

# Self-Control: Does the Educator Matter More than the Education?

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**Abstract:** Self-control has important effects on outcomes such as education, savings, health and criminality. There is clear evidence that self-control is in part determined by the relationships inside the family. However, there is still debate about the role of schools and teachers on developing self-control. In this paper, I analyze the effects of teaching styles, teacher-student relationships and years of school on self-control. I exploit a data set from Mexico that includes information for adults, family dynamics and school environments when they were children. To identify causality, I use a bounding methodology. I find that when teachers promote a participative teaching style and create supportive teacher-student relationships, they can affect the self-control of their students. The magnitudes of these effects are bigger than the effects of family relationships on self-control. In particular, I find that an increase by one standard deviation in the participative teaching style increases the level of self-control by .30 standard deviations. Also, I find a similar magnitude in the case of teacher-student relationships. However, I do not find evidence that the years of school determine self-control.

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# 1 Introduction

Self-control has important effects on outcomes related to academic success (Mischel et al. 1998; Duckworth and Seligman 2005), criminality (Morris, et al. 2011), savings and physical health (Moffitt et al. 2011), among others. There is evidence that self-control is in part determined by parenting styles (Pratt et al. 2004). However, there is still debate regarding the effects of school and teachers on self-control.

Skibbe et al. (2010) find that years of school has no effect on self-control. Also, there has been attempts to create curriculums to increase self-control inside the classrooms. The program *Tools of the Mind*, for example, includes 40 activities to improve mental functions, one being self-control. Farran and Wilson (2014) conducted a random experiment to evaluate this program, and they find no effects on self-control; but find negative effects in other variables such as letter identification and quantitative concepts. It is possible that neither the school nor developing curriculums impacts self-control, but rather the teachers can promote self-control. Tuner, et al. (2005), using data from the National Longitudinal Survey of the Youth, find effects of school socialization (i.e. the ability of teachers to maintain discipline in the school) as an important predictor of self-control.

In this paper, I analyze the effects of teaching styles, teacher-student relationships and years of school on self-control. I use a database that has information on socioeconomic and non-cognitive variables for 1,335 women and 644 men participating in the conditional cash transfer program *PROGRESA* in Mexico. The data contains information of self-control, teaching styles, teacher-student relationships and years of school. But also, it has information for other important variables

that have been recognized as predictors of self-control, such as parenting styles, family relationships, parental involvement at the school, number of siblings, growing up with both parents, among others.

However, a study of this type has considerable endogeneity problems. The measures of teaching styles and teacher-student relationships are latent variables constructed using principal components, and this implies that they are approximations with a potential problem of measurement error. It is well known that when the regressors are measured with error the parameters estimated are biased toward zero. Furthermore, while the data contains a considerable number of controls, it is possible that other variables are correlated with our variables of interest causing a problem of omitted variables. To assess the problem of omitted variables, I use two bounding methodologies; one developed by Oster(2014) and the other by Krauth (2016). Regarding reverse causality, this is not a serial concern, i.e. it is almost impossible that the level of self-control of adults affect the teaching-styles or teacher-student relationships when they were at school.

I find that when teachers promote a participative teaching style and they have supportive teacher-student relationships, they can affect the self-control of the students. In particular, I find that an increase by one standard deviation in the participative teaching style increases the level of self-control by .30 standard deviations. I find a similar magnitude for the case of supportive teacher-student relationships (.28). These magnitudes are bigger than the effects of family relationships. However, I do not find evidence that years of school impacts self-control. When analyzing women and men, I found that the results are consistent for the case of women; but in the case of the men, only participative teaching style is maintained as predictor of self-control.

The rest of the paper is organized as follows. Section 2 introduces some related literature, In

Section 3, I introduce the data and the empirical strategy. In Section 4, I present the results, and I conclude with Section 5.

## 2 Literature Review

Gottfredson and Hirshi (1990) built up the hypothesis that self-control is mainly a function of parenting styles. Parents who can identify and discipline their children's misconduct earlier in life will bring up kids with sufficient self-control. As a consequence, self-control is principally developed during the childhood and stable during the adolescence. For Baumrind (1991), discipline is important, but it also should be accompanied by clear explanations and reasoning. Baumrind refers to parents that promote discipline, but also reasoning, as authoritative.

Evidence has shown that parenting affects self-control. Pratt, et al. (2004) using data from the National Longitudinal Survey of Youth (NLSY) found that poor parental supervision is associated with lower self-control; but, also they found that high levels of monitoring generates lower self-control. Cochran et al. (1998) found that warm parents rather than vigilant parents impacts self-control of the children.

Fox and Calkins (2003) and Morris et al. (2007) recognize that most of the research has concentrated in the effects of parenting on self-control; but, there are other important factors such as siblings, life events, mentors or school environment that could potentially have consequences on self-control.

Fox and Calkins (2003) established siblings can provide support in stressful situations, but also

can be the source of negative conflict. Amato (2001) review the effects of family disruptions on personality. In general, there is a correlation between personality and life events, such as divorce. Prevoo and Weel (2015) analyze the effects of family disruptions (death of a parent and divorced parents) on self-esteem, internal locus of control, and behavioural problems using the British Longitudinal Data. They found that family disruptions are related with the personal traits analyzed. However, the relationships disappears when controls related to home are added.

Emmy Werner (2005) studied a cohort of children who lived in families troubled by chronic discord, divorce, alcoholism and/or parental psychopathology from Kauaui, Hawaii. Werner found that one-third of the children who had experienced such risk factors did not develop behavioral problems, none one of these individuals had a criminal history (a factor associated with lack of self-control), and their divorce rates were significantly lower. One of the factors that differentiate the children who succeeded against their environments was the existence of a tutor (an emotionally stable person who was sensitive to their needs).

Gottfredson and Hirshi (1990), also left open the hypothesis that other institutions, like the school, have the potential to influence self-control. For example, a professor also can identify and discipline children's misconduct. However, studies have found that attending school has no impacts on self-control. Skibbe et al. (2010) found that rather than the years of school, it was the children's chronological age that predicts self-control. Yet, it is possible to suggest that it is teacher rather than the school itself that can promote self-control. Turner, et al. (2005), using data from the National Longitudinal Survey of Youth, found effects of school socialization (i.e. the ability of teachers to maintain discipline in the school) on self-control. Rimm-Kauffman et al. (2002) found that teachers who are aware of what children were doing and responded warmly when the children

needed attention have positive effects on self-control.

Also, there has been efforts to develop self-control inside the school, but the results on self-control are mixed. The program *Tools of the Mind* was implemented in pre-k classrooms in 1993 in the USA. The program include 40 activities to improve mental functions, one being self-control. Farran and Wilson (2014) conducted a random experiment to evaluate the program. They do not find effects of the program on self-control; but, find negative effects in other variables such as letter word identification and quantitative concepts. The authors suggest many hypothesis for this result; in particular, it appears that target pedagogic activities potentially challenge the interaction between teacher and students; and also it decreases the time the children have to explore the materials freely. On the other hand, Domitrovich, Corts and Greenberg (2007), analyze the *Promoting Alternative Thinking Strategies (PATHS)* curriculum program for preschool-age children in Head Start on self-control. PATHS is a teacher-taught curriculum designed to improve children's social competence. They found positive effects of the program on self-control.

### 3 Data

I use a database that has information on socioeconomic and non-cognitive variables for 1,335 women who attend at least one year at the primary school and were participating in the conditional cash transfer program *PROGRESA* in Mexico in 2010. Also, for around 50% of these women, the survey collected information from their husbands. So, in total, I have information for 1,979 individuals.

Table 1 present some basic statistics. The average years of schooling was 5.9, which implies the average education was close to primary school (6 years). The average age was 43 years old, and in

average they had 6 siblings. 76% lived with both parent when they were children, and 35% reported having a tutor when they were children, i.e. an emotionally stable person who was sensitive to their needs. In general, I do not find differences in the variables presented above when comparing between men and women, with the exception of age. The average age of the women is 42 and for the men is 45 years old.

The data contain information for the following non-cognitive variables: self-control, participative teaching style, supportive teacher-student relationship, authoritative parenting style, positive family relationships, and parental involvement in the school. The self-control test is based on the Self-Regulation Questionnaire (SQR) of Brown, et al. (1999), and it has 10 items. The participative teaching style is based on Leung, Lue and Lee (2003), and it has 8 items. The supportive teacher-student relationship, which has 7 items, is based on the Teacher-Student Relationship Inventory of Ang (2005). The authoritative parent test, which has 5 items, is based on the Parenting Scale of Arnold, et al. (1993). The positive family relationship test, which has 6 items, is based on the Scale of Family Atmosphere of Molloy and Pallant (2002). The parental involvement at the school is based on the Parents Perception of General Invitations for Involvement from the School Scale of Walker et al. (2005), and it has 12 items. All tests were analyzed and validated for the families participating in the *PROGRESA* program by Palomar (2015) .

I use principal components as a data reduction tool to construct the following latent variables: self-control, participative teaching style, supportive teacher-student relationship, authoritative parenting style, positive family relationships, parental involvement in the school and parent support with the homework. Table 2 list the scales (Column 1) and the questions (Column 2) used to build each scale. Each question has a categorical answer of the type “always”, “frequently”, “rarely” and

“never”. I aggregate those answers into scales using principal component analysis where only one latent factor was retained. Finally, Column 3 shows the loading associated with each variable.

## 4 Estimation Strategy

### 4.1 Establishing Causality

The model to estimate is given by:

$$Y = \beta X + \gamma W + e.$$

where:  $Y$  is the outcome of interest (self-control);  $X$  is a vector of the variables of interest (teaching style, teacher-student relationship and years of school);  $W$  is a vector of observed control variables; and finally  $e$  is the error term.

The objective is to understand how participative teaching style, supportive teacher-student relationship and years of school influence self-control. However, there are some estimation problems. The measures of participative teaching style and supportive teacher-student relationship are latent variables constructed using principal components, this imply they are approximations, with a potential problem of measurement error. It is well known that when the regressors are measured with error the parameters estimated are bias toward zero. Furthermore, while the data contains a considerable number of controls, it is possible that there exists other variables that are correlated with our variables of interest causing a problem of omitted variable. To assess the problem of omitted variable, I use two bounding methodologies, one developed by Oster (2014) and the other by Krauth

(2016). Regarding reverse causality this is not a serial concern, i.e. it is almost impossible that the level of self-control of adults affect the participative teaching-style or supportive teacher-student relationships when they were at school.

I start explaining the methodology of Oster (2014). The full model has the form:

$$Y = \beta X + W_1 + W_2 + \epsilon.$$

where  $W_1$  contains the observed control variables multiplied with their coefficients  $W_1 = \sum_{j=1}^{J_o} w_j^o \gamma_j^o$ ;  $W_2$  contains all residual variation that cannot be explained by  $X$ , and  $W_1$ ; and  $W_2 = \sum_{j=1}^{J_u} w_j^u \gamma_j^u$  is not observed. Finally,  $\epsilon$  is a random error. If  $W_1$  is not correlated with  $W_2$ , but  $X$  is correlated with  $W_2$ , then  $\beta$  is not identified. Oster (2014) suggests the following:

(1) Regress  $Y$  on  $X$ , and report the parameters  $\beta^0$  and R-squared  $R^0$ .

(2) Regress  $Y$  on  $X$  and  $W_1$ , and report the parameters  $\tilde{\beta}$  and R-squared  $\tilde{R}$ .

(3) Use the information from (1) and (2), and define  $R_{max}$  as the overall R-squared of the model, i.e. control for observables ( $X, W_1$ ) and unobservables ( $W_2$ ). Also, assuming that  $\frac{cov(X, W_2)}{Var(W_2)} = \delta \frac{cov(X, W_1)}{Var(W_1)}$  and that  $W_1$  is not correlated with  $W_2$ ; Oster (2014) shows that  $\beta^* = \tilde{\beta}_1 - \delta \frac{(\beta_1^0 - \tilde{\beta}_1)(R_{max} - \tilde{R})}{(\tilde{R} - R^0)}$  is a consistent estimator for  $\beta_1$ .

But, to estimate  $\beta_1^*$  one needs assumptions for  $\delta$  and  $R_{max}$ . Oster (2015) proposes an  $R_{max} = \min\{1.3\tilde{R}, 1\}$ , where the  $\tilde{R}$  is the R-squared of the regressions using controls, and the cut-off value

of 1.3 is derived by a sample of 65 papers that used randomized controlled trials. She determined that using this cut-off allowed 90% of the randomized results to survive. So, she proposes two strategies to implement this methodology: statements about  $\delta$  and bounding statements about  $\beta$ .

The first strategy calculates the value of  $\delta$  that makes the value of  $\beta$  equal to zero. For example a value  $\delta = 3$  implies that the unobservables are three times as important as the observables to produce a value of  $\beta$  equal to zero. She proposes a value of  $\delta \geq 1$  as a reasonable cut-off for the results being robust to the problem of omitted variable. The second strategy consists in generate bounds for  $\beta$ . Notice that the value of  $\beta^*$  is a function of  $\delta$  and  $R_{max}$ . Given the value of  $R_{max}$ , Oster proposes to calculate the value of  $\beta^*$ , when  $0 \leq \delta \leq 1$ . So, we can build the following set  $[\tilde{\beta}_1, \beta_1^*]$ . If this set excludes zero, the results from the controlled regressions can be considered robust to omitted variable bias.

The benefit of Oster's bounding methodology is the intuitive way to arrive to the development of the bounding strategy. However, her approach needs information for two sensitive parameters ( $R_{max}$  and  $\delta$ ), and she does not provide a method to develop inference about the bounding. Krauth's bounding methodology, while more complex, only needs information about  $\delta$  and provides inference about the bounding based on Imbens and Manski (2004) confidence intervals. I explain his methodology below.

The model is given by:

$$y = x\beta_x + c\beta_c + \epsilon, \text{ where } E(c'\epsilon) = 0$$

Also, define  $\lambda$  such that:

$$corr(x, \epsilon) = \lambda corr(x, c\beta_c)$$

Assuming a finite interval  $\Lambda = [\delta^L, \delta^H]$ , such that  $\delta^L \leq \delta \leq \delta^H$ . Define  $d = [y \ x \ c]$  and allow for a second moment of length  $m$  such that  $E_m(d'd)$  is finite and positive definite. Then,  $\beta_c$  and  $\lambda$  can be identified if  $\beta_x$  were known:

$$\beta_c(b_x; m) = E_m(c'c)^{-1} E_m(c'y) - b_x E_m(c'c)^{-1} E_m(c'x) \text{ and}$$

$$\lambda(b_x; m) = \frac{corr_m(x, y - b_x x - c\beta_c(b_x; m))}{corr_m(x, c\beta_c(b_x; m))}$$

Let  $B_x(\Lambda; m)$  be defined as the set of all  $b_x$  satisfying:

$$cov_m(x, y - b_x x - c\beta_c(b_x; m)) \sqrt{var_m(c\beta_c(b_x; m))} = \lambda cov_m(x, c\beta_c(b_x; m)) \sqrt{var_m(y - b_x x - c\beta_c(b_x; m))}$$

for some  $\lambda \in \Lambda$ , Krauth shows that there exists at least one  $b_x$  in the set  $B_x(\Lambda; m)$ . So,  $B_x(\Lambda; m)$  is the identified set with its upper and lower bounds given by:

$$\beta_x^L(\Lambda; m) = \inf B_x(\Lambda; m) \text{ and}$$

$$\beta_x^H(\Lambda; m) = \sup B_x(\Lambda; m)$$

In his paper, Krauth (2015) gives in great detail the approach to get the Imbens and Manski

(2004) confidence interval for the identified set.

## 5 Results

### 5.1 Effects of Participative Teaching Style and Supportive Teacher-Student Relationship on Self-control

Table 3, column 1 presents an OLS regression of the participative teaching style on self-control. I control for years of schooling, age, age squared, authoritative parenting style and having positive family relationships. I find that an increase in one standard deviation in the participative teaching style increases the level of self-control by .30 standard deviations. To see how important is this effect, notice that an increase in one standard deviation on positive family relationships increase self-control by .16 standard deviations. As other studies have found, I do not find evidence that years of school affects self-control. Other important result is that authoritative parenting style is statistically significant, but not being the most important predictor as the literature on parenting styles proposed. I found a coefficient associated with authoritative parenting style of .05.

The association between self-control and participative teaching style could be the result of not controlling for other important variables. In Table 3, column 2, I include a variable that measures how much parents are involved in the education of their children (parent involvement) and a variable that measures if parents were able to support the children with their homework (help with the homework). In Colum 3, I includ the number of siblings. In column 4, I include a dummy variable regarding whether the children lived with both parents and whether or not they had a tutor when they grew up. The parameter associated with teaching style is stable and statistically significant;

but this is not the case for years of school, which parameter continues being not statistically significant.

Regarding the effects of supportive teacher-student relationships on self-control, the results are presented in Table 4. In Column 1, I control for years of schooling, age, age squared, authoritative parenting style and having positive family relationships. I find that supportive teacher-student relationship increases the level of self-control, but the parameter associated with years of school is not statistically significant. In order to analyze if the coefficient associated with supportive teacher-student relationships was stable, I replicate the analysis presented in columns (2) to (4) in Table 3. The results confirm that the coefficient associated with supportive teacher-student relationships is around .28, and it is statistically significant in all the regressions analyzed. Another important result is that having positive family relationships is statistically significant, with a coefficient associated of .21; but, having authoritative parents is not any more statistically significant.

The results presented above show that participative teaching style and supportive teacher-student relationships have important effects on self-control. In addition, the results are robust when I include other variables that have been analyzed in other studies as potential predictors of self-control. However, it is possible that these results are biased as a consequence of a potential problem of omitted variables. In order to analyze how sensitive are the results to the problem of omitted variable, I use Oster (2014) and Krauth (2016) bounding methodologies.

In Table 5, I present the results using the bounding methodology of Oster (2014). Column 1 shows the estimated treatment effects for the baseline model (together with standard errors (in parentheses) and the R-squared  $\hat{R}$  (in brackets)). Column 2 presents the point estimates for the

model including control variables. Column 3 reports the identification set  $[\tilde{\beta}, \beta^*]$ . Column 4 shows whether the identified set excludes zero, and finally column 5 reports the hypothetical value of  $\delta$  that suggest an effect of  $\beta = 0$ .

The important assumption to apply Oster methodology is to find a group of controls who are not related to the error term, and that in some sense are exogenous. A potential candidate is the age of the individual. However, it has been found that the order of birth among siblings can affect variables related to personality. So, I include as a control the number of siblings. The bounding analysis of participative teaching style on self-control using as controls age, age square and number of siblings is presented in Table 5, row 1. This gives an identified set of  $[\.375, \.383]$ . To further test robustness, I calculate the hypothetical value of  $\hat{\delta}$  that makes the effect of  $\beta = 0$ . The absolute value of  $\hat{\delta}$  is 10.72. According to Oster(2014), a value bigger than one can be considered robust against omitted variables. To better understand the robustness of these results, in row 2 , I include the same controls as (1), but adding a dummy variable for living with both parents and having a tutor when they grew up. In this case the identified set is  $[\.370, \.372]$ , and the value of  $\hat{\delta}$  is 39.14. So, using Oster's bounding methodology the results are robust to the problem of omitted variable.

The result of supportive teacher-student relationships on self-control is presented in Table 5, row 3. Using as a controls age, age squared and years of school, I find an identified set of  $[\.312, \.357]$ , and a value of  $\hat{\delta}$  of 2.71. In row 4, I add living with both parents and having a tutor as a controls. In this case, the identified set is  $[\.294, \.353]$ , and the value of  $\hat{\delta}$  is 2.25. This result confirms that supportive teacher-student relationship is robust to the problem of omitted variables.

In Table 6, panel 1, I present the results using Krauth's bounding methodology. Controls are

age, age squared, and number of siblings. Column (1) presents the effect of participative teaching style on self-control. Also, it includes the asymptotic 95% confidence interval using Imbens and Manski (2004). If the correlation between the participative teaching style and unobservables is not larger than the correlation between the participating teaching style and observables ( $0 \leq \delta \leq 1$ ), then the identified set is [.375, .390]. Finally, the value of  $\delta$  which implies a value of  $\beta = 0$  is calculated. It's absolute value is 38.2. Panel 2, column 1, presents the results using the following controls age, age squared, number of siblings, living with both parents and having a tutor. In this case the identified set is [.361, .372], and the value of  $\delta$  is 7.95. While there is a considerable reduction in the value of  $\delta$ , the result is still robust to the problem of omitted variable. Finally, I replicate the same analysis for the case of supportive teacher-student relationships. In panel 1, using as a controls age, age squared and years of school, I find that the identified set is [.291, .356] and the value of  $\delta$  is 7.95. In panel (2), adding as a controls living with both parents and having a tutor, I find the identified set is [.242, .352] and the value of  $\delta$  is 2.61. So, using kraut's bounding methodology, I find that participative teaching style and supportive teacher-student relationship are robust to the problem of omitted variable.

## 5.2 Effects of Participative Teaching Style and Supportive Teacher-Student

### Relationship on Men's Self-control

In Table 7, I use OLS to analyze the effects of participative teaching style on self-control for the case of men. I start in column 1, controlling for age, age squared, authoritative parenting style, and positive family relationships. I find that an increase in one standard deviation in the participative teaching style increases the level of self-control by .31 standard deviations. In the case of years of school, I find that the coefficient associated with years of school is 0.02. Also, I found that positive

family relationships has an effect on self-control, but this is not the case of parenting styles. Then I include other controls. In column 2, I add parental involvement in the school and help with the homework. In column 3, I include number of siblings; and in column 4, I add variables for living with both parents and having a tutor. I observe a decrease in the effect of teaching style on self-control from .31 (column 1) to .27 (column 2) when I include as a control parental involvement and help with the homework. But then, the coefficient associated with teaching style is around .26 and statistically significant when I incorporate the other controls (see columns 3 and 4). However, while the coefficient associated with years of school is constant around .02, in some specifications (see columns 2 and 4), it is not statistically significant.

I present the results of supportive teaching-student relationships on self-control for the case of the men in Table 8. For each column, I use the same controls as those used in Table 7. I find that for all the specifications, the coefficient associated with supportive teacher-student relationship is statistically significant, but it moves from 0.28 (in column 1) to .23 (in column 4). In the case of years of school, the coefficient associated is 0.02, but for some specifications the coefficient is not statistically significant (see column 2 and 4).

To check that these results are robust to omitted variable, I present the results using Oster's bounding methodology in Table 9. I use two specification: in the first, I use as a controls age, age squared and number of siblings. In the second, I include the same controls, but I add living with both parents and having a tutor. The results for participative teaching style using the first specification are presented in row 1. The identified set is  $[\text{.308}, \text{.422}]$  and the value of  $\delta$  which implies a value of  $\beta = 0$  is 1.62. In row 2, I present the second specification. In this case, the identified set is given by  $[0.266, 0.410]$  and the value of  $\delta$  is 1.44. So, using the identified set strat-

egy or calculating the value of  $\delta$ , for both specifications, the results are robust to the problem of omitted variable. In the case of supportive teacher-student relationships, the results are presented in row 3 and 4 in Table 9. Row 3 corresponds to the first specification and row 4 to the second specification. For the first specification, I find that the identified set is  $[\.371, \.3149]$ , but the value of  $\delta$  which implies a value of  $\beta = 0$  is 0.88. This value is below the threshold of 1 in order to consider the result robust to omitted variable. In the second specification, the identified set is  $[\.195, \.356]$  and the value of  $\delta$  is 1.32. So, given the results of the first specification, the results related to supportive teacher-student relationship are not robust to the problem of omitted variable.

In Table 10, I present the results using Krauth's bounding methodology. In column 1, I report the results for participative teaching style. In panel 1, I use as a controls age, age squared and number of siblings. I found that the identified set is  $[\.421, \.447]$ , and the value of  $\delta$  which implies a value of  $\beta = 0$  is 98.8. In the second panel, I use the same controls as panel 1, but I add living with both parents and having a tutor. In this case, the identified set is  $[\.298, 0,420]$ , and the value of  $\delta$  is 2.51. The analysis for teacher-student relationship is presented in column 2. I use the same controls used in column 1 for panel 1 and 2. In panel 1, the identified set is given by  $[0.344, 0.370]$  and the value of  $\delta$  is 5.69. In panel 2, the identified set is given by  $[0.173, 0.356]$ , and the value of  $\delta$  is 1.77.

To sum up, in the case of the men, the results for participative teaching style are robust using two different bounding methodologies and using a different set of controls. However, in the case of supportive teacher-student relationship, the result was not robust using the Oster's bounding methodology.

### 5.3 Effects of Participative Teaching Style and Supportive Teacher-Student Relationship on Women's Self-control

I analyze the effect of participative teaching style on self-control using OLS for the case of the women. In Table 11, column 1, I control for years of schooling, age, age squared, authoritative parenting and positive family relationships. I find that an increase in one standard deviation in the participative teaching style increases the level of self-control in .29 standard deviations. Then, I add parental involvement and help with the homework in column 2; number of siblings in column 3, and living with both parents and having a tutor in column 4. In all the regressions, I find that the coefficient associated with teaching style is around .30, and it is statistically significant. Regarding supportive teacher-student relationship the results are presented in Table 12. From columns 1 to 4, I use the same controls as those presented in Table 11. In all the cases, I found that the coefficient associated with teacher-student relationship is around 0.28 and being statistically significant.

To analyze if the previous results are not affected by the problem of omitted variable, I use the Oster's bounding methodology and the results are presented in Table 3. In the case of participative teaching style the results are presented in row 1. In this case, I control for age, age squared, and number of siblings. The identified set is  $[0.351, 0.361]$ , and the value of  $\delta$  which implies a value of  $\beta = 0$  is 8.79. Also, I decided to check the robustness of this result incorporating new controls; in particular, I add living with both parents and having a tutor. In this case, the bounding is  $[0.351, 0.359]$ , and the value of  $\delta$  which implies a value of  $\beta = 0$  is 10.51. This implies that the coefficient of participative teaching style is robust to the problem of omitted variable. Then, I conduct a similar analysis for supportive teacher-student relationship. In row 3, I use the same controls as row 1. I find that the identified set is  $[0.308, 0.343]$  and the value of  $\delta$  is 3.62. In row 4, I use the same controls as row 2, in this case the identified set is  $[0.308, 0.343]$  and the value of  $\delta$  is 3.28.

Finally, I present the results using Krauth's bounding methodology. In column 1, I present the results for participative teaching style. The controls are age, age squared, and number of siblings. In this case, the identified set is given by  $[0.351, 0.357]$ , and the value of  $\delta$  which implies a value of  $\beta = 0$  is 157.6. In panel 2, I include the same controls as in panel 1, but I add living with both parents and having a tutor. In this case, the identified set is  $[0.350, 0.353]$  and the value of  $\delta$  is 21.1. The results for supportive teacher-student relationship are presented in column 2. I use the same controls as those used in panel 1 and 2 for participative teaching style. In the case of panel 1, I find that the identified set is given by  $[-.254, .343]$  and the value of  $\delta$  is 2.98. In the case of panel 2, the identified set is  $[-.239, .342]$  and the value of  $\delta$  is 2.67.

To sum up, using two different methodologies for bounding, and using two different specifications for the set of controls; I find that participative teaching style and supportive teacher-student relationships are robust to the problem of omitted variable.

## 6 Conclusion

Self-control has important effects on outcomes such as education, savings, health and criminality. There is clear evidence that self-control is in part determined by the relationships inside the family. However, there is still debate about the role of schools and teachers on developing self-control. In this paper, I analyze the effects of teaching styles, teacher-student relationships and years of school on self-control. I exploit a data set from Mexico that includes information for adults, family dynamics and school environments when they were children. To identify causality, I use a bounding methodology. I find that when teachers promote a participative teaching style and create supportive

teacher-student relationships, they can affect the self-control of their students. The magnitudes of these effects are bigger than the effects of family relationships on self-control. In particular, I find that an increase by one standard deviation in the participative teaching style increases the level of self-control by .30 standard deviations. Also, I find a similar magnitude in the case of teacher-student relationships. However, I do not find evidence that the years of school determine self-control.

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## Appendix A

Table 1: **Basic Descriptive Statistics**

	Total		Women		Men	
	Mean	S. D.	Mean	S. D.	Mean	S. D.
Years of Schooling	5.9	2.8	5.9	2.8	5.9	3.0
Age	42.8	10.6	41.7	10.27	45.2	11.0
Siblings	5.9	3.0	5.9	3.0	5.9	3.1
Living with both parents	.76	.42	.74	.43	.79	.40
Having a tutor	.35	.48	.36	.48	.34	.47
N. of cases	1,979	1,979	1,335	1,335	644	644

Table 2: **Latent Variable**

Scale name	Scale survey question	Factor Loading
Self-control Eigenvalue: 4.258	[1] You make decisions carefully	0.291
	[2] You finish what you start	0.319
	[3] You have a lot of willpower	0.307
	[4] You check your progress when you put a goal	0.328
	[5] You can keep a plan to carry it out	0.343
	[6] You think before doing things	0.309
	[7] You kep your goals and you do not allow anyone apart from them	0.346
	[8] You persever to achieve your goals.	0.362
	[9] You meet whatever it takes to achieve your goals	0.294
	[10] When there is something that firgtens you, you try to face it.	0.243

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Participative Teaching	[1] Teachers let students said their opinion and their feelings	.340
Style	[2] Teachers tried to know the opinion of the students	0.369
Eigenvalue: 5.002	[3] Teachers helped students to learn their strengths and weakness	0.353
	[4] Teachers encouraged students to say their point of view	0.351
	[5] Teachers helped the students to see advantages and disadvantages of different ways of solving a problem	0.338
	[6] Teachers listened the students' experiences	0.350
	[7] Teachers encouraged the students to express their ideas	0.356
	[8] Teachers tried to understand the students	0.368

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Supportive Relationship	[1] When I needed help I could get help from my teachers	0.420
Teacher-Student	[2] You talked about your personal life with your teachers	0.286
Eigenvalue: 3.557	[3] You sought your teachers when you needed to be heard	0.434
	[4] When you had problems at home, you asked for help to your teachers	0.285
	[5] When it was necessary, you asked for help to your teachers	0.447
	[6] When teachers missed the class, you missed them	0.396
	[7] Teachers helped to do things in the possible best way	0.337

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Authoritative Parenting	[1] Your parents made you feel how much they loved you	0.418
Style	[2] Your parents encouraged you to say your feelings when	0.463

Eigenvalue: 3.076	you disagree with something	
	[3] Your parents explained the consequences of misconduct	0.463
	[4] Your parents talked and reasoned with you when you misbehaved	0.459
	[5] Your parents knew the issues and concerns of their children	0.430
<hr/>		
Positive Family Relationships	[1] Your family was very proud to be united	0.429
	[2] You feel very dear in your family	0.389
Eigenvalue: 3.553	[3] The members of your family listened to each other	0.419
	[4] The members of your family expressed their affection easily	0.359
	[5] I had a lot of happier moments with my family	0.421
	[6] Your family solved your problems in a non violent way	0.425
<hr/>		
Parental Involvement in the school	[1] Your parents were constantly communicating with your teachers	0.4096
	[2] Your parents talked with your teachers about your performance	0.4134
Eigenvalue: 4.180	[3] Your parents knew the activities you performed at school	0.382
	[4] Your parents participated in the activities organized by the school	0.393
	[5] Your parents did volunteer work at the school where you studied	0.353
	[6] I talked with my parents about what happened at school	0.339
	[7] Your parents helped you to take out good grades	0.346
<hr/>		
Parental Involvement	[1] Your parents explained when you did not understand the homework	0.478

in the homework	[2] You asked your parents for help with your homework	0.427
Eigenvalue: 3.320	[3] Your parents had the ability to help with your school activities	0.437
	[4] Your parents helped with your homework	0.462
	[5] Your parents know how to help you in order you do well at the school	0.427

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Table 3: OLS Estimates: Effects of Teaching Style on Self-control

	(1)	(2)	(3)	(4)
Participative Teaching Style	0.306*** (0.023)	0.305*** (0.025)	0.304*** (0.025)	0.302*** (0.025)
Years of Schooling	-0.006 (0.008)	-0.006 (0.008)	-0.005 (0.008)	-0.005 (0.008)
Age	0.046*** (0.011)	0.047*** (0.011)	0.046*** (0.011)	0.047*** (0.011)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Authoritative Parenting	0.059** (0.027)	0.062** (0.029)	0.059** (0.029)	0.061** (0.029)
Positive Family	0.169*** (0.028)	0.168*** (0.028)	0.173*** (0.028)	0.173*** (0.028)
Parental Involvement		0.030 (0.036)	0.027 (0.036)	0.026 (0.036)
Help with the Homework		-0.033 (0.032)	-0.031 (0.032)	-0.029 (0.032)
Siblings			0.006 (0.007)	0.007 (0.007)
Living with both Parents				-0.046 (0.052)
Having a Tutor				0.056 (0.045)
Constant	-1.087*** (0.270)	-1.113*** (0.272)	-1.127*** (0.272)	-1.127*** (0.274)
$R^2$	0.19	0.20	0.20	0.20
Observations	1797	1773	1767	1767

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 4: OLS Estimates: Effects of Teacher-Student Relationship on Self-control

	(1)	(2)	(3)	(4)
Teacher-Student Relationship	0.293*** (0.023)	0.286*** (0.025)	0.285*** (0.025)	0.283*** (0.025)
Years of Schooling	0.001 (0.008)	0.000 (0.008)	0.001 (0.008)	0.001 (0.008)
Age	0.032*** (0.011)	0.034*** (0.011)	0.033*** (0.011)	0.033*** (0.011)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Authoritative Parenting	0.028 (0.027)	0.028 (0.029)	0.026 (0.029)	0.027 (0.029)
Positive Family	0.213*** (0.027)	0.208*** (0.028)	0.213*** (0.028)	0.212*** (0.028)
Parental Involvement		0.050 (0.036)	0.046 (0.036)	0.046 (0.036)
Help with the Homework		-0.042 (0.032)	-0.039 (0.032)	-0.038 (0.032)
Siblings			0.006 (0.007)	0.006 (0.007)
Living with both Parents				-0.014 (0.052)
Having a Tutor				0.061 (0.045)
Constant	-0.743*** (0.271)	-0.787*** (0.274)	-0.805*** (0.274)	-0.828*** (0.276)
$R^2$	0.19	0.19	0.19	0.19
Observations	1811	1783	1777	1777

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 5: Oster’s Bounding Methodology: Effects of Teaching Style and Teacher-Student Relationship on Self-control

	(1)	(2)	(3)	(4)	(5)
Indepvar	Baseline Effect $\dot{\beta}$ , (S.E.), [ $\dot{R}$ ]	Controlled Effect $\tilde{\beta}$ , (S.E.), [ $\tilde{R}$ ]	Identified Set $[\tilde{\beta}, \beta^{*'} (\min\{2.2\tilde{R}, 1\}, 1)]$	Exclude zero?	$\dot{\delta}$ for $\beta = 0$
<b>Participative Teaching Style (1)</b>	0.373*** (0.010) [0.139]	0.375 *** (0.021) [0.152]	[0.375, 0.383]	Yes	10.72
<b>Participative Teaching Style (2)</b>	0.373*** (0.010) [0.139]	0.372 *** (0.021) [0.153]	[0.370, 0.372]	Yes	39.14
<b>Teacher-Student Relationship (1)</b>	0.362*** (0.006) [0.131]	0.357 *** (0.021) [0.136]	[0.312, 0.357]	Yes	2.71
<b>Teacher-Student Relationship (2)</b>	0.362*** (0.006) [0.131]	0.353 *** (0.021) [0.138]	[0.294, 0.353]	Yes	2.25

Standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, \*p < 0.1.

(1) Controls for age, age squared, and number of siblings. (2) Include the same controls as (1), but adding living with both parents when child and having a tutor.

Table 6: **Krauth's Bounding Methodology: Effects of Teaching Style and Teacher-Student Relationship on Self-control**

	Participative Teaching Style	Teacher-Student Relationship
(1)		
OLS point estimate (95% CI)	.375*** (0.333,0.417)	0.356 *** (0.314, 0.399)
Bounds (1), $0 \leq \lambda \leq 1$ (95% CI)	[0.375, 0.390]*** (0.332,0.448)	[0.291, 0.356]*** (0.211, 0.394)
$\hat{\lambda}(0)$	-38.23	3.81
(2)		
OLS point estimate (95% CI)	0.372*** (0.330,0.414)	0.352*** (0.309, 0.395)
Bounds (2), $0 \leq \lambda \leq 1$ (95% CI)	[0.361, 0.372]*** (0.289,0.416)	[0.242, 0.352]*** (0.168, 0.390)
$\hat{\lambda}(0)$	7.95	2.61

Ninety-five percent confidence intervals in parentheses, \*\*\*= statistically significant at 1%, \*\*= significant at 5%, \*significant at 10%. (1) Controls are age, age squared, and number of siblings. (2) Include the same controls as (1), but adding living with both parents when child and having a tutor.

Table 7: OLS Estimates for Men: Effects of Teaching Style on Self-control

	(1)	(2)	(3)	(4)
Participative Teaching Style	0.313*** (0.043)	0.276*** (0.047)	0.266*** (0.047)	0.265*** (0.047)
Years of Schooling	0.020* (0.012)	0.020 (0.012)	0.021* (0.012)	0.020 (0.012)
Age	0.021 (0.018)	0.024 (0.018)	0.023 (0.018)	0.023 (0.018)
Age squared	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Authoritative Parenting	0.070 (0.048)	0.044 (0.050)	0.035 (0.050)	0.032 (0.051)
Positive Family	0.244*** (0.049)	0.229*** (0.049)	0.244*** (0.049)	0.242*** (0.049)
Parental Involvement		0.173*** (0.063)	0.165*** (0.063)	0.165*** (0.063)
Help with the Homework		-0.094* (0.057)	-0.086 (0.057)	-0.087 (0.057)
Siblings			0.012 (0.012)	0.011 (0.012)
Living with both Parents				0.017 (0.092)
Having a Tutor				0.047 (0.077)
Constant	-0.666 (0.470)	-0.691 (0.468)	-0.759 (0.468)	-0.772 (0.470)
$R^2$	0.25	0.27	0.27	0.27
Observations	585	575	573	573

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 8: OLS Estimates for Men: Effects of Teacher-Student Relationship on Self-control

	(1)	(2)	(3)	(4)
Teacher-Student Relationship	0.289*** (0.040)	0.246*** (0.045)	0.237*** (0.045)	0.235*** (0.045)
Years of Schooling	0.020 (0.012)	0.021* (0.012)	0.021* (0.012)	0.020 (0.013)
Age	0.013 (0.019)	0.015 (0.019)	0.016 (0.019)	0.015 (0.019)
Age squared	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Authoritative Parenting	0.059 (0.049)	0.048 (0.051)	0.039 (0.051)	0.033 (0.051)
Positive Family	0.289*** (0.047)	0.270*** (0.047)	0.283*** (0.047)	0.279*** (0.048)
Parental Involvement		0.156** (0.065)	0.150** (0.065)	0.150** (0.066)
Help with the Homework		-0.090 (0.058)	-0.084 (0.057)	-0.086 (0.058)
Siblings			0.009 (0.012)	0.008 (0.012)
Living with both Parents				0.035 (0.092)
Having a Tutor				0.076 (0.078)
Constant	-0.435 (0.472)	-0.491 (0.472)	-0.553 (0.472)	-0.578 (0.475)
$R^2$	0.25	0.26	0.26	0.26
Observations	587	576	574	574

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 9: Oster’s Bounding Methodology: Effects of Teaching Style and Teacher-Student Relationship on Men’s Self-control

	(1)	(2)	(3)	(4)	(5)
Indepvar	Baseline Effect $\hat{\beta}$ , (S.E.), [ $\hat{R}$ ]	Controlled Effect $\tilde{\beta}$ , (S.E.), [ $\tilde{R}$ ]	Identified Set $[\tilde{\beta}, \beta^{*'} (\min\{2.2\tilde{R}, 1\}, 1)]$	Exclude zero?	$\hat{\delta}$ for $\beta = 0$
<b>Participative Teaching Style (1)</b>	0.426*** (0.037) [0.174]	0.422 *** (0.037) [0.176]	[0.308, 0.422]	Yes	1.62
<b>Participative Teaching Style (2)</b>	0.426*** (0.037) [0.174]	0.410 *** (0.038) [0.180]	[0.266, 0.410]	Yes	1.44
<b>Teacher-Student Relationship (1)</b>	0.377*** (0.037) [0.146]	0.371 *** (0.037) [0.145]	[0.371, 3.149]	Yes	0.88
<b>Teacher-Student Relationship (2)</b>	0.377*** (0.037) [0.146]	0.356 *** (0.037) [0.151]	[0.356, 0.195]	Yes	1.32

Standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, \*p < 0.1.

(1) Controls for age, age squared, and number of siblings. (2) Include the same controls as (1), but adding living with both parents when child and having a tutor.

Table 10: **Krauth's Bounding Methodology: Effects of Teaching Style and Teacher-Student Relationship on Men's Self-control**

	Participative Teaching Style	Teacher-Student Relationship
(1)		
OLS point estimate (95% CI)	.421*** (0.347,0.495)	0.370 *** (0.297, 0.443)
Bounds (1), $0 \leq \lambda \leq 1$ (95% CI)	[0.421, 0.447]*** (0.345,0.574)	[0.344, 0.370]*** (0.156, 0.445)
$\hat{\lambda}(0)$	98.8	5.69
(2)		
OLS point estimate (95% CI)	0.410*** (0.335,0.485)	0.356*** (0.281, 0.430)
Bounds (2), $0 \leq \lambda \leq 1$ (95% CI)	[0.298, 0.410]*** (0.141,0.480)	[0.173, 0.356]** (0.054, 0.423)
$\hat{\lambda}(0)$	2.51	1.77

Ninety-five percent confidence intervals in parentheses, \*\*\*= statistically significant at 1%, \*\*= significant at 5%, \*significant at 10%. (1) Controls are age, age squared, and number of siblings. (2) Include the same controls as (1), but adding living with both parents when child and having a tutor.

Table 11: OLS Estimates for Women: Effects of Teaching Style on Self-control

	(1)	(2)	(3)	(4)
Participative Teaching Style	0.297*** (0.028)	0.308*** (0.030)	0.311*** (0.030)	0.309*** (0.030)
Years of Schooling	-0.022** (0.010)	-0.023** (0.010)	-0.022** (0.010)	-0.023** (0.010)
Age	0.058*** (0.014)	0.059*** (0.014)	0.058*** (0.014)	0.059*** (0.014)
Age squared	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Authoritative Parenting	0.056* (0.033)	0.072** (0.035)	0.073** (0.035)	0.075** (0.035)
Positive Family	0.134*** (0.033)	0.142*** (0.034)	0.144*** (0.034)	0.145*** (0.034)
Parental Involvement		-0.021 (0.045)	-0.022 (0.045)	-0.022 (0.045)
Help with the Homework		-0.025 (0.039)	-0.025 (0.040)	-0.023 (0.040)
Siblings			-0.000 (0.009)	0.002 (0.009)
Living with both Parents				-0.070 (0.063)
Having a Tutor				0.048 (0.055)
Constant	-1.265*** (0.334)	-1.254*** (0.337)	-1.246*** (0.338)	-1.229*** (0.342)
$R^2$	0.18	0.18	0.18	0.18
Observations	1212	1198	1194	1194

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 12: OLS Estimates for Women: Effects of Teacher-Student Relationship on Self-control

	(1)	(2)	(3)	(4)
Teacher-Student Relationship	0.283*** (0.028)	0.284*** (0.029)	0.287*** (0.030)	0.285*** (0.030)
Years of Schooling	-0.011 (0.010)	-0.013 (0.010)	-0.012 (0.010)	-0.012 (0.010)
Age	0.042*** (0.014)	0.044*** (0.014)	0.042*** (0.014)	0.043*** (0.014)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Authoritative Parenting	0.019 (0.033)	0.025 (0.036)	0.025 (0.036)	0.027 (0.036)
Positive Family	0.181*** (0.033)	0.182*** (0.034)	0.185*** (0.034)	0.184*** (0.034)
Parental Involvement		0.019 (0.044)	0.018 (0.044)	0.019 (0.044)
Help with the Homework		-0.034 (0.040)	-0.034 (0.040)	-0.033 (0.040)
Siblings			0.003 (0.009)	0.004 (0.009)
Living with both Parents				-0.034 (0.063)
Having a Tutor				0.041 (0.056)
Constant	-0.897*** (0.335)	-0.911*** (0.340)	-0.905*** (0.340)	-0.911*** (0.344)
$R^2$	0.17	0.17	0.17	0.17
Observations	1224	1207	1203	1203

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 13: Oster’s Bounding Methodology: Effects of Teaching Style and Teacher-Student Relationship on Women’s Self-control

	(1)	(2)	(3)	(4)	(5)
Indepvar	Baseline Effect $\hat{\beta}$ , (S.E.), [ $\hat{R}$ ]	Controlled Effect $\tilde{\beta}$ , (S.E.), [ $\tilde{R}$ ]	Identified Set $[\tilde{\beta}, \beta^{*'} (\min\{2.2\tilde{R}, 1\}, 1)]$	Exclude zero?	$\hat{\delta}$ for $\beta = 0$
<b>Participative Teaching Style (1)</b>	0.347*** (0.026) [0.124]	0.351 *** (0.026) [0.142]	[0.351, 0.361]	Yes	8.79
<b>Participative Teaching Style (2)</b>	0.347*** (0.026) [0.124]	0.351 *** (0.026) [0.143]	[0.351, 0.359]	Yes	10.51
<b>Teacher-Student Relationship (1)</b>	0.350*** (0.026) [0.122]	0.344 *** (0.026) [0.130]	[0.314, 0.344]	Yes	3.62
<b>Teacher-Student Relationship (2)</b>	0.350*** (0.026) [0.122]	0.343 *** (0.026) [0.111]	[0.308, 0.343]	Yes	3.28

Standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, \*p < 0.1.

(1) Controls for age, age squared, and number of siblings. (2) Include the same controls as (1), but adding living with both parents when child and having a tutor.

Table 14: **Krauth's Bounding Methodology: Effects of Teaching Style and Teacher-Student Relationship on Women's Self-control**

	Participative Teaching Style	Teacher-Student Relationship
(1)		
OLS point estimate (95% CI)	.351*** (0.300,0.402)	0.343 *** (0.291, 0.396)
Bounds (1), $0 \leq \lambda \leq 1$ (95% CI)	[0.351, 0.357]*** (0.295,0.433)	[0.254, 0.343]*** (0.159, 0.390)
$\hat{\lambda}(0)$	157.6	2.98
(2)		
OLS point estimate (95% CI)	0.350*** (0.299,0.402)	0.342*** (0.289, 0.395)
Bounds (2), $0 \leq \lambda \leq 1$ (95% CI)	[0.350, 0.353]*** (0.294,0.436)	[0.239, 0.342]** (0.146, 0.388)
$\hat{\lambda}(0)$	21.11	2.67

Ninety-five percent confidence intervals in parentheses, \*\*\*= statistically significant at 1%, \*\*= significant at 5%, \*significant at 10%. (1) Controls are age, age squared, and number of siblings. (2) Include the same controls as (1), but adding living with both parents when child and having a tutor.