for involvement by mothers.

To address endogeneity in the relation between maternal involvement and school trouble, we propose an approach akin to that in Fruehwirth et al. (2019). They use variation within schools across an appropriately defined peer reference group to identify the effect of religiosity on mental health. In our study, we draw on evidence that parenting advice from social circles and families tends to be weighted more heavily than advice from experts (Kalil

2. The Add Health study was designed by J. Richard Udry, Peter S. Bearman and Kathleen Mullan Harris, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining the restricted-use data files should contact Add Health, The University of North Carolina at Chapel Hill, Carolina Population Center, 206 W. Franklin Street, Chapel Hill, NC 27516-2524 (addhealth_contracts@unc.edu)

2015). Thus, we expect that mothers are more likely to respond to a peer group of mothers with similar education levels and who have children with the same exogenous characteristics (race, gender, school and grade). We therefore use peer mothers' involvement as an instrumental variable.

Our baseline estimates show that an increase in maternal involvement leads to a significant reduction in the adolescent's school trouble. This effect is obscured by a standard OLS regression, which yields a very small effect estimate but one that may be biased toward zero by responses to poor behavior (e.g., McNeal 2012).[3] Our evidence implies that continued maternal involvement beyond early childhood is important for skill development during adolescence. We conduct a large number of sensitivity analyses—aimed at detecting possible violations of the exclusion restriction—and find that our baseline estimates remain robust.

We also examine several mechanisms that may explain the influence of maternal involvement during adolescence. First, maternal involvement may change the adolescent's aspirations for future education. This would be consistent with theory that positions involvement as an effort to shift a child's choice set towards a more forward looking perspective (Doepke et al. 2019). Second, we examine whether involvement might affect the adolescent's mental health. Third, parenting style, and children's perceptions thereof, have been identified as an important factor determining child outcomes (Jeynes 2007; Doepke et al. 2019). We consider the effect of maternal involvement on the adolescent's perceptions of warmth, control and autonomy, which are three salient dimensions of parenting style (Steinberg et al. 1992; Marchant et al. 2001). Our evidence suggests that involvement is linked to mechanisms within the home that shift adolescent aspirations and, to a lesser extent, mental health and perceptions of warmth in the relationship with parents.

The remainder of this paper is organized as follows. In Section 2 we

3. Becker and Tomes (1976) present theoretical predictions in line with either enhancement or response. We discuss these implications further in section 4.

briefly review some of the relevant literature on parental involvement. This topic has been extensively studied in sociology, education and developmental psychology, but for conciseness we restrict our review to the literature in economics. Section 3 discusses the data and construction of the school trouble variable and mother's involvement. We outline our empirical strategy in Section 4 and present results in Section 5. Finally, Section 6 concludes.

2 Related Literature

For some time economists have recognized the importance of family background in determining a wide range of outcomes, yet it has only been recently that attention has turned toward how parents and their actions matter for children and adolescents (Björklund and Salvanes 2011; Heckman and Mosso 2014). Reasons for this include the difficulty of dealing with endogeneity—for example, because of unobserved parent and family characteristics or simultaneity between parental action and children's behavior—and a lack of adequate data. A standard finding in the literature is that in a basic regression much of the correlation between parental action and their child outcomes disappears once family background is controlled for (Avvisati et al. 2010). Moreover, Avvisati et al. (2010) find that programs in the U.S. targeted at increasing parental involvement are often found to result in negligible returns. Many of these studies, however, were based on small samples or unable to address endogeneity concerns and identify a causal effect.

In contrast, studies on the development of cognitive and noncognitive skills generally find parental investments are critically important for skill production during early life (Heckman and Mosso 2014). A number of studies have explored the relation between "home inputs," including forms of parental involvement and resources at home, and child outcomes. Todd and Wolpin (2007) find past and present home inputs matter for student test scores. Cunha and Heckman (2008) and Cunha et al. (2010), focusing on children 6 to 13 years old, find parental inputs play a role in cognitive skill

formation at early ages while continuing to affect noncognitive skills at later ages.

Elsewhere, Aizer (2004) and Welsch and Zimmer (2008) both focus more narrowly on involvement as measured by after school supervision. Aizer (2004) finds that supervision reduces antisocial behaviors, whereas Welsch and Zimmer (2008) find no effect of supervision on test scores. Kalb and Ours (2014) turn attention toward parental reading on reading ability among young children in Australia and find a large positive impact. Similarly, Price (2010) finds a substantial and positive impact of mothers' reading aloud to their child on reading scores.

One of the few experimental studies is Avvisati et al. (2014) who analyze a field experiment with sixth graders in disadvantaged Parisian schools. The intervention under study aimed to promote parental involvement both in school and at home. Parents in the treatment group increased school- and home-based involvement. Further, their children experienced significant treatment effects, especially in terms of reducing truancy and the number of disciplinary infractions.

Recent theoretical work has linked the role of parental effort in the early life of a child, through investments, with a broad set of parenting strategies and the child's later choice of effort and eventual human capital attainment (Doepke et al. 2019). This literature incorporates the typology of parenting *style* from developmental psychology—where parents are classified as permissive, authoritative or authoritarian—into an economic model and examines how style responds to varying economic conditions.

One particular implication is that the use of strict supervision and control as a method to direct a child toward a given outcome (e.g., occupational choice) can result in a mismatch between the child's talents and abilities and their subsequent choices. Parental investments in the form of effort and involvement can help avoid this by teaching the child noncognitive skills, such as patience, and allow them greater freedom to match their abilities

to choices in the future (Doepke et al. 2019). However, much of the focus in both theory and empirical analysis has been on involvement during early life. Less is known about how involvement may matter for skill development during adolescence.

3 Data and Variables

3.1 Data Description

For this study we use the National Longitudinal Study of Adolescent to Adult Health (Add Health). Add Health began in 1994 as a nationally representative sample of adolescents in the U.S. The study was split between an in-school survey and an in-home survey. The in-home survey is a subset of 20,745 adolescent students out of the 90,000 in-school participants. The in-home group has been followed through four waves, with the wave IV sample aged 26-32.

At wave I for the in-home sample, Add Health also conducted a parent survey. The mother was the targeted respondent. If the biological mother was not in the home, then the next mother figure was requested before the father. The expectation was that mothers would be more involved with the children's school and other activities and be able to provide more detail. We draw on this survey for several important measures on mothers.

The in-home sample provides rich information about the participants' home, social, and school life during the adolescent years. It also provides detailed information on young adult life outcomes. Key for our identification strategy is that at wave I we can observe peer reference groups in school along many different dimensions. For the analysis of maternal involvement and school trouble, we use data from wave I in order to utilize random variation across peer group cohorts to disentangle our effect of interest.

3.2 School Trouble Scale and Skills

We conduct a factor analysis on observed school trouble measures, with a single latent variable (factor) to capture the underlying skills these trouble measures proxy. A number of studies have explored the distinction between cognitive and noncognitive skills (Heckman et al. 2006; Heckman and Kautz 2012; Heckman and Mosso 2014). We cannot separately identify cognitive and noncognitive skill factors, because Add Health only provides one test score, the Peabody Picture Vocabulary test. However, we explore the link between our constructed latent variable and the vocabulary test score with wave IV completed education and wages and find results that are consistent with previous literature on the effects of noncognitive and cognitive skills.

Our observed measures of latent skills are all self-reported and consist of grade point average, the number of unauthorized missed school days, reports on a zero to four scale of trouble with teachers, trouble with other students, and trouble getting homework done, a measure for the frequency one gets into fights, and an indicator for being suspended at any point during the school year.[4][5] We take the negative of grade point average so that higher values imply greater trouble to be consistent with the rest of our measures. To create a single measure of skill from school troubles, we estimate a basic latent factor structural equations model and predict the latent skill factor for each adolescent in the sample. For most observed measures, we use a linear measurement equation

$$M_j = \alpha_j \theta + \epsilon_j, \quad j = 1, \dots k-1, \tag{3.1}$$

where M_j is the j-th indicator, α_j is the factor loading, θ is the latent skill

4. We drop students who missed more than 30 days of school. This reduces the sample by 236 observations.

5. Kautz and Zanoni (2014) have some overlapping measures with us in their analysis of the Chicago One Goal Program. They argue such measures are more likely observable for a school than personality measures.

factor, and ϵ_j is measurement error. Following standard practice, we set the scale of θ by constraining the factor loading for one of the observed measures to 1. For school suspension we use a probit measurement equation

$$M_k = \Phi(\alpha_k \theta) + \epsilon_k, \tag{3.2}$$

where $\Phi(\cdot)$ is the CDF of the standard normal distribution. We estimate the measurement system in (3.1) and (3.2) using the `gsem` command in Stata. We also drop missing observations in our measures to ensure the measurement equations are estimated on the same sample. Summary statistics for the measures are available in appendix table A.1 and the estimated factor loadings are available in column 1 of appendix table A.2. Each measurement is strongly related to the latent skill variable θ. We standardized the scale to a mean of zero and a standard deviation of one. For ease of exposition, we often refer to the latent skill variable as the school trouble scale.

In addition to the factor loadings with the full sample, we also report the factor loadings split across gender and then grade-levels. We do this to test against significant heterogeneity in the loadings. Columns 2-3 in appendix table A.2 illustrate that the measures load onto our scale evenly across gender. Columns 4-9 illustrate the same by grade-level. The only exception is that days of skipping school loads more heavily at later grade-levels, otherwise the loadings are consistent. We think this is sensible because skipping school may be easier when one is older. However, in all specifications to come we will control for the grade-level effect in a non-linear manner.

To further evaluate our composite school trouble measure we explore the relation between this measure and two future outcomes observed in wave IV: completed education level and wages. We report our results in the supplemental appendix, section B.1. In terms of both completed education and wages, our school trouble scale follows closely to the patterns reported by Heckman (2008) and Heckman et al. (2014) for noncognitive skills.[6] Like-

6. These studies use different data from ours and identify separately the distribution of

wise, the picture vocabulary test score closely matches the patterns found for cognitive skills. These results suggest that our construction of the school trouble scale is a reasonable proxy for noncognitive skills. Moreover, they show evidence that our dependent variable has long-term implications.

3.3 Mother's Involvement

The Add Health survey contains a number of questions that can be used to measure mother's involvement. Our set of interest involves responses to a series of questions about whether the adolescent has done a particular activity with their mother in the last four weeks.[7] In appendix table A.3, we report the full list and label which measures are used in our involvement scales.

We construct three scales from the available involvement questions. We primarily focus on a subset of binary variables related to mother's involvement in school-related matters. These are: (1) talking about school work or grades, (2) working together on a school project, and (3) talking about other things you are doing in school. Our hypothesis is that these are most directly related to school trouble. Moreover, we suspect that many of the other measures may contain only noise.[8] Our primary measure of mother's involvement is the standardized sum of the 3 variables discussed above. Figure A.1 displays the distribution of the scale prior to normalization and indicates a substantial amount of variation in mother's involvement.

Additionally, we explore the data with a principle components analysis (PCA) for evidence that our schooling-related involvement scale variables are correlated in the way we would expect if they explain shared variance separately from the remaining involvement variables.[9] We report these re-

noncognitive skills and cognitive skills.

7. Answers are no, yes (0,1).

8. For example, one question is "Have you gone shopping with your mother in the last four weeks?"

9. Because of the binary nature of the involvement variables, we use the polychoric

sults in the appendix table A.4. There are three components with an eigenvalue above 3. After rotating the loadings to obtain orthogonal components, we find that component 1, which has the largest eigenvalue and explains the largest amount of shared variance, almost entirely loads on the three schooling-related involvement variables. This supports our intuition that the schooling-related variables are related and reasonable to focus upon.

Finally, we construct two alternative measures of mother's involvement, both of which are normalized sums of binary responses. The first is based on a total of all ten involvement questions, including both school-related activities and other activities. The second measure is constructed based only on the non-schooling-related questions. Estimates based on these alternative involvement measures are also reported in section 5.1 for comparison.[10]

3.4 Sample Selection and Controls

We control for observable maternal characteristics, household characteristics, and adolescent individual characteristics drawn from the in-home wave I and the wave I parent survey. These include mother's education level indicators, mother's age, household income, the number of siblings in the home, an indicator for single parent homes, whether the adolescent is female, race and ethnicity, school-grade level indicators, and school fixed effects.

To construct our dependent variable, we dropped individuals who were not in school during wave I (395), who were older than 19 (85), who have missing values for any of the school-trouble scale measures (412), or who are extreme outliers in the number of skipped school days (236). The full sample, after constructing the dependent variable, consists of 19,617 observations. For our final selected sample, we drop observations with missing

correlation matrix from the involvement variables for the PCA.

10. Examining the two additional components in appendix table A.4 it appears component 2 may load on outside the home activities and component 3 on communication unrelated to schooling. For simplicity, however, we focus on the schooling-related involvement in component 1 and check our results against the full and alternative scales.

values for mother's involvement or peer mothers' involvement.[11] We also drop observations whose respondent to the parental survey is listed as male or as not the biological mother, when the biological mother, in fact, lives in the home. We do this because maternal education is taken from responses to the parental survey. This accounts for only a small percentage of observations that are dropped (384 total).[12] Our final selected sample consists of 12,316 observations.[13]

In appendix section A.2, we report summary statistics for the sample used to construct school trouble and for the final selected sample. Table A.5 shows that the mean differences are in some cases statistically significant; however, in all cases the magnitudes of these differences are very small, indicating that the full sample and the selected sample are very similar.

4 Empirical Strategy

We use a standard linear regression model to estimate the causal effect of mother's involvement on school trouble:

$$Y_{is} = X'_{is}\beta + I_{is}\gamma + \alpha_s + \varepsilon_{is}. \tag{4.1}$$

Y_{is} the measure of school trouble for individual i in school s; X_{is} is the vector of covariates; I_{is} is our measure of mother's involvement; α_s is a school fixed effect and ε_{is} represents unobserved heterogeneity. An obvious concern is that I_{is} may be endogenous due to reverse causality between Y_{is} and I_{is}.

Becker and Tomes (1976) suggest that parents' involvement with their

11. When one of the control variables is missing, we impute a value (the mean for a continuous variable and zero for a discrete variable) and add a missing indicator.

12. The specific numbers of observations dropped at each stage of the sample selection process are given in Table A.5 in the appendix.

13. Our sample selection is not unlike other studies who have used Add Health for similar analysis with the in-home data. For example, see Fruehwirth et al. (2019) who use Add Health and a similar identification strategy to ours to explore the effect of religiosity on mental health and have a very similar selected sample size.

children may follow either an "enhancement model" or a "response model." In the enhancement model parents become more involved when their children do better and experience less school trouble, resulting in a negative correlation between I_{is} and ε_{is}. Assuming for the moment that γ in equation (4.1) is negative, the OLS estimator $\hat{\gamma}$ will then be biased away from zero and will overestimate the magnitude of the effect of involvement.

Alternatively, in the response model parents increase their involvement in response to school trouble.[14] Consequently, I_{is} and ε_{is} will be positively correlated. In this case—assuming again that γ is negative—the OLS estimator $\hat{\gamma}$ will be biased towards zero and will underestimate the magnitude of the involvement effect.

To estimate the effect of mother's involvement on school trouble, we use an instrumental variables (IV) estimator. We follow an identification strategy similar to the one proposed by Fruehwirth et al. (2019), who use peer religiosity as an instrument to estimate the effect of religiosity on mental health. In this paper, we use the average of mother's involvement in a suitably chosen peer group as instrument.

For a given mother, say A, the peer reference group is defined as the group of mothers with the same level of education as A, and whose children are in the same school, in the same grade, and are of the same race and gender as the child of A. In our data, we categorize the mother's self-reported level of education as (1) no high school, (2) high school diploma, (3) some college, (4) college graduate and (5) post-college training. Thus, our instrument is average mother involvement among peers who share the same school-grade-race-gender-mother's education.

The motivation behind using this instrument is the idea that mothers who share similar education levels and whose children are similar (in terms of the characteristics listed above) are more likely to interact and influence each

14. This is sometimes referred to as the "reactive hypothesis." See, for example, McNeal (2012).

other. This idea is not new: earlier studies by Carbonaro (1998), Sheldon (2002), McNamara Horvat et al. (2003), and Mullis et al. (2003) have all found that parental networks can influence parents and children's outcomes. Additionally, Kalil (2015) point out evidence suggesting parents, especially less educated parents, are more likely to take advice from their social circle than from experts.[15] Thus, by choosing a peer reference group at a level the mothers are likely to interact we expect the instrument to be relevant for maternal involvement.

The exclusion restriction for the instrument is, of course, not directly testable. One concern is a potential violation due a selection effect: unobservables predict the reference group, which in turn could be related to the level of their respective mothers' involvement and be correlated with school trouble. Our peer reference group selection strategy is designed to eliminate this problem.

The peer reference group is defined on predetermined characteristics. Interaction within our peer group is likely, and needed for relevance among mothers, because of homophily. However, variation in maternal involvement across cohorts of our chosen reference group will be random if parents select into schools based on school-level characteristics.[16] On this assumption, instrument assignment is as good as random once controlling for the school fixed effect. Thus, we expect variation in average maternal involvement across peer groups will be free of selection bias in our baseline result. Moreover, in section 5.2 we consider a number of sensitivity tests around the assumption of selection based on fixed school factors and find a high degree of robustness.

A second concern is that peer mother involvement could influence ado-

15. Consistent with this point in the supplementary appendix table B.2 we indeed find a pattern consistent with a stronger involvement response to average peer maternal involvement by mothers with less education.

16. This is a now well known argument in the peer effects literature. See Sacerdote (2014) for a comprehensive review.

lescent school trouble through the adolescent's peer group. An advantage of our data, is that we can observe numerous peer outcomes and characteristics. In section 5.3, we use this information to check the sensitivity of our results. We also construct a second instrument by choosing another plausibly relevant peer group and provide an overidentification test. In all cases, our result remains highly robust.

Finally, in section 5.4 we explore some additional concerns, especially focusing on a potential threat from involvement by fathers. Again, we continue to find evidence consistent with our baseline result lending further credibility to the exclusion restriction. Subsequently, we examine heterogeneity in section 5.5 and explore some potential mechanisms that can explain the effect of mother's involvement on school trouble in section 5.6.

5 Results

5.1 Baseline Results

We report our baseline results in Table 1.[17] All specifications control for school fixed effects, our controls and, where applicable, missing indicators for the controls. Standard errors are clustered at the school level. In the first row, we report estimates for the schooling-related involvement scale. The OLS estimate of mother's involvement in column 1 is negative but small in magnitude. If mothers tend to respond to poor behavior in school with more involvement, we expect this estimate to be biased toward zero.

In column 2, we report the first-stage estimate for the effect of average peer mothers' involvement (schooling-related scale) on mother's involvement (schooling-related scale). We find that peer mothers' involvement is positively and significantly related to maternal involvement, suggesting the instrument is indeed relevant.

Next, in column 3 we report the two-stage least squre estimate for the ef-

17. A full table of results is available in the supplementary appendix table B.3.

fect of our preferred, schooling-related maternal involvement scale on school-trouble. The point estimate here suggests that a standard deviation increase in maternal involvement decreases school-trouble by near half a standard deviation. The Kleibergen-Paap F statistic (K-P F) is 14.128, suggesting the instrument is reasonably strong. However, it is still relatively close to 10, the common rule of thumb cutoff for weak instruments.

We follow the advice of Andrews et al. (2018) and report the Anderson-Rubin (AR) weak instrument robust test for the null hypothesis that $\gamma = 0$.[18] The AR test rejects the null with a p-value of 0.5% and yields a 95% confidence interval for the effect of maternal involvement of $[-1.272, -0.159]$. Also, this interval does not overlap with the 95% confidence interval for the OLS estimate in column 1.[19] Thus, our IV estimates are not driven by weak instrument bias and endogeneity in the standard OLS estimate substantially underestimates the effect of maternal involvement.

As demonstrated in supplementary appendix table B.2, the school trouble scale is strongly associated with future education and wages. Depending on the specification chosen from Table B.2 and based on a simple translation, a standard deviation increase in our maternal involvement, schooling-related scale is associated with a 2.5%-6.5% increase in future wages. Our result implies that matneral involvement continues to play a significant role in adolescent skill development and through this potentially has a long-lasting impact.

Our primary baseline result is the estimate for schooling-related maternal involvement; however, in columns 4 and 5 we replace this scale with a scale that uses all available involvement variables (column 4) and then a scale utilizing only the involvement variables that are *not* schooling-related involvement (column 5). These provide a check on whether the involvement measures we have are all generically related to school trouble or if indeed our

18. In our single endogenous regressor just identified case, the AR test is both robust to weak instruments and efficient (Andrews et al. 2018).

19. The OLS confidence interval is $[-0.105, -0.068]$.

Table 1: School Trouble and Mother's Involvement

	OLS	First-Stage	2SLS		
	(1)	(2)	(3)	(4)	(5)
Mother's Involvement	-0.086***		-0.509**		
	(0.009)		(0.216)		
Peer Mother Involvement		0.072***			
		(0.019)			
Mother's Involvement (All)				-0.589*	
				(0.310)	
Mother's Involvement (Alt.)					-0.383
					(0.242)
N	12316	12316	12316	12316	12316
K-P F			14.128	8.904	9.724
AR Weak IV Robust p			0.005	0.009	0.054

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level.

[B]All specifications include school fixed effects, our base set of controls, and missing indicators for missing observations in our control set.

[C]Mother's involvement is constructed from the three questions on involvement with schooling-related matters. Mother's involvement (all) includes all available mother involvement questions in the scale. Mother's involvement (alternative) includes all involvement questions except for the schooling-related questions used in the primary scale. All scales are summed over the included measures and then standardized.

[D]Column 1 reports standard OLS estimates. Column 2 the first stage of average peer mother involvement at the school-grade-race-gender-mother education level on mother's involvement. Column 3 the 2SLS estimates without clustering. Column 4 the 2SLS estimates with clustering. Column 5 and 6 report 2SLS estimates with clustering for the all and alternative scales.

[E]The Anderson-Rubin (AR) weak IV robust p-values are reported at the 95% level and 250 gridpoints. These report a weak instrument robust test of the null that $\gamma = 0$.

preferred scale is more important. In these additional scales, we define our instrument as the average of the scale in our reference group.[20]

The full scale estimate in column 4 is similar to that of our schooling-related scale but the first-stage is a bit weaker (the K-P F statistic is 8.904) and only significant at the 10% level. Column 5 shows the estimate for the scale which omits all schooling-related measures. In this case, the point

20. In section 5.4 we examine the first stage relationship between the peer average of our primary scale and each iteration of the scale. We show that the average of peer mothers' schooling-related involvement is not related to the alternative scale.

estimate shrinks back toward the OLS estimate and is insignificant. This suggests that the full scale estimate is driven by the schooling-related measures with the additional measures adding only noise.

These estimates are consistent with our expectation. Schooling-related involvement is more closely relevant for school-trouble. The alternative measures of involvement available in our data appear to do little to shift school trouble. Thus, in the remainder of this paper we use our preferred measure of maternal involvement. Of course, the reliability of our baseline estimate rests on the exclusion restriction, so we turn next to explore a number of robustness checks.

5.2 Robustness to Selection

In this section, we aim to check against possible selection bias. Our identification strategy hinges on the variation across peer groups—defined by the same school, grade, race, gender and mother's education level—being random, conditional on school fixed effects. If selection into schools is not only based on factors that are fixed at the school level, then the unobservables determining selection may correlate with peer mothers' involvement and school trouble, thereby violating our exclusion restriction.

We first consider the inclusion of a variety of additional controls that would reasonably be associated with a selection mechanism, if one is present. Table 2 reports our results. In columns 1-3, we include a control for peer mothers' involvement for different definitions of the peer group that get progressively closer to our instrument. We control for peer mothers' involvement at the same school and grade level in column 1, at the same school, grade and race level in column 2, and at the same school, grade, race and gender level in column 3. In column 4, we control for the Add Health Peabody picture vocabulary test (AH PVT) scores as a control for cognitive ability.

We expect that if unobservables correlate our instrument directly with school trouble, then controlling for peer mothers' involvement for different

definitions of the peer group should result in sensitive estimates. Our results show, however, that the estimates for mother's involvement remain quite similar to our baseline result (column 1: -0.427, column 2: -0.475, and column 3 -0.643) and significant at 5% level in all cases. The instrument is stronger in the specifications for columns 1 and 2 (K-P F values of 19 and 17) and slightly weaker in column 3 (9.6). Moreover, the estimate on the peer mothers' involvement controls are close to zero and never statistically significant. Furthermore, in column 4 we find that controlling for cognitive ability does not change the maternal involvement estimate nor the strength of the instrument.

Finally, in columns 5-6 we turn to including school trends. Our first approach is to interact each school indicator with a grade-level variable (column 5). Our second approach is to interact each school indicator with the same school-grade peer average maternal involvement to control for school trends at the school-grade level in peer maternal involvement. Both approaches add a large amount of covariates to the model. In column 5, the maternal involvement coefficient estimate increases in magnitude to -0.745 but is less precise. The estimate remains significant at the 10% level and, importantly, yields the same qualitative conclusions as our baseline. In column 6, controlling for differences in peer mothers' involvement between schools and grades, the estimate is more precise and again much closer to our baseline estimate.

Overall the results in table 2 support our claim that selection effects are removed after conditioning on the school fixed effect. To test this further we also explore balancing tests in the supplementary appendix, section B.3. In these tests, we regress the observable controls that are not part of our peer group definition on our instrument. If selection effects are removed conditional on school fixed effects, then we do not expect much correlation to exist between these variables and our instrument.

Indeed, we find little evidence that our instrument is related to these controls. Only in the case of the AH PVT test score do we find a correlation

Table 2: Selection Robustness Checks: Additional Controls

	(1)	(2)	(3)	(4)	(5)	(6)
Mother Involvement	-0.427**	-0.475**	-0.643**	-0.475**	-0.745*	-0.445**
	(0.172)	(0.187)	(0.284)	(0.212)	(0.437)	(0.208)
SG Peer Mother Inv.	-0.106					
	(0.074)					
SGR Peer Mother Inv.		-0.022				
		(0.044)				
SGRG Peer Mother Inv.			0.040			
			(0.041)			
AH PVT				-0.127***		
				(0.013)		
School FE	Yes	Yes	Yes	Yes	Yes	Yes
SG Trend	No	No	No	No	Yes	No
SG-Peer Mother Inv. Trend	No	No	No	No	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Missing Indicators	Yes	Yes	Yes	Yes	Yes	Yes
N	12316	12316	12316	12316	12316	12316
K-P F	19.452	16.979	9.595	13.843	4.574	14.437

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level. Inv. is involvement.
[B]SG is school-grade. SGR is school-grade-race. SGRG is school-grade-race-gender. Each of these refers to the defintion of the peer group level used in controlling for the peer mean.
[C]AH PVT is the Add Health Peabody Picture Vocabulary test score.
[D]SG-peer trend includes an interaction between grade-level and each school indicator.
[E]SG-peer mother involvement trend includes an interaction between school-grade level average peer mother involvement and each school indicator.

that is significant at the 10% level, although it is small in magnitude. Thus, we re-estimate the AH PVT specification by allowing for the effect of same school-grade peer mothers' involvement to vary across schools, similar to column 6 of table 2. Doing so cuts the correlation between our instrument and the AH PVT score to near zero and removes the significance.[21]

In summary, the estimates in Table 2 are consistent with our baseline

21. Also, note that when controlling for AH PVT or the school by school-grade peer maternal involvement interaction we find effect estimates very similar to our baseline.

estimate and suggest that selection into schools is largely based on factors that are fixed at the school level. These are accounted for by the school fixed effects in our model. Next, we turn to examining possible threats to our exclusion restriction that could run through the peer group.

5.3 Robustness Tests at the Peer Group Level

In this section, we investigate possible violations of the exclusion restriction that could run through the peer group. A primary concern is whether our instrument may influence school trouble through an adolescent's peers' school trouble. We test for this possibility in table 3.

In column 1, we control for average school trouble of a peer group of adolescents, defined by the school, grade, race, gender and mother's education level. While this variable should not suffer from selection effects, it likely does suffer from simultaneity. Our focus, however, is to check the sensitivity of our baseline result to its inclusion. We also control for the peer average in the Add Health picture vocabulary test score to capture a broader array of peer skills and for peer averages of our controls where applicable.[22] Our estimated maternal involvement effect is -0.479, significant at the 5% level, and close to our baseline estimate.

In column 2, we move to the school-grade level and again control for peer skills and peer averages in the control variables. Again, our estimate of the effect of maternal involvement remains stable. Finally, we return to our original peer group definition and use peer averages of the number of siblings, mother's age, and single parent homes in our instrument set. In column 3, we only report the first-stage estimate for peer mothers' involvement. It remains positively related to mother involvement and efficient. Column 4 shows, however, that the instrument set is relatively weak, with the K-P F statistic falling to 4.651. Nevertheless, we do pass the overidentification test

22. We cannot control for peer averages of the variables used to define the reference group. These would not vary within groups.

Table 3: Peer Group Level Robustness Checks I

	(1) 2SLS	(2) 2SLS	(3) 1st Stage	(4) 2SLS
Mother Involvement	-0.479**	-0.504**		-0.411**
	(0.234)	(0.225)		(0.190)
Peer School Trouble	-0.007			
	(0.025)			
Peer AH PVT	0.001			
	(0.020)			
SG Peer School Trouble		-0.003		
		(0.084)		
SG Peer AH PVT		0.041		
		(0.069)		
Peer Mother Involvement			0.073***	
			(0.019)	
SGRGP Avg. Controls	Yes	No	Yes	No
Sch-Grade Avg. Controls	No	Yes	No	No
N	12316	12316	12316	12316
K-P F	12.525	12.756		4.651
Over-ID p				0.379

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level.

[B]All specifications control for school fixed effects, our base set of controls, and missing indicators for our controls.

[C]Column 1 reports 2SLS estimates using our primary instrument definition and controlling for peer level averages at the same reference group level (SGRGP) as our instrument. In addition to reported estimates for peer school trouble and AH PVT we also control for peer number of siblings, parental age, single parent homes, and household income. We cannot include peer controls on the variables used to define the peer reference group. AH PVT is included among the controls because we also control for the peer level of AH PVT. Missing indicators are included for these variables where needed.

[D]Column 2 reports 2SLS estimates using our primary instrument definition and controlling for peer level averages at the school-grade level. In this case, we can include peer level averages of all controls (and skills) excepts for grade-level. AH PVT is included among the controls because we also control for the peer level of AH PVT. Missing indicators are used where needed.

[E]Columns 3 and 4 report the first and second stages from including peer controls at the school-grade-race-gender-mother education level in the instrument set. We only report the estimate for our primary instrument in column 3. All other peer variables are insignificant and near zero. Peer variables used are average of number of siblings, mother's age, and single parent homes.

and our second-stage estimate remains consistent with the baseline.

For a second set of sensitivity checks, we develop an additional instrument by redefining the peer group based on another potentially relevant dimension for mothers. Mothers may be more likely to respond to mothers whose children share similar characteristics and to mothers who share the same religious denomination.[23] We draw this idea from Fruehwirth et al. (2019), who use it in a different context.[24] To sort denominations, we follow the same approach as Fruehwirth et al. (2019). We list the categories in the supplementary appendix, table B.5 and provide the frequency distribution.

In table 4 we report the first- and second-stage, using as an instrument only the average of peer maternal involvement in this new peer group definition. We first condition on observations that are non-missing in this variable. The first-stage (column 1) is similar to the baseline first-stage effect, although it is slightly weaker with a K-P F of 7.816. However, the AR test rejects the null of $\gamma = 0$ at the 5% level and we emphasize that our objective is to examine the sensitivity of our second-stage estimate. Indeed, the second-stage estimate for mother's involvement (column 2) remains similar to our baseline estimate.

In columns 3-4, we use both our new and initial instrument, conditioning on the sample that is non-missing in either instrument ($N = 10670$). The first-stage estimates for both instruments are weaker than when using one instrument alone but each remains significantly correlated with maternal involvement and our second-stage estimate, while slightly higher, again remains stable. Moreover, we do not reject the null hypothesis that the overidentifying restrictions are valid.

Finally, we return to our selected sample from our baseline analysis by

23. We define this as sharing the same school-grade-race-gender-mothers' religious denomination (SGRGR).

24. Where they use the adolescent's religious denomination because their focus is on how the adolescent responds to peers, we instead use the mother's report of religious denomination.

Table 4: Peer Group Level Robustness Checks II

	(1) 1st Stage	(2) 2SLS	(3) 1st Stage	(4) 2SLS	(5) 1st Stage	(6) 2SLS
Mother Involvement		-0.586**		-0.607**		-0.524***
		(0.293)		(0.270)		(0.196)
Peer Mother Involvement			0.048**		0.065***	
			(0.020)		(0.019)	
SGRGR Peer Mother Inv.	0.065***		0.048*		0.049**	
	(0.023)		(0.025)		(0.024)	
N	12117	12117	10670	10670	12316	12316
K-P F		7.816		6.131		9.402
Over-ID p				0.694		0.641
AR Weak IV Robust p		0.015		0.021		0.008

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level. Inv. is involvement.

[B]All specifications control for school fixed effects, our base set of controls, missing indicators for our controls, and indicators for the mother's religious denomination.

[C]Columns 1 and 2 report the first and second stages from redefining the reference group to the same school-grade-race-gender-mother's religious denomination (SGRGR). We omit observations missing peer mother involvement at this reference group definition.

[D]Column 3 and 4 report the first and second stages using peer mother involvement at both our original reference group and redefined group as instruments.

[E]Column 5 and 6 report results after setting missings in peer mother involvement for the redefined level to the mean and controlling for a missing indicator in both stages. Again we have two instruments of peer mother involvement at two definitions of the reference group.

imputing missing observations in the SGRGR peer mother involvement to the mean and controlling for a missing indicator. We include the missing indicator in both stages but maintain our instrument set. In column 5, we find that for our original instrument the first-stage estimate strengthens slightly, while for our additional instrument it remains consistent with that in column 3. The K-P F rises closer to 10 and our second-stage estimate on maternal involvement of -0.524 falls very close to our baseline estimate. Again, we easily pass the overidentification test and maintain weak instrument robust inference.

The supporting evidence in this section points to a robust result. We

checked for possible threats to our exclusion restriction that may run through the peer group but find no evidence consistent with this concern. Next, we turn to some final checks with a focus on a threat from involvement by fathers.

5.4 Additional Robustness Tests

We test against two additional concerns. One possible concern is that our peer mother schooling-related involvement instrument may be related to alternative forms of maternal involvement. Another concern is whether father involvement poses a threat to the exclusion restriction.

We aim to examine whether our instrument may influence other forms of maternal involvement. In this case, either our involvement measure proxies a broad array of involvement—making it difficult to say much specifically about involvement—or, in the worse case, we would have a violation of the exclusion restriction. In table 5, we report on the first-stage estimates from holding our instrument fixed at the peer average of mothers' schooling-related involvement (our preferred scale from table 1) and iterate over each of our involvement scales. If there is something specific about mother's schooling-related involvement in response to peers' mother's involvement, then we do not expect our instrument to be related to other forms of involvement.

Column 1 of table 5 shows again that peer mother schooling-related involvement shifts mother's schooling-related involvement. Column 2, shows that when we combine the schooling-related involvement with all other measures, as shown in appendix table A.3, the relationship weakens. Finally, in column 3, we find that peer mother schooling-related involvement is unrelated to the involvement scale that utilizes all involvement measures except the schooling-related measures. This evidence is consistent with our expectation. Mothers appear to respond to the peer mother schooling-related involvement by increasing their own but are unaffected in alternative forms of involvement.

Table 5: First-Stage Changing Scales and Holding the Instrument Fixed

	(1) Schooling-Related Scale	(2) Full Scale	(3) Alternative Scale
Peer Mother Involvement	0.072***	0.045***	0.012
	(0.019)	(0.017)	(0.016)
N	12316	12316	12316

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level.
[B]Peer mother involvement is held at the average of schooling-related scale amongst the same school-grade-race-gender-mother's education reference group.
[C]All specifications include school fixed effects, our base set of controls, and missing indicators for missingness in control variables.
[D]The schooling-related scale corresponds to our preferred involvement scale we focus on throughout. The full scale corresponds to that used in column 5 of table 1 and the alternative scale to that used in column 6 of table 1.

Next, if fathers respond to peer mother involvement, then we would potentially have a violation of the exclusion restriction. We examine this in table 6. First, we form a combined scale that is the sum of mother and father schooling-related involvement. A large share of fathers are missing so when missing we set the scale to mother's involvement. In column 1, we report the result maintaining our instrument at peer mother involvement. The first-stage K-P F is similar to our baseline and so too the second-stage estimate.

Second, we return to instrument maternal involvement but control for father involvement. We impute missing fathers to the mean and add a missing indicator. Column 2 shows that our estimate for maternal involvement is somewhat larger but still yields the same conclusions from our baseline.

Third, in columns 3-6 we report on different iterations of regressing father involvement on our instrument. To maintain our selected sample, we maintain the imputation for missing fathers in columns 3 and 4 and control for the missing father indicator. In column 3, we omit mother's involvement and find that peer mother involvement is significantly correlated with father involvement, albeit small in magnitude. However, in column 4, upon control-

ling for maternal involvement, this correlation cuts to approximately zero, suggesting that our instrument is indeed unrelated to what father's do.

Table 6: Father Involvement Robustness Checks

	(1) School Trouble	(2) School Trouble	(3) Father Inv.	(4) Father Inv.	(5) Father Inv.	(6) Father Inv.
Parental Inv. Combo	-0.574**					
	(0.234)					
Mother Inv.		-0.655**		0.452***		0.634***
		(0.329)		(0.014)		(0.014)
Father Inv.		0.298				
		(0.204)				
Missing Father Inv.		0.429**	-0.359**	-0.393**		
		(0.200)	(0.179)	(0.164)		
Peer Mother Inv.			0.035***	0.002	0.051***	0.013
			(0.012)	(0.010)	(0.017)	(0.013)
N	12316	12316	12316	12316	8775	8775
K-P F	15.069	9.497				

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level.

[B]All specifications include the base set of controls, missing indicators for controls, and school fixed effects. Inv. is involvement.

[C]Column 1 uses a combined mother/father standardized scale of the sum of mother and father involvement (equal to mother if father missing and vice-versa).

[D]Column 2 instruments mother's involvement and controls for father involvement and missingness in father involvement.

[E]Columns 3 and 4 report on a father involvement specification where we maintain our analytic sample via imputation to the mean and controlling for missingness in father involvement.

[F]Columns 5 and 6 report on removing imputation and dropping observations missing in father involvement.

Nevertheless, out of concerns over the imputation for missing fathers we restrict the sample to non-missing fathers in columns 5 and 6. Again, we first omit maternal involvement and then include it, and again, we find the same

pattern. Once maternal involvement is included the correlation between our instrument and father involvement cuts to near zero. Thus, our evidence suggests that peer mother schooling-related involvement works through impacting other mothers and not fathers.

5.5 Heterogeneity

We explore heterogeneity on three dimensions. First, there is evidence in the literature that influences on skill development decline as a child ages (Doepke et al. 2019; Heckman and Mosso 2014). In our sample we have some 7th and 8th graders, so we aim to test whether mothers' response to peer mother involvement is driven only by mothers of the youngest adolescents in our sample, and likewise, for the effect of mother's involvement. Second, it may be of concern whether the efficacy of maternal involvement is constant across mother's skill. Potentially, the returns to involvement for mother's of lower education will be lower if they lack adequate training in effective involvement. Thus, we also aim to test whether mothers' response to peer mother involvement is driven only by mothers at higher education levels, and likewise, for the effect of mother's involvement. Third, we test for heterogeneity by gender since in our data we find males generally are much more troubled.

Our ability to explore heterogeneity is to an extent limited. One, our sample size precludes many refined cuts of the data. Two, the strength of our instrument may not be enough to adequately disentangle multiple layers of heterogeneity. Third, some of the questions in regard to heterogeneity may be substantive. How parents choose to invest and their subsequent influence along differing dimensions of socio-economic status, neighborhoods, and other dimensions may hinge on a number of factors beyond the scope of this study and that deserve careful theoretical and empirical attention.[25]

25. See Doepke et al. (2019) for a theoretical model dealing with some of these issues along with a review of the literature.

Thus, we see our analysis here as suggestive and motivating for further work. We report our analyses in the supplementary appendix section B.5.

We find no evidence for heterogeneity by grade-level, or more specifically, no evidence that our result is driven by those from lower grades in our data. We find this both in terms of mothers' response to peer mother involvement and the efficacy of maternal involvement.

For heterogeneity by mother's education we do find some evidence that less educated mother's have the strongest response to changes in peer mother involvement. As noted in section 4, this result is in-line with evidence that parents, especially less educated parents, put more weight on parenting advice from their social relationships, communities, and families (Kalil 2015).

Turning to the efficacy of involvement, we find that the effect of maternal involvement is largely driven by the group of observations with mother's holding less than a completed college degree. Given evidence in the literature that more highly educated parents invest more in their children, then interventions attempting to boost maternal involvement will likely be focused on those with lower education (Heckman and Mosso 2014). Our evidence implies such improved involvement among mothers who hold less education can indeed be beneficial.[26]

Finally, school-trouble exhibits substantial variation by gender. In the supplementary appendix, figure B.3 we report the density plots of school-trouble by gender and find that the distribution of school-trouble for males is substantially shifted toward greater trouble compared to girls. This is unsurprising as male noncognitive development at early ages lags behind that of girls in the US (Bertrand and Pan 2013). Thus, we test for differences in the influence of mother's involvement across genders.

We do not find evidence that the effect of mother's involvement varies substantially by gender. Thus, our evidence broadly suggests maternal in-

26. How to get parents involved and keep them involved is a relevant question which deserves careful attention in its own right.

volvement is effective across gender. However, we urge caution in drawing a strong conclusion as our data may not be sufficiently powered to detect this heterogeneity.

5.6 Mechanisms

Research in education and developmental psychology has identified a number of contextual factors that predict academic achievement. Some of these factors may also serve as a mechanism that can explain the impact of mother's involvement on school trouble. Below we discuss three potential mechanisms that we can investigate empirically in the Add Health data.

The first mechanisms is the transfer of values and expectations about education from parents to children. Fan and Chen (2001), Hill and Tyson (2009), Jeynes (2007) and Castro et al. (2015) show that how parents value education and parental expectations and aspirations for their children's academic achievement are significant predictors of academic outcomes. If parental involvement coincides with parents communicating and transferring values, expectations and aspirations to adolescents, then parental involvement can lead to less school trouble.

The second mechanism is adolescent mental health. Wang and Sheikh-Khalil (2014) present evidence that parental involvement reduces adolescent symptoms of depression. This may occur because parental involvement gives parents an opportunity to provide emotional support to their children. Involvement can also foster a feeling of connectedness between parents and children that improves emotional and mental well-being. In turn, this can facilitate the transfer of values and aspirations between parents and adolescents and increase academic engagement in school (Wang and Sheikh-Khalil 2014).

The third and final mechanism we consider is parenting style. Parenting style reflects the relation between parents and children and is a strong predictor of academic achievement (Jeynes 2007). Steinberg et al. (1992)

identifies three salient dimensions of style: parental warmth and responsiveness, behavioral supervision and strictness, and allowing psychological autonomy. The empirical results of Dornbusch et al. (1987), Steinberg et al. (1992), Deslandes et al. (1997) and Marchant et al. (2001) show that an "authoritative" parenting style, characterized by high levels of emotional responsiveness and parental supervision but without being overly strict, are associated with higher academic achievement. If mother's involvement alters the adolescent's perceptions of parenting style, parenting style may be a mechanism for changes in school trouble.

We constructed several measures from the Add Health survey to explore the three mechanisms. Details about the construction of each measure can be found in Appendix B.6. We construct one measure of college aspirations and three measures of mental health (depression, self-esteem and suicidal ideation).[27] The final three measures reflect the dimensions of parenting style discussed above: warmth and responsiveness, behavioral supervision and strictness, and autonomy.

Table 7 shows the estimated impact of mother's involvement on college aspirations and mental health, using peer mothers' involvement as instrument. A increase in mother's involvement leads to a statistically significant increase in the level of college aspirations, and a decrease on the depression scale. Self-esteem and suicidal ideation do not appear to be impacted by our involvement measure. Table 8 shows estimates for the school trouble equation, when each of the four measures and their interaction with mother's involvement are included in the model. The association between college aspirations and school trouble is negative and highly significant. Compared to our baseline estimates in Table 1, the impact of mother's involvement is slightly smaller in magnitude and significant at 10% (instead of 5%). This suggests that some of the impact of mother's involvement may operate through its effect on the

27. For depression we use the 19 scale questions from the Center for Epidemiological Studies Depression (CES-D) scale. Our construction of the CES-D scale and the self-esteem scale is the same as that in Fruehwirth et al. (2019).

Table 7: College Aspirations and Mental Health

	(1) College Aspirations	(2) CES-D	(3) Self-Esteem	(4) Suicidal Ideation
Mother Involvement	0.527**	-0.399*	-0.040	-0.064
	(0.223)	(0.215)	(0.202)	(0.063)
N	12240	12240	12240	12240
K-P F	14.136	14.136	14.136	14.136

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level.
[C]Column headers indicate the dependent variable for the specification.
[D]We drop missing observations in college aspirations and mental health variables reducing our sample compared to the baseline by 74.

adolescent's college aspirations.[28] Higher scores on the depression scale are associated with higher levels of school trouble, and controlling for depression again appears to dampen the effect of mother's involvement. Finally, the associations between self-esteem and school trouble, and suicidal ideation and school trouble both have the expected sign. In these specifications the magnitudes of the coefficients of mother's involvement are slightly larger and significant at 5%, as opposed to 10% for aspirations and depression. This result, coupled with columns (3) and (4) of Table 7, makes self-esteem and suicidal ideation seem less likely as substantive mechanisms.

Table 9 shows the results for the parental style measures. Mother's involvement is significantly related to the perceived warmth of the parents (column 1). The estimates in column 4 show that a warmer parenting style is associated with less school trouble, but controlling for warmth does not eliminate the impact of mother's involvement. This suggests that while parenting style matters, other mechanisms (such as the transfer of values and aspirations) may be more important. Mother's involvement has no significant

28. The four included measures may, of course, be endogenous themselves. Thus, we view Table 8 as providing suggestive evidence for potential mechanisms.

impact on perceived parental control or autonomy (columns 2 and 3). These parenting style variables also have no significant association with school trouble (columns 5 and 6), nor do they diminish the effect of mother's involvement.

In summary, the results discussed here provide several insights about the mechanisms that can explain part of the effect of mother's involvement. First, a higher level of mother's involvement leads to higher college aspirations, lower values on the depression scale and a higher perception of warmth in the relation with parents. Second, the school trouble regressions show that these changes, in turn, are associated with lower levels of school trouble. Third, after controlling for the mechanisms we have explored here, mother's involvement remains a significant factor in reducing school trouble. While the last two results are not necessarily causal effects, they do suggest that college aspirations, mental health and elements of parenting style are plausible channels through which mother's involvement may affect school trouble.

6 Conclusion

Over the past few decades parental involvement has been promoted by policy makers and educators as an important factor that can help drive student success. The No Child Left Behind Act of 2002 and the Every Student Succeeds Act of 2015 both required states to formulate strategies to promote parental involvement at home and in the school. Part of this policy focus has been driven by a large body of research, emanating from education and developmental psychology, that has pointed to a positive association between parental involvement and student outcomes.

Very few studies have been able to estimate the causal effect of parental involvement on academic achievement and noncognitive outcomes. Recent evidence has emerged about the causal link between parental investments and skill formation during early childhood but much less is known about the period of adolescence. The contribution of this paper is to provide new

results in this area. Specifically, we estimate the causal effect of mother's involvement on adolescent trouble in school.

We construct a measure of adolescent school-trouble and link it with noncognitive skills. We identify the causal effect of mother's involvement on adolescent school-trouble by using the average of mother's involvement in an appropriately chosen peer group as an instrument. The peer group of mothers is not self-selected but rather defined as the group of mothers who have a number of exogenous characteristics in common (the child's race, gender, school and grade, and the mother's education level). Our baseline estimates point to a statistically significant and substantial effect of mother's involvement: an increase of 1 standard deviation in mother's involvement leads to a reduction in school trouble of about 0.5 standard deviations.

Selection effects at the school level or a direct effect of peer mothers' involvement on school trouble would invalidate the exclusion restriction for the instrument. The richness of the Add Health data allows us to conduct a wide range of robustness checks. We find our result to be remarkably stable, which lends further credibility to our baseline results.

Finally, we explore a number of mechanisms that may explain the causal effect of mother's involvement on school trouble. These include the impact of mother's involvement on the adolescent's college aspirations, mental health and perceptions of parenting style. We find that an increase in mother's involvement is associated with higher college aspirations, lower levels of depression, and a higher perceived level of warmth in the relationship with parents.

These potential mechanisms point toward channels within the home that influence skill development during adolescence through the mother-adolescent relationship. The link we discovered with mental health was relatively weak and did not exist for self-esteem and suicidal ideation. However, the shifts in aspirations, depression, and warmth suggest that what mothers do may shift how an adolescent feels about themselves and their family. This particular

mechanism may operate as a protective device that prevents subsequent poor choices by the adolescent at school and currently remains an understudied area of research. We believe further study of processes within the family remains a promising topic for future study. In this study, we show that maternal involvement in the home can indeed matter for adolescents and their skill development.

Table 8: School Trouble with College Aspirations and Mental Health

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother Involvement	-0.339*	-0.336*	-0.350*	-0.350*	-0.485**	-0.471**	-0.448**	-0.455**
	(0.202)	(0.202)	(0.193)	(0.193)	(0.210)	(0.215)	(0.210)	(0.212)
College Aspirations	-0.263***	-0.259***						
	(0.023)	(0.025)						
Mom Inv. X Coll. Asp.		0.027						
		(0.095)						
CES-D Scale			0.322***	0.321***				
			(0.016)	(0.016)				
Mom Inv. X CES-D				-0.047				
				(0.085)				
Self-Esteem					-0.169***	-0.172***		
					(0.023)	(0.024)		
Mom Inv. X Self-Esteem						-0.080		
						(0.097)		
Suicidal Ideation							0.459***	0.462***
							(0.041)	(0.041)
Mom Inv. X Suicidal								0.055
								(0.282)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Missing Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12240	12240	12240	12240	12240	12240	12240	12240
K-P F	12.855	6.363	13.437	6.669	14.326	6.350	13.902	6.871

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses.

[B]All specifications include the base set of controls, missing indicators for controls, and school fixed effects.

[C]Specifications with an interaction instrument the interaction with the interaction of our IV and the variable of interest (college aspirations, CES-D, etc.)

Table 9: Measures of Parenting Style: Warmth, Control, and Autonomy

	Warmth	Control	Autonomy	School-Trouble		
	(1)	(2)	(3)	(4)	(5)	(6)
Mother Involvement	0.410**	0.143	0.112	-0.465**	-0.534**	-0.516**
	(0.193)	(0.177)	(0.160)	(0.231)	(0.229)	(0.220)
Mother's Inv. X Warmth				0.050		
				(0.090)		
Warmth				-0.144***		
				(0.047)		
Mother's Inv. X Control					0.040	
					(0.083)	
Parental Control					0.001	
					(0.007)	
Mother's Inv. X Auto.						-0.002
						(0.075)
Autonomy						-0.040
						(0.026)
N	12215	12215	12215	12215	12215	12215
K-P F	14.030	14.030	14.030	6.256	6.188	6.936
AR Weak IV Test	0.032	0.409	0.488	0.055	0.015	0.018

Note: [A]* 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.

[B]Column headers indicate the dependent variable for the specification.

[C]We drop missing observations in the style variables of interest, which reduces the sample by 101 observations.

[D]In columns 1-3 the AR test is a weak-IV robust test that the effect of mother's involvement is equal to 0.

[E]In columns 4-6 the AR test is a joint weak-IV robust test that the main effect and interaction are jointly equal to 0.

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A Appendix

A.1 School-Trouble Scale Measures and Factor Loadings

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

	Wave I			
	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	0.278	0.448	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
Negative of GPA	0.516***	0.513***	0.536***	0.534***	0.541***	0.491***	0.538***	0.521***	0.465***
	(0.014)	(0.021)	(0.022)	(0.038)	(0.037)	(0.029)	(0.033)	(0.035)	(0.038)
Days of Skipping School	1.809***	1.712***	2.122***	0.509***	1.099***	1.588***	2.591***	2.682***	3.173***
	(0.061)	(0.086)	(0.101)	(0.060)	(0.100)	(0.109)	(0.177)	(0.199)	(0.270)
Trouble with Teachers	0.636***	0.637***	0.698***	0.753***	0.814***	0.569***	0.550***	0.577***	0.616***
	(0.019)	(0.028)	(0.030)	(0.056)	(0.059)	(0.037)	(0.037)	(0.043)	(0.054)
Trouble with Students	0.508***	0.583***	0.527***	0.592***	0.564***	0.420***	0.469***	0.496***	0.558***
	(0.017)	(0.027)	(0.027)	(0.050)	(0.048)	(0.031)	(0.036)	(0.041)	(0.053)
Home Work Done	0.685***	0.649***	0.785***	0.707***	0.827***	0.603***	0.634***	0.646***	0.765***
	(0.021)	(0.030)	(0.036)	(0.056)	(0.063)	(0.041)	(0.045)	(0.051)	(0.070)
Fighting	0.377***	0.341***	0.389***	0.360***	0.398***	0.333***	0.365***	0.422***	0.394***
	(0.011)	(0.014)	(0.018)	(0.029)	(0.030)	(0.022)	(0.025)	(0.029)	(0.032)
Suspension	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

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses.

[B]Each coefficient represents the factor loading for the measurement equation given by the row variable.

[C]Column 1 is our primary scale for analysis. The following factor analyses are on sub-samples given by the column except in the last columns where we expand to include attitudes about college.

A.2 Variable Lists and Descriptive Statistics

Table A.3: List of Variables for Scale Measures of Mother Involvement

Q: 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?			
	Mother School Related Scale	Mother Full Scale	Mother Alt. Scale
gone shopping		yes	yes
played a sport		yes	yes
gone to a religious service or church-related event		yes	yes
talked about someone you're dating or a party you went to		yes	yes
gone to a movie, play, museum, concert, or sports event		yes	yes
had a talk about a personal problem you were having		yes	yes
had a serious argument about your behavior		yes	yes
talked about your school work or grades	yes	yes	
worked on a project for school	yes	yes	
talked about other things you're doing in school	yes	yes	

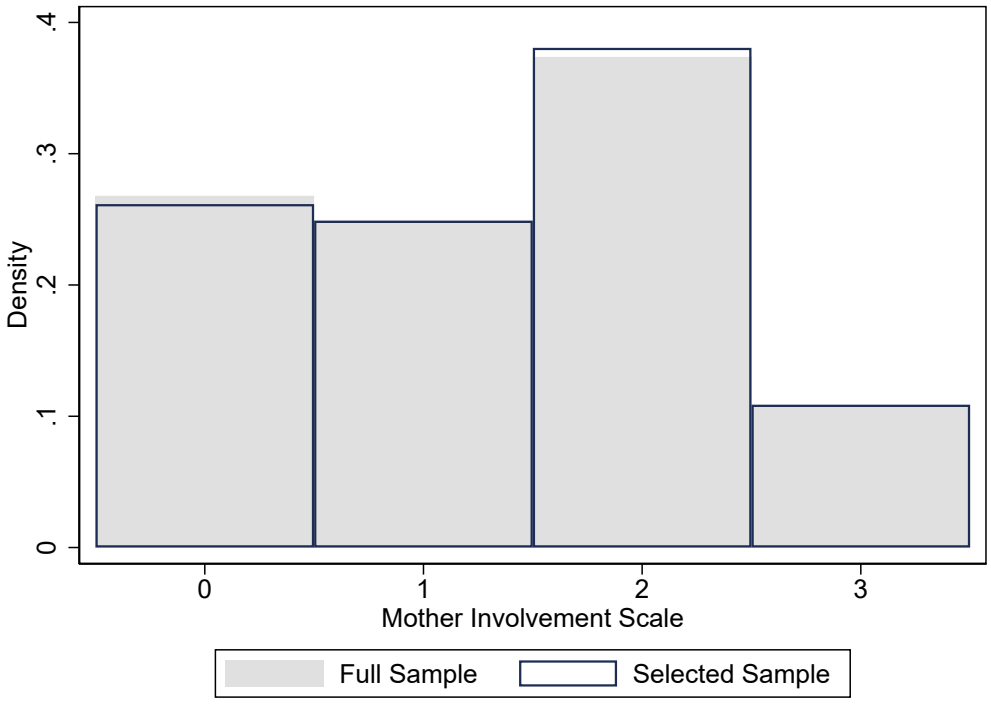

Figure A.1: Histogram of Mother's Involvement Scale

Table A.4: PCA Rotated Loadings for Involvement Variables

	RC1	RC2	RC3
gone shopping	-0.000	0.464	0.087
played a sport	0.066	0.548	-0.014
gone to a religious service or church-related event	0.106	0.278	-0.144
talked about someone you're dating or a party you went to	0.038	-0.007	0.600
gone to a movie, play, museum, concert, or sports event	-0.024	0.592	0.017
had a talk about a personal problem you were having	0.085	0.058	0.569
had a serious argument about your behavior	-0.113	-0.016	0.526
talked about your 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're doing in school	0.623	-0.059	0.016
Eigenvalue (pre-rotate)	2.940	1.428	1.232

Note: RC is rotated component. Rotated loadings on each variable for the three components with an eigenvalue above 1 (prior to rotation) are reported in each row. Standard orthogonal varimax rotation is used. The PCA is conducted using the polychoric correlation matrix for involvement variables because of their binary nature.

Table A.5: Summary Statistics for Primary Covariates

	Full Sample Mean / SD	Selected Sample Mean / SD	p-value of difference in means
School-Trouble	0.000	-0.030	0.000
	(1.000)	(0.986)	
Mother Involvement	0.022	0.035	0.010
	(0.997)	(0.993)	
Peer Mother Involvement	0.032	0.031	0.340
	(0.641)	(0.640)	
Mother's Characteristics			
No HS Diploma	0.172	0.162	0.000
	(0.378)	(0.369)	
HS Diploma	0.293	0.316	0.000
	(0.455)	(0.465)	
Some College	0.300	0.319	0.000
	(0.458)	(0.466)	
College Graduate	0.144	0.131	0.000
	(0.351)	(0.337)	
Post-College Training	0.092	0.073	0.001
	(0.289)	(0.260)	
Mother's Age	41.931	41.756	0.000
	(6.756)	(6.333)	
Household Characteristics			
Household Income	46.424	46.702	0.235
	(52.582)	(48.975)	
Number of Siblings in H.H.	1.463	1.475	0.087
	(1.221)	(1.174)	
Single Parent Home	0.317	0.287	0.000
	(0.465)	(0.453)	
Individual Characteristics			
Female	0.507	0.511	0.157
	(0.500)	(0.500)	
Hispanic	0.165	0.146	0.000
	(0.372)	(0.354)	
Black	0.221	0.207	0.000
	(0.415)	(0.405)	
Other	0.086	0.049	0.000
	(0.281)	(0.216)	
White	0.527	0.598	0.000
	(0.499)	(0.490)	
Grade-Level 7	0.136	0.142	0.000
	(0.343)	(0.350)	
Grade-Level 8	0.137	0.138	0.344
	(0.343)	(0.345)	
Grade-Level 9	0.178	0.184	0.001
	(0.383)	(0.388)	
Grade-Level 10	0.196	0.206	0.000
	(0.397)	(0.404)	
Grade-Level 11	0.189	0.188	0.875
	(0.391)	(0.390)	
Grade-Level 12	0.164	0.142	0.000
	(0.370)	(0.349)	
N	19617	12316	

Note: 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 mother's 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).

B Supplementary Appendix

B.1 School Trouble and Links to Education and Labor Market Outcomes

We test that 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 B.1 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 B.1: Summary Statistics for Variables in Logged Income Analysis

	Mean	SD	Min	Max
Logged Income	10.184	1.027	0.693	13.816
School-Trouble	-0.029	0.986	-1.652	5.022
ahpvt	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 B.1 displays kernel density plots for school trouble (top panels) and PVT scores (bottom panels), stratified by sex and completed education level. For both males and females, the distributions of school trouble among those

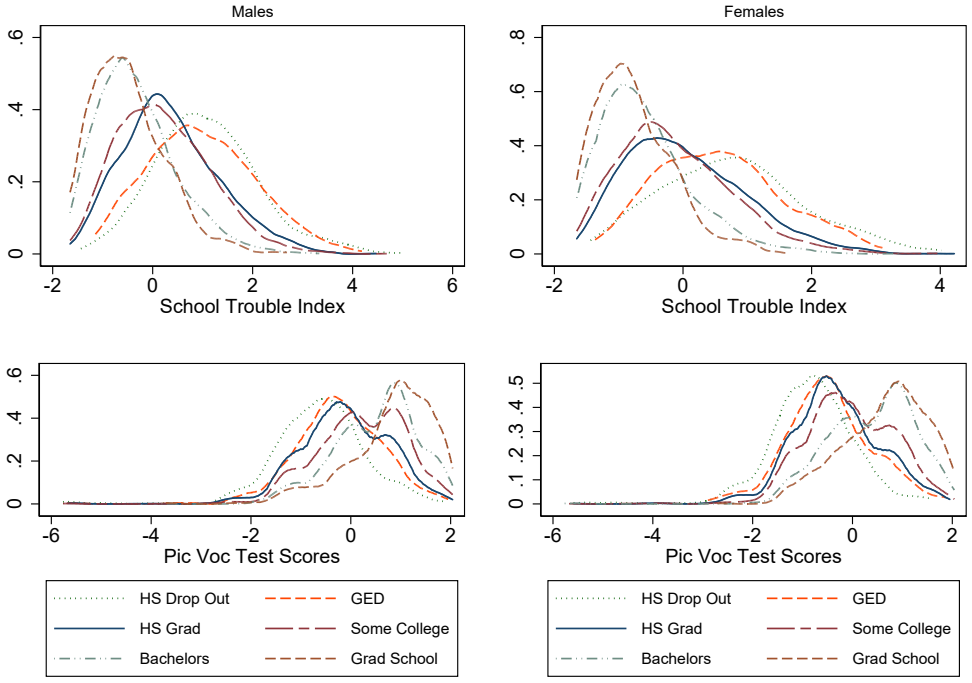

Figure B.1: Density Plots by Education Level and Gender of School Trouble and Test Scores

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 B.1 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 B.2, 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). Column 6 contains estimates from 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.[29]

29. 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 B.2: School Trouble and Wave IV Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
School Trouble Index	-0.149***	-0.136***	-0.133***	-0.065***	-0.067***	-0.047***	-0.050***
	(0.012)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)
Pic Vocab Test Score		0.112***	0.095***	0.040***	0.040***	0.021	0.017
		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
GED or Certificate Holder				0.006	0.008	-0.027	-0.027
				(0.112)	(0.114)	(0.115)	(0.119)
HS Diploma				0.281***	0.282***	0.151**	0.153**
				(0.067)	(0.068)	(0.064)	(0.066)
Some College				0.394***	0.389***	0.208***	0.202***
				(0.075)	(0.077)	(0.074)	(0.077)
College Graduate				0.762***	0.738***	0.512***	0.485***
				(0.076)	(0.076)	(0.076)	(0.076)
Master's Degree or Better				0.921***	0.887***	0.660***	0.613***
				(0.089)	(0.086)	(0.089)	(0.087)
School Level FE	No	No	Yes	No	Yes	No	Yes
N	11775	11775	11775	11775	11775	13250	13250
R^2	0.118	0.126	0.163	0.165	0.195		

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses.

[B]Survey weight gswgt4_2 and strata region are used from the Add Health wave IV weight file.

[C]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.

[D]Columns 6 and 7 contain estimates from a Heckman selection model with ever married and number of children excluded from the main equation.

[E]5,491 observations are lost from sample attrition.

[F]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.

B.2 Baseline Full Results

Table B.3: School Trouble and Mother's Involvement: Full Results

	OLS	First-Stage	2SLS		
	(1)	(2)	(3)	(4)	(5)
Mother Involvement	-0.086***		-0.509**		
	(0.009)		(0.216)		
Mother's Involvement (All)				-0.589*	
				(0.310)	
Mother's Involvement (Alt.)					-0.383
					(0.242)
Peer Mother Involvement		0.072***			
		(0.019)			
HS Diploma	-0.135***	0.085***	-0.096*	-0.075	-0.106**
	(0.045)	(0.029)	(0.049)	(0.060)	(0.053)
Some College	-0.182***	0.159***	-0.109**	-0.057	-0.117*
	(0.037)	(0.032)	(0.054)	(0.088)	(0.069)
College Graduate	-0.344***	0.227***	-0.241***	-0.174	-0.259***
	(0.053)	(0.040)	(0.075)	(0.117)	(0.092)
Post-College Training	-0.428***	0.295***	-0.294***	-0.222	-0.331***
	(0.052)	(0.046)	(0.085)	(0.135)	(0.100)
Mother's Age	-0.004**	-0.000	-0.004**	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Number of Siblings in H.H.	-0.023**	-0.004	-0.024**	-0.028**	-0.027***
	(0.009)	(0.010)	(0.011)	(0.011)	(0.010)
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	0.245***	0.097***	0.285***	0.301***	0.269***
	(0.023)	(0.022)	(0.032)	(0.042)	(0.031)
Female	-0.435***	0.065***	-0.405***	-0.236**	-0.278***
	(0.018)	(0.018)	(0.023)	(0.106)	(0.101)
Hispanic	0.039	-0.029	0.025	0.010	0.023
	(0.055)	(0.039)	(0.054)	(0.061)	(0.061)
Black	0.180***	0.037	0.198***	0.149***	0.141***
	(0.046)	(0.039)	(0.056)	(0.058)	(0.050)
Other	-0.112**	-0.038	-0.131***	-0.233***	-0.207***
	(0.045)	(0.040)	(0.047)	(0.082)	(0.078)
Grade-Level 8	0.060	-0.023	0.049	0.073*	0.078*
	(0.040)	(0.039)	(0.040)	(0.042)	(0.041)
Grade-Level 9	0.097*	-0.075	0.063	0.095*	0.117**
	(0.053)	(0.047)	(0.052)	(0.054)	(0.056)
Grade-Level 10	0.003	-0.064	-0.026	-0.007	0.013

continued

Table B.3 – continued

	OLS	First-Stage	2SLS		
	(1)	(2)	(3)	(4)	(5)
	(0.051)	(0.045)	(0.052)	(0.057)	(0.056)
Grade-Level 11	-0.007	-0.043	-0.027	-0.000	0.012
	(0.052)	(0.043)	(0.052)	(0.055)	(0.056)
Grade-Level 12	-0.107*	-0.136***	-0.169***	-0.114**	-0.074
	(0.056)	(0.046)	(0.059)	(0.058)	(0.061)
Missing Mother's Age	0.024	0.212*	0.115	0.120	0.051
	(0.106)	(0.108)	(0.123)	(0.137)	(0.119)
Missing Household Income	-0.026	-0.049	-0.047*	-0.035	-0.021
	(0.022)	(0.030)	(0.027)	(0.029)	(0.024)
Missing Hispanic	-0.100	-0.010	-0.113	-0.161	-0.145
	(0.168)	(0.217)	(0.185)	(0.200)	(0.189)
Missing Other	0.117	-0.176	0.034	-0.034	0.036
	(0.287)	(0.505)	(0.445)	(0.425)	(0.313)
School FE	No	Yes	No	No	No
N	12316	12316	12316	12316	12316
K-P F			14.128	8.904	9.724

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level. All notes from our baseline table apply here. Missing observations in control variables are set to the mean (if continuous) or zero (if discrete) and we include a missing indicator where applicable.

B.3 Balancing Tests for Selection Checks

In table B.4, 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.

We run our balancing tests over single parent homes, number of siblings in the household, logged household income, mother's age, and the cognitive ability control (AH PVT).[30] For all but the cognitive ability variable we find

30. We do not impute for missingness for these variables as when in the control set

Table B.4: 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 APVT	(6) AH PVT
Peer Mother Involvement	-0.007	-0.001	0.012	0.154	0.024*	0.018
	(0.006)	(0.017)	(0.010)	(0.096)	(0.012)	(0.012)
SG Peer Mother Involvement						0.547***
						(0.186)
School FE	Yes	Yes	Yes	Yes	Yes	Yes
SG-Peer Mother Inv. Trend	No	No	No	No	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	12316	12316	10647	12230	11805	11805

Note: [A]* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses and are clustered at the school level.
[B]Sample size varies because in baseline regressions we set missing in these variables to the mean or 0 but cannot do that here.
[C]All specifications include school fixed effects, grade-level indicators, race indicators, gender, and mother's education indicators.

peer mother's involvement to be insignificant and in most cases near zero.

For AH PVT, it is significant, although small in magnitude. Thus, in column 6, we retest AH PVT including the school-grade peer mother involvement trend—interactions between it and each school indicator. While we find that school-grade peer mother involvement is strongly related to AH PVT, the coefficient estimate on our instrument now falls closer to zero (0.018) and is insignificant. It is worth noting that the estimated standard error does not change between columns 5 and 6, suggesting the loss of significance upon inclusion of the trend control is due to a weakening of the correlation. Moreover, back in column 4 of table 2 when controlling for AH PVT we find our result remains highly consistent. We find the same when including the school-grade peer mother involvement trend control in column 6.

B.4 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

because they are used here as dependent variables

involvement. In section 5.3, 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 B.5: 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%

B.5 Heterogeneity Results

First, there is evidence in the literature that influences on skill development decline as a child ages (Doepke et al. 2019; Heckman and Mosso 2014). Our sample is of adolescents but some of these are young adolescents in 7th or 8th grade. We aim to test whether mothers' response to peer mother involvement is driven only both mother's of the youngest adolescents in our sample, and likewise, for the effect of mother's involvement. Second, it may be of concern whether the efficacy of maternal involvement is constant across mother's skill. Potentially, the returns to involvement for mother's of lower education will be lower if they lack adequate training in effective involvement. Thus, we also aim to test whether mothers' response to peer mother involvement is driven only by mothers at higher education levels, and likewise, for the effect of mother's involvement.

In the left panel of figure B.2, we report the average marginal effect of peer mother involvement on mother's involvement at each grade-level.[31] The confidence intervals are quite wide because our sample size by grade-level is relatively small. Nevertheless, we see no pattern of in general of stronger responses by mothers at earlier grades. If anything, the pattern suggests the strongest responses to peer mother involvement occur from 9th-11th grade.

In the right panel of figure B.2, we report similar results for the first-stage over mothers' education-level. The pattern provides no evidence that the first stage result is driven by mother's with greater education. If anything, it is mothers with lower education that respond the strongest to peer mother involvement. This result bears some sense to the literature. In a reivew, Kalil (2015) suggests that parents, especially those with lower education, tend to put more weight on parenting advice from their social groups, communities, and families than from experts.

In table B.6, we explore heterogeneity in the effect of mother's involvement by grade-level and mother's education. In column 1, we interact mother's involvement with a grade-level variable and instrument this interaction with the interaction between our main instrument and grade-level. The interaction effect is estimated to be near zero, suggesting there is no heterogeneity by grade-level. Our instrument was never very strong to begin with, thus there is concern with whether this approach will yield strong enough instruments to effectively evalute for heterogeneity. Indeed for this specification we find the overall K-P F is very small (4.177), 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 very similar to the baseline result. Thus, our results are at least not driven by the 7th and 8th graders in the

31. Involvement is schooling-related involvement as defined previously. The peer reference group is our original grouping unless otherwise noted.

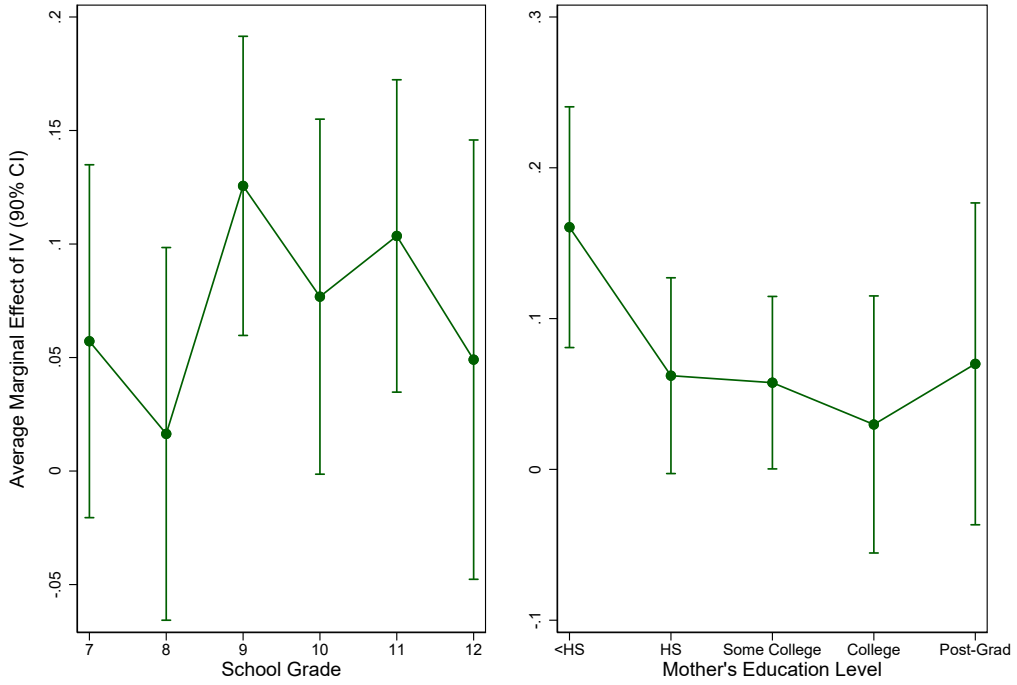

Figure B.2: Mother's Involvement and Peer Mother's Involvement Heterogeneity

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 point toward strong effects on the level-effect that fall substantially as mother's education increases. In fact, these suggest that almost all of the results are driven by mother's with less than a completed college education. Again, weak instruments may be a problem here and we caution against drawing strong conclusions.

In column 4, we restrict the sample to observations with mothers who

Table B.6: Heterogeneity by Grade-Level and Mother's Education

	(1)	(2)	(3)	(4)
Mother Involvement	-0.419	-0.458**	-0.773***	-0.669**
	(1.222)	(0.197)	(0.245)	(0.294)
Mother Inv. X Grade	-0.009			
	(0.119)			
Mother Inv. X Mother's EDU			0.202*	
			(0.109)	
N	12316	8866	12316	9810
K-P F	4.177	17.276	3.135	9.558
AR Weak IV Test	0.019	0.016	0.001	0.002

Note: [A]* 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.

[B]In column 1, the instruments are peer mother involvement and its interaction with grade-level. We instrument both mother involvement and its interaction with grade-level. In column 3, we follow a similar approach for mother's education level.

[C]In column 2, we restrict the sample to those in 9th grade or above (in high school).

[D]In column 4, we restrict the sample to observations with mother's who have less than a college degree.

have less than a completed college education.[32] Here the K-P F is near 10 and the effect of mother's involvement remains somewhat higher than the baseline effect at -0.669. Overall, these results suggest that for mother's of lower education there schooling-related involvement can indeed be effective. A deeper analysis of the influence of involvement across maternal skill is beyond the scope of this paper and likely worth devoting significant attention to.

Next, we turn to ask whether the effect of mother's involvement may vary across gender. Figure B.3 shows that males in general exhibit much more school-trouble. To test for heterogeneity by gender in the effect of mother's involvement, we interact gender with mother's involvement and instrument it with an interaction between our instrument and gender. One concern is that the interaction instrument may be too correlated with peer mothers'

32. We are including those with less than HS, HS, and some college.

involvement itself to effectively evaluate both mother's involvement and its interaction with gender. Also, because our instrument is not very strong splitting the sample by gender cuts the sample size to much. Thus, we explore the interaction of mother's involvement with a female indicator on different iterations of defining the peer reference group. First, we keep our original reference group definition. Second, we drop gender, leaving the reference group as same school-grade-race (SGR)-mother's education. Third, we turn the same SGR-mother's religious denomination reference group, which results in losing additional observations ($N = 11299$ in this case). And, fourth, we use the SGR-mother's religious denomination reference group and the instrument at our original definition to obtain multiple instruments and overidentification.

Figure B.3: School-Trouble Empirical Density Plots by Gender

In table B.7, we report the results. In column 1, using our instrument at its interaction with a female indicator at the original reference group definition we find no evidence for a differential effect. Although, we do pass a weak IV robust test that the effect of mother's involvement and its interaction with female are jointly equal to zero we are still concerned by the very low K-P F, thus turn to iterations of our instrument at different reference group definitions.

Table B.7: Heterogeneity by Gender

	(1) Original IV	(2) SGR-Mother's EDU IV	(3) SGR-Mother's RD	(4) Multiple IVs
Mother Involvement	-0.512***	-0.511*	-0.531	-0.598**
	(0.195)	(0.297)	(0.328)	(0.251)
Mother's Inv. X Female	0.016	0.095	0.126	0.132
	(0.269)	(0.184)	(0.211)	(0.218)
Female	-0.406***	-0.412***	-0.407***	-0.401***
	(0.028)	(0.029)	(0.034)	(0.028)
N	12316	12316	11299	11299
K-P F	2.342	3.392	3.456	4.766
AR Weak IV Test	0.009	0.103	0.212	0.058
CLR Weak IV Test				0.014
Lagrange K Weak IV Test				0.029
Over-ID p-value				0.758

Note: [A]* 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.

[B]Each specification includes two endogenous variables: mother's involvement and its interaction with female.

[C]Column headers indicate the instrument employed. In each case, the instrument set is the main IV and its interaction with female.

[D]Original IV is the average of mother's involvement at our primary reference group level: the same school-grade-race-gender-mother's education.

[E]SGR-Mother's EDU cuts gender from the reference group definition and is the same school-grade-race-mother's education level.

[F]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.

[G]Multiple IVs employs the SGR-Mother's RD, its interaction with female, and our original reference group definition to obtain overidentification.

[H]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.

In column 2 and 3, we restrict the reference group to the SGR-mother's education and the SGR-mother's religious denomination and find similar results. The main effect is less efficient but almost identical, the interaction effect is not significant, and the K-P F remains low. Finally, in column 4 we use the instrument at SGR-mother's religious denomination reference group and its interaction with female to instrument the interaction between mother's involvement and female. We then include the instrument at our original reference group definition, the SGR-mother's religious denomination definition, and the interacted instrument to obtain multiple instruments. Again, we find similar 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 that 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. However, we do see in columns 3 and 4 that the interaction effect is positive and around 0.13 though not significant. It may be that we are underpowered to detect this effect statistically. This positive interaction effect would suggest that mother's involvement is somewhat less effect for females, but even if we take this at face-value the average effect for females will still be larger than that reported in the baseline OLS results.

B.6 Variable Definitions for Mechanism Section

Table B.8: 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 B.9: 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	