The Causal Impact of Alternative Parental Child Rearing Practices on Adolescent Outcomes

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Abstract

While the role of parenting style as a determinant of adolescent outcomes has a long history in developmental psychology and sociology, determining causality remains a challenge. In this study we estimate the impact of parental discipline and parental monitoring on a variety of risky behaviors. We use information on random assignment to parental training programs to identify the impact of alternative child rearing practices. Our results indicate that increases in parental supervision can reduce risky behavior, whereas the establishment of rules or disciplines has no significant impacts. Further, the estimated impacts are found to increase in magnitude as a child ages. Finally, we find that child rearing practices should be treated as endogenous and that rich data on child rearing practices is needed since many parenting strategies occur simultaneously to identify impacts of independent behaviors.

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1 Introduction

The idea that poor parental child rearing practices have substantial negative impacts on child and adolescent development is gaining increasing attention in policy debates regarding child care. In the United States, numerous state governments are now using welfare funds to implement initiatives designed to directly improve parenting, such as requiring certain welfare recipients to attend parenting classes or providing home visits to new parents.[1] The idea that certain child rearing practices are more effective at either reducing the likelihood of adolescent risky behavior or boosting academic achievement is far from new,[2] as there exists a large multi-disciplinary literature which report statistical associations between specific parenting styles or child rearing practices and a variety of problem behaviors.[3] Yet, few of these studies have statistically accounted for endogeneity biases that could arise from parental decisions, as these reflect behavioral choices. There are many reasons to expect selection bias in simple comparisons of outcomes of children whose parents actively and inactively monitor their development: If parents are more likely to monitor children with a history of tendency towards problems, then the estimated effects of parental monitoring could be under-estimated. On the other hand, a lack of parental monitoring could be correlated with other characteristics of families that cause negative outcomes.

This paper contributes to a growing literature which examines issues related to child care by estimating the direct impact of parental child rearing practices.[4] We use an instrumental variables strategy to recover consistent estimates of the causal impacts of several alternative child rearing practices. To deal with the potential endogeneity of child rearing practices, we exploit exogenous variation from the availability of two randomized intervention that provided an opportunity for parents to gain additional information on effective parenting strategies. Second, we examine the heterogeneity in the impacts both within and across periods to determine if the

relationship grows steeper as a child ages. Third, we explore the heterogeneity in the impacts across the distribution of innate adolescent attributes.

Within the economics literature the majority of work examining the interactions between parents and (adolescent) children is theoretical.[5] Empirically understanding the causal mechanisms through which family background affects child development and subsequent labor market outcomes have long been of interest to social scientists.[6] While much of the economics and developmental psychology literature examine the effects of parental care (also referred to as investments in child quality) on the development of children, there is limited work on parental behavior (or parenting styles) on such outcomes. Weinberg (2001) develops a formal model and finds that child rearing practices vary positively with family income. Aizer (2004) using a fixed effects strategy finds that adult supervision reduces the probability that an adolescent skips school, uses alcohol or marijuana, steals or gets involved in fights. Similarly Arys et al. (2005) and Dooley and Stewart (2006) present evidence from fixed effect regressions suggesting that adult supervision impacts child behaviors with US and Canadian data respectively.

Our empirical approach allows us to separately identify the direct impact of specific parental strategies from other family characteristics such as income and maternal employment which provide indirect effects.[7] Understanding the direct role of parental practices may help policymakers in three aspects: First, it may help identify the circumstances under which parents are less able to influence teenagers thus helping policymakers design social policies to remedy the parents' failure. In the second aspect, our study may help formulate social policies that strengthen the parental control over adolescents. Third, our results can also be used to shed light on the long run effectiveness of early childhood interventions to see whether these impacts truly operate through a desired channel of parental monitoring.

The considerable heterogeneity in the styles in which parents interact with their

children has been independently documented and classified by anthropologists and developmental psychologists.[8] Our empirical strategy does not make use of classifications developed within developmental psychology such as whether parents are indulgent, authoritarian, authoritative, and uninvolved, etc. Instead we focus on the extent to which parents supervise and discipline their children. We believe this taxonomy leads to estimates that are simpler to interpret as the marginal effects can be immediately translated. In addition, measuring parenting styles in this fashion is likly to lead to measures with substantially more variation over a life-cycle for each parent. The marginal effects simply recover the impacts of small increases in specific strategies whereas defining parenting styles used alternative criteria could involve either smal or large changes in specific or multiple parental behaviors. For example, if a parents' style were to swiches from being indulgent to authoritarian this not could be due to a massive increase in the number of rules they announce but they may also change how conscioustness they are in other parenting behaviors.[9] Further, if the change in style was due to a large changes in specific practices, the estimated treatment effect could be masqueardinf for potential non-linear relationships.

Our analysis yields three major findings for the economic literature on the impacts of parental child rearing practices

1) Active supervision plays a substantially larger role than the establishment of rules and discipline. Increases in parental supervision can substantially reduce the likelihood that a child engages in risky behavior either early in life or as a teenager. In addition, there are large positive relationships between supervision and academic performance particularly in mathematics. Our results suggest that parental child rearing practices should be treated as endogenous. Finally, our results suggest that the assumptions underlying fixed effects strategies are violated indicating that child risky behavior and the response by parents is also driven by random time-varying unobserved shocks.

2) The role of active supervision at reducing risky behavior is much larger later in the lifecycle than early in the lifecycle. In particular, our estimates suggest that parental supervision has extremely large impacts at reducing delinquency and theft in the mid to late teens. Further, we find that there is substantial heterogeneity in the estimated impacts of parental behaviors across almost all of the conditional outcome distributions.

3) Estimating the impacts of specific child rearing practices requires the researcher to specify a full set of parental child rearing practices. Since child rearing practices are highly positively correlated, it is difficult to disentangle their independent impacts unless one could find a source of variation that can separate between multiple parental strategies. Since it is doubtful that such a unique source of exogenous variation could be to identify one practice from another, the results indicate that researchers should collect, utilize and collective analyze data on the different child rearing strategies.

The rest of the paper is organized as follows. In the next section, we describe the data used in our analysis. Section 3 introduces the economic model that underlies our analysis and describe the empirical method that we employ to estimate causal parameters. We also describe the two randomized interventions that are used to identify these causal parameters. The empirical results are presented and discussed in section 4. A concluding section discusses what our findings on imply for the literature and suggests avenues for further research.

2 Data

The subjects in this study were part of a longitudinal study that started in the spring of 1984. Kindergarten teachers in the 53 schools of the lowest socioeconomic areas in Montreal were asked to rate the behavior of each boy in their classroom. Eighty-seven percent of the kindergarten teachers agreed to participate, and 1161 boys were

rated. The sample was reduced to 1037 boys by including only those boys born from Caucasian, French-speaking parents themselves born in Canada to preclude cultural and socioeconomic biases.[10] This sampling strategy is extremely important in our context as anthropologists have documented large variation in parenting styles across cultures which if unaccounted for would confound the analysis. Informed consent was regularly obtained from mothers and the subject (boys) throughout the study.

Following the initial teacher assessments in kindergarten, the mothers provided demographic information through a telephone survey. The mother provided information on family structure, years of education, date of birth, employment status including occupation for the most recent job for each parent. Parents' mean age at the birth of their son was 25.4 (SD = 4.8) for mothers, and 28.4 (SD = 5.6) for fathers. The mean number of school years completed by the mothers was 10.5 (SD = 2.8), and 10.7 (SD = 3.2) for fathers. The majority of the parents were unskilled workers. The mean and median family income when the boys were age 10 years (1988) was between $25,000 and $30,000 (Canadian dollars) which is substantially lower than the 1987 median Canadian income of $44,000 for couples with children. Approximately 67% of the boys lived with both biological parents, 24% lived with the mother alone and the remaining 9% lived in other family arrangements.

Parents, continually interviewed on approximately a biannual basis until the subject was 16 years old, providing information on changes in family structure and the family environment. Participation rates in follow-up interviews were high ranging between 70 - 85%.

In our study, we consider academic and non academic outcomes such as substance abuse, criminal activity and gang activity. Information pertaining to the boys' level of substance use, sexual behavior, delinquency and parent's child rearing practices were assessed with a self-report questionnaire. This information was gathered annually each spring from ages 10 to 17 during visits to the schools the boys attended. Ques-

tions pertaining to alcohol, drug, and cigarette use were assessed using a 7 point scale. In our analysis we employ indicator variables for whether in the last year the subject has i) got drunk from alcohol ii) smoked cigarettes iii) used marijuana and iv) used harder drugs such as cocaine, heroin, amphetamines, etc. Responses to delinquency and rearing practice items were ordinal on a 4 point scale that corresponds to never, once or twice, often and very often.[11] We consider total fighting and criminal activity rather than creating indicator variables as in Levitt and Lochner (2001). Individuals were also asked to report whether they were a member of a juvenile gang as well as the type of activities the gang engaged in. Finally, the panel structure of the data also served to cross-validate the information provided by the boys and to identify inconsistencies in the data.

We also consider dropping out of school where being a dropout is defined as an individual who stopped attending school at a point in time whether or not he reentered school at a later time. Dropout status was determined in two steps. First, the subjects completed a questionnaire and provided a self-report. This information was immediately verified using the computerized lists of the Montreal school board and the Ministry of Education. If a participant was not on the annual School board list, the Ministry of Education was asked to verify whether he was enrolled in another school board within the province.[12]

Several parental characteristics measured in the kindergarten interview are included in the analysis. These measures include years of schooling for each parent and family structure. Following Ginther and Pollack (2003), we define family structure as an indicator of whether in kindergarten the child was being reared in a nuclear household.[13] We use post kindergarten parent interviews to construct long run family income, which we define as the average of parents income across earlier years as in Solon (1992) and Blau (1999).

The children reported parental child reporting practices. Measures of supervision

are based on three items, determining i) the presence of a parent / guardian at home after school, ii) parental knowledge of where children are when they go out and iii) parental knowledge of the child's peer group. Parental rules / discipline were assessed based on the child's report of their existence as well as whether they were punished if the rules were violated and the severity of the punishment.

Table 1 presents summary statistics for the sample used in this study. Notice that the majority of parents have low education levels and over 40% of both the mothers and fathers were themselves high school dropouts (having completed fewer than 11 years of schooling). There weer slightly more mothers that attended college (26.5%) relative to fathers (21.2%). The children engage in a large number of risky behaviors. Over 60% of the subjects have gotten drunk from alcohol at least once and over 37% have smoked cigarettes. Approximately 13% of the boys have been a member of violent or delinquent gang and over 17% of used a narcotic drug (not including marijuana) such as cocaine or methamphetamine.Examining columns 2 and 3 of Table 1 there are very few interesting changes over time in any of the variables. While the likelihood of many risky behaviors may be expected to increase over time, it was unclear ex-ante how parental strategies vary as a child ages. There was a decrease in both supervision and discipline although the latter decereased by a larger amount. The only major increase in risky behavior exists in drug use which doubled on average.

3 Economic Model

In this section, we provide a simple two stage model that guides our estimation strategy and describe how we handle concerns regarding endogeneity. In the first stage, altruistic parents select the optimal child rearing practices j^* for child i in

period T, which provides the highest indirect utility for their household V_{ij}^*,

$$V_{ij} \equiv V_{ij}(X_i, C_j | I_{iT-1}), \text{ for each } j \text{ available to child } i \tag{1}$$

where X_i are observable family characteristics of the child i; C_j is the time and monetary cost of providing strategy j,and I_{iT-1} is all the information parents have on the full history of the child's behavior and human capital achievement.

Family characteristics of the child may have causal effects if better educated parents are more adept at stimulating their child's interest, identifying developmental problems, structuring educational activities, helping with school work and monitoring as well as influencing the child's peer group. Similarly, family's socioeconomic status may influences the amount of human capital developed by the child since the additional income allows parents to meet their child's health or nutritional needs, live in better neighborhoods, afford tutoring and after school activities among other channels.

In the second stage, given the teenager's perception of his parents child rearing practices p_{ijt} (not necessarily equal to p_{ij^*t} determined in the first stage) at the beginning of this period the child decides whether to engage in risky activity, R, or to engage in non-risky activity, N. Note that this distinction is not made for modelling convenience or due to data constraints but rather is consistent with a body of evidence in developmental psychology that indicates that the adolescent's perception of the parent's behavior has more validity as it is a better predictor of adolescent behavior.[14] Mathematically, define a child i's instantaneous utility at time t, u_{it} as

$$u_{it} = u(c_{it}, l_{it}; p_{ijt}, X_i, \varepsilon_{it}) \tag{2}$$

where u is any twice differentiable function, c_{it} is a child's current consumption vector, l_{it} is the current amount of leisure, p_{ij^*t} are parental practices and ε_{it} are utility shocks. The selection of risky behavior such as sexual activity or drug use directly affects the child's consumption vector.

We define U_{it}^N to be a fully rational person's expected intertemporal utility at period t for engaging in behavior N,

$$U_{it}^N = u_{it}^N + \sum_{s=t+1}^{\infty} \delta_N^{s-t} u_{is} \tag{3}$$

where δ_N is a discount factor. Similarly define U_{it}^R to be a fully rational person's expected intertemporal utility at period t for engaging in behavior R,

$$U_{it}^R = u_{it}^R + \sum_{s=t+1}^{\infty} \delta_R^{s-t} u_{is} \tag{4}$$

where δ_R is a discount factor such that $0 \preceq \delta_R < \delta_N \preceq 1$. An individual engages in risky activity if $U_{it}^R > U_{it}^N$ since they attach too little weight to their well being later in life. Note, certain risky behaviors such as sexual activity may yield higher instantaneous utility.

3.1 Empirical Model

We do not have data rich enough to directly estimate the structural model described above. Thus, we empirically model risky behavior by taking a linear approximation to the intertemporal utility functions in equations 3 and 4 yielding

$$\alpha_p^N p_{it} + \alpha_x^N X_{it} + \varepsilon_{it}^N \tag{5}$$

$$\text{and } \alpha_p^R p_{it} + \alpha_x^R X_{it} + \varepsilon_{it}^R \tag{6}$$

respectively where $\alpha' s$ are loading factors and the X matrix contains family characteristics.

An individual engages in risky behavior if $U_{it}^R > U_{it}^N$ which implies that

$$\alpha_p^R p_{it} + \alpha_x^R X_{it} + \varepsilon_{it}^R - (\alpha_p^N p_{it} + \alpha_x^N X_{it} + \varepsilon_{it}^N) \geq 0 \tag{7}$$

We define Y_{it}^* as the propensity to engage in risky behavior and Y_{it} as dichotomous indicators for whether adolescent (i) in year (t) has been engaged in a particular delinquent, criminal or antisocial behavior. Rearranging terms yields

$$\begin{aligned} Y_{it}^* &= \theta_0 + \theta_1 X_{it} + \theta_2 p_{it} + \mu_{it} \\ Y_{it} &= 1 \; if \; Y_{it}^* \geq 0 \end{aligned} \tag{8}$$

where $\mu_{it} = \varepsilon_{it}^R - \varepsilon_{it}^N$. Estimates of equation 8 are undertaken under a variety of assumptions regarding the error structure and the relationship between parental practices and the residuals. Exogenous control variables that are included in the matrix include, parental schooling (up to a quadratic), family income, family structure (intact vs. non intact), home environment, parental age, parental age at birth of the child, demographic events in the household such as a recent birth or death, family income and controls for year unobserved heterogeneity to capture macroeconomic period effects.[15]

The major empirical concern relates to the endogeneity of P_{it}. In our analysis we use an instrumental variables procedure. We make use of two randomized interventions that occurred at an early age for the parents of these children. The first intervention was designed to promote academic success and occurred in 28 of the 53 schools from which the sampling occurred. The program was offered by the Montreal Catholic School Commission in randomly chosen low income neighborhoods. The program provided the opportunity for parents of the boys to attend their child's class one afternoon a week. The main focus of these meetings was to inform parents about the philosophy of the program, advise them on personal problems and teach positive child rearing practices vis a vis: supervision of homework, consistency in discipline and stimulating themselves and their children. Attendance for the program was not mandatory and the parents were asked during the initial interview if they has attended these sessions.

The second intervention occurred three years later when the boys were 7 years of age and normally starting second grade. Data from the kindergarten interviews of teachers as well as their parents were used to compute delinquency risk using the disruptiveness scale of the Social Behavior Questionnaire. In total, 259 boys were considered to be disruptive and were randomly assigned to one of the following groups i) treatment prevention group (n=75), ii) sensitization-contact group (n=124) iii) control group (n=60). The treatment prevention group included two components targeting both the boys themselves as well as their families when the subjects were between 7 and 9 years old. The family component, adapted from the Oregon Social Learning Center, intended to improve parents' disciplinary practices and supervision deficits. The sensitization-contact group was designed to assess the presence of Hawthorne effects. Each family was assigned a contact person who would offer advice in the event of a crisis. In our analysis, we include an indicator from being above a threshold on the delinquency scale in the first stage regressions since assignment to the intervention is based on this indicator. Our instruments are a series of program indicator variables equal to one if assigned to that program.

Our identification relies on the instrument, assignment to the various treatment programs is truly random. Holland (1988) termed this identification strategy as an encouragement design, since subjects are randomly selected and encouraged to take the treatment, but it is the effects of the treatment itself, not the effects of encouragement, which are of interest. Thus, the selection bias that arises in accepting the treatment is removed via the instrumental variables analysis as not all those who are encouraged to attend, comply. Randomization of the instruments is not sufficient on its own and for the instruments to be valid they must affect the outcome only by manipulating the treatment.

We also present evidence from OLS and fixed effects estimates of equation 8. By including individual fixed effects in the estimation we can directly account for in-

dividual factors that may be related to child rearing strategies and risky behavior outcomes and are unobserved to the researcher. While using a fixed effects strategy allows the researcher to simultaneously control (assuming constant impacts over time) for many parental characteristics/behaviors and some genetic factors; it does not provide any guidance as to why, the subjects and their parents behavior changes over time. In other words, while the fixed effects approach controls for family unobserved heterogeneity it implicitly assumes that child rearing practices do not respond to either current or past random shocks to children's behavior. Intuitively, it is highly unlikely that unobserved to the econometrician factors that are related to both children's behavior and their parents' child rearing practices are fixed over time. Rather it is reasonable to expect that parent's would respond to transitory shocks such as changes in the composition of a child's peer group, changes in after school activities as well as transitory socioeconomic circumstances. Since a fixed effects approach may overcome biases from correlations between the parental startegies and the fixed effect, it may not have completely solved the endogeneity problem as correlations may exist between the parenting variables and the error term (i.e. $Cov(P_{iT} - \overline{P}_i, \varepsilon_{iT} - \overline{\varepsilon}_i) \neq 0$). As such, we believe that an instrumental variables approach is preferred to using a fixed effect strategy to estimate the causal effect of child rearing practices. We directly test whether the implicit assumptions of the fixed effects strategy holds. In addition, we consider an indirect test by estimating equation at different child ages. The fixed effects strategy is very sensitive to time-varying treatment effects when the treatment state varies slowly.[16]

It is important to state explicitly that we can not recover the structural parameters of our model and we will be estimating reduced form impacts. As our interest is in the causal effect of parental child rearing practices and there is likely treatment effect heterogeneity, one can interpret the resulting IV estimates as local average treatment effects.

4 Results

Table 2 presents OLS estimates of equation 8 where we treat the parental child rearing practices as exogenous. Higher levels of discipline and rules have very weak relationship with the majority of the anti-social behaviors. While it is negatively and significantly related to the probability of having gotten drunk from alcohol, higher levels of rules are significantly and positively related to more destructive activity and gang membership. In addition, the impacts of parental rules on report card grades in French are wrong signed. In contrast, parental supervision has significant and "right-signed" estimates with each adolescent outcome. It is interesting to note that kids who achieved higher verbal IQ test scores are more likely to have been drunk or used marijuana. It is not surprising that kids with higher cognitive ability measures score substantially higher in both subject areas and are less likely to drop out of school.

Instrumental variable estimates of equation 8 that correct for the endogeneity of parental child rearing practices using randomized assignment as an instrument are presented in Table 3. The results for parental supervision are very similar in spirit to Table 2. Increased supervision is negatively and significantly related to each anti-social behavior and are positively related to grades. the magnitudes are substantially larger than those reported in Table 2. Once endogeneity is corrected for parental supervision leads to a nearly 5 point gain on report card scores in Math, an effect that is eight times larger than a one point increase in the innate ability proxy. In contrast, while the magnitude of the impact of parental discipline also increases substantially from the OLS estimates in Table 2 it does not significantly affect any of the outcomes. Hausman tests reject the exogeneity of the parental child rearing vector for each specification.

Table 4 presents fixed effects estimates of equation 8. This specification corrects for the endogeneity of child rearing practices under the assumption that the endogene-

ity arises due to a correlation with an individual specific time invariant unobserved heterogeneity term. This approach essentially identifies impacts from exploiting variation with individuals and essentially regresses changes in quality of parenting during the adolescent years on changes in delinquent behavior. The results differ substantially. Parental supervision only affects five of the outcomes and the impacts are substantially smaller than those reported in Table 2. This indicates that if one were to correct for the endogeneity under a specific assumption regarding what was causing the endogeneity that parental supervision has very small impacts. Similarly, parental rules has very few significant relationships with the outcomes. Once again, many of the relationships are wrong signed suggesting that higher levels of discipline are associated with higher levels of stealing, destructive activity and delinquency. Finally, changes in the family structure have large impacts on education outcomes. In years where the family structure becomes non-nuclear, French report card scores fall and likelihood of dropping out of a school increases by a little over 5%.

While F-tests support our accounting for unobserved heterogeneity and suggest fixed effects is preferred over OLS, the results differ from the IV estimates. In order to ascertain which estimates present more compelling evidence we conduct several statistical tests. First, we ran overidentification tests which indeed validated our instruments. Second we tested whether the fixed effects approach implicit assumption that all the regressors in the model are strictly exogenous is valid. To conduct this test we follow specification tests described in Chapter 11 of Wooldridge (2002). Specifically, we include leading terms in the estimating equation and then using one less period of data we reestimate the model. If the regressors are strictly exogenous than the leading term should be insignificant. For all family structure leading terms that we investigated we are not able to reject the significance of the leading term; which calls the fixed effects approach in to question. Only the leading family income variable survives the test, but this is very weak evidence as family income on its own

does not have a statistically significant impact.

Since the reliability of our 2SLS estimates depends directly on the validity of our instrument, potential concerns regarding weak identification may exist. Weak identification could result in i) the 2SLS estimates being inconsistent and biased towards the OLS estimates,[17] and ii) the test statistics for inference are inaccurate. Regarding the first problem, not only is the coefficient on at least two of the instruments reported in Table 5 for each behavior significant at the 1% level but also a Hausman test rejects the consistency of the OLS estimates for every specification reported in Table 2. The coefficients on the instrument and exogenous regressors in both columns appear reasonable in sign and magnitude. The instruments are statistically significant predictors of supervision and discipline and the F-statistics on their joint significance is respectively above current cutoffs (i.e. Staiger and Stock (1997)) for weak instruments. Thus, we do not need to consider empirical approaches to correct for a potential statistical inference problem.

To examine the robustness of our results, we replicated the full analysis using discrete measures of parental education and family income as opposed to treating these variables as continuous. In general, our results on parental supervision and discipline did not change neither qualitatively, nor quantitatively.[18]

A concern with the above analysis is that with multiple outcomes testing statistical hypotheses such as whether child rearing practices are effective requires a special set of statistical techniques since these outcomes are not indepedent. Making adjustments for the use of multiple outcomes has a long history in psychology (Benjamini and Yekutiele (2001)) and has also been adopted in some studies within studies in economics that examine multiple child outcomes (Kling and Liebman (2004) and Ding and Lehrer (2007)). The motivation for these tests is that without accounting for the fact that outcomes collected within the study are related one may over reject the Null hypothesis of no treatment effects when using univariate statistical methods.

Therefore one needs to adjust the p-value for the multiple outcomes and we consider making corrections for both the Familywise error rate (FWER) and false discovery rate (FDR). These p-value adjustments reduce the chance of making type I errors and are based on the number of outcomes being considered. Formally, suppose that we wish to test K hypotheses, $H_{1,}H_{2,....}H_k$ of which only $l < K$ are true, the FWER is simply the probability of making one or more type I errors (i.e. one of l true hypotheses in the family is rejected) among all the single hypotheses when performing multiple pairwise tests on a families of hypotheses that are similar in purpose. While, the FWER controls for the probability of making a Type I error,[19] we also consider the FDR rate which controls the expected proportion of incorrectly rejected null hypotheses (type I errors) in a list of rejected hypotheses. It is a less conservative procedure with greater power than FWER control, at a cost of increasing the likelihood of obtaining type I errors. This procedure reports a q value which is simply the minimum false discovery rate at which the test may be called significant.

For the FWER, we use the free step-down resampling method (Westfall and Young 1993) that allows the different p-values to be arbitrarily correlated. The two-step procedure developed in Benjamini, Krieger and Yekutieli (2006) is used to compute q-values. This approach was selected as Benjamini et al (2006) present evidence from simulations that the algorithm performs well when p-values are positively correlated across tests (as in our case) therefore providing sharper control. If all Null hypotheses are true, controlling for the FWER is equivalent to accounting for the FDR; however as increasingly more alternative hypotheses are true controlling for the FDR can result in fewer Type II errors than controlling for the FWER. We conducted these corrections using the IV estimates. We found that once one corrects for multiple inference that wherever the univariate statistical tests would suggest that rules/discipline were effective, the corrections reject their significance. The high q-value of the FDR casts doubt on the significant impact of parental rules on these outcomes. In contrast

approximately 70% of the outcomes in which parental supervision was signifcant retained their signifcance at the 10% once adjustments for multiple inference were made.

4.1 Impacts Over the Life-Cycle

In this sub-section we examine whether the estimated relationship varies during adolescence. Specifically we repeat our IV analysis described above with sub-samples of our data defined by different age ranges. This analysis permits us to examine whether the impacts of parental practices are more effective at early versus later ages. Results from OLS, fixed effects and two stage least squares of the impacts of parental supervision and discipline on some specific outcomes are presented in Table 6. The top panel presents estimates using data from 1988 to 1991 and the lower panel presents estimates from 1992 to 1995.[20]

As the role of parental rules and discipline remains limited we focus on parental supervision. Notice that while the impact of parental supervision increases in magnitude over time for both OLS and 2SLS, the fixed effects estimates continue to suggest a smaller role that reduces in time as a child ages. At older ages, the IV estimates suggest that parental supervision has extremely large impacts at reducing delinquency and theft. For total drug use, parental supervision does not have a significant impact at early ages but has a impact when children are older a period in which they are more likely to experiment. Interestingly the fixed effects estimate again present evidence of the opposite time pattern for this outcome. Additional tests of strict exogeneity over this sub-sample continue to reject the assumptions implicit with the fixed effects approach.

We also investigated if there are any differences in the impacts of parental child rearing practices by birth order. We hypothesize that parents would be more willing

to punish their first-borne children who engage in risky behaviors in order to influence the actions of their later-born children. Our results were mixed as a consistent pattern did not emerge. Second, we examined whether parental supervision and discipline in early periods has lasting impacts. We were interested to see whether children from "stricter" households continue to experience higher levels of supervision and discipline and do they have differences in the number of deviant friends later in life. We found that higher rates of supervision early in life led to a significant decrease in having deviant frioends later in life. the magnitrude of the impact was approximately 50% of that of current supervion. In contrast there did not appear to be any lasting impacts of heavier rates of discipline later in life. A complete exploration of the potential dynamics is beyond the scope of the final version of this project.

4.2 Alternative Definitions of Parental Strategies

To the best of our knowledge there does not exist a study that uses causal inference methods to estimate the impacts of alternative parental child rearing practices. The majority of work considers only one factor such as discipline or supervision. In this subsection, we consider what, if any, effect it would have on our estimates if we followed the usual practice and only include one parental child rearing measure in the estimating equation. One could imagine that in OLS and family fixed effects strategies omitted variable bias could occur since many of the neglected parenting strategies would be correlated with both the included child rearing practice as well as adolescent outcomes. The IV estimates may not overcome bias in this setting unless the instruments are unique to specific child rearing practices. OLS, fixed effects and two stage least squares estimates are presented in Table 7, where each entry refers to the point estimate of that specific child rearing practice in equations that account for the other exogenous controls. Information on parental supervision is presented in

the top panel and information on discipline is provided in bottom panel.

Examining results from these regressions and comparing them to those presented in Tables 2 to 4, we would reach many alternative conclusions. For example, among the IV estimates the impact of parental supervision on the use of any hard drug becomes significant at the 10%. The magnitude of the impact of parental supervision on stealing, delinquency, fighting and destructive activity increases by approximately 20%. For the OLS estimates parental rules and discipline no longer significantly affects drug use but has twice the impact on destructive activity and cigarette smoking. Similarly, among the fixed effects estimates parental discipline is significantly related to stealing but no longer delinquency.

Taken together, the results of Table 7 illustrate the need and care to account for a full set of parental child rearing practices if we wish to reach a conclusion regarding the impact of a particular strategy in any analysis. Even with exogenous instruments such as random assignment to correct for the endogeneity of particular child rearing practices, the omission of highly correlated alternative strategies may present a misleading picture of the causal relation between a particular strategy and adolescent outcomes.[21]

Due to the positive correlation in the two child rearing strategies in our study and the lack of exogenous variations that can explain one particular strategy alone, the coefficient for one particular strategy such as discipline may reflect the composite effect of several child rearing practices, thus the reliability of that coefficient is dependent on the rich controls we could potentially have on most of the correlated strategies. We conducted separate analysis using subsamples in which the measures of supervision and discipline were substantially more positively correlated strengthening the above finding. Thus, without the rich information on child rearing practice, most of the exogenous variations cannot identify the impact of one strategy only. Not surprisingly, the two parental child rearing categories we used in this strategy can be

decomposed into their underlying questions provided we have enough instruments.[22]

4.3 Is the link between parental practice and child outcomes homogenous?

In this subsection, we shed light on the extent of heterogeneity in the estimates of the impacts of child rearing practices affects adolescent outcomes. Specifically, we examine how parental child rearing practices affects the quantiles of achievement / adolescent outcome distribution using the quantile instrumental variables estimator of Cherzonukov and Hansen (2005, 2006). This approach permits studying heterogeneous quantile treatment effects over the entire population rather than estimating an average effect only for the (unobserved) sub-population of "compliers" (Angrist, Imbens and Rubin, 1996).

The limitation of using this approach is that we must assume that there is only one heterogeneity term and it is identically distributed on all possible treatment variables conditional on all observed and unobserved factors that affect treatment response. Formally, this is an assumption is similar to rank invariance and implicitly imposes the assumption that one selects the treatment without knowledge of the potential outcomes. This assumption is arguably weaker than independence and monotonicity which underlies the linear IV results presented earlier. After all, monotonicity implies that treatment response is a strictly monotonic function of a scalar unobserved heterogeneity.

In this version we present estimates of parenting practices on our two measures of academic achievement as the impacts of child rearing practices may vary over the distribution of unobserved factors (i.e. ability) that affect achievement.[23] Following Ding and Lehrer (2007b) we are implicitly allowing parenting and ability to be two separate factors in the generation of achievement to interact in unknown ways . If

ability and parenting are substitutes we would expect the marginal returns on child rearing practices to decrease with ability. If ability and supervision or rules are complements then marginal returns to these practices would be higher for the more able. Figure 1 presents estimates of the IV and QRIV impacts of parental rules and supervision for French and mathematics test scores at nine deciles of the distribution. Examining the impact of parental supervision finds that the largest benefits from supervision occur at the lowest deciles. Those in the bottom deciles receive nearly two and three times the benefit of individuals in the highest deciles of the conditional French and mathematics achievement distribution. This would conform with a great deal of literature in education that suggests the impact of home inputs are most important for the least able. Interestingly the impact of parental rules follows different patterns in the two subject areas. Whereas individuals in the lowest decile of the conditional french achievement distribution would benefit the most from relaxation of rules and discipline, the decile with the largest impact in the conditional mathematics distribution was 0.7. Only at the 0.3 decile of the conditional French distribution were additional rules leading to gains in achievement. Finally, tests of the homogeneity of the treatment effects across quantiles are rejected for each outcome indicating that there is substantial heterogeneity in the impacts of these child rearing practices.

5 Conclusions

Over the last decade, researchers and policymakers have devoted increasing attention to dimensions of the quality of parenting practices. In this study, we examine whether supervision or discipline has causal impacts on a variety of childhood antisocial behaviors and academic performance outcomes. The key innovation is the use of two randomized interventions to overcome the endogeneity of the parental child rearing practices. Our results find that supervision is in general more effective than the estab-

lishment of rules and discipline. We also presented evidence that rejects the implicit assumptions underlying fixed effects estimation of models designed to estimate the impact of parenting on child development.

Yet it should be stressed that an important limitation of this study is that the impacts we estimate are applicable to children of disadvantaged French Canadian parents. The composition of this sample differs from other children in the Montreal area and throughout North America.

There are several directions for future research. For instance, we plan to examine the dynamic parent-child interactions and model it is as a reciprocal process. One could postulate that ineffective parenting increases the probability of child problem behaviors but also that in response to either hostile or obstinate child behavior could be followed by a reduction in parental efforts to either (or alternatively both) monitor and discipline. This could provide an explanation for the fact that antisocial children are more likely to grow up to be delinquent adults and our data provides measurement on the hostility of the relationship. Alternatively, effective parenting strategy may reduce the likelihood of this lifecycle trajectory by influencing a child's friendship choices and peer groups which changes the likelihood of subsequent involvement in delinquency during this period. We plan to focus on this pathway since unlike individual behavior of their children, we believe that parents have more accurate information regarding the friends of their child. Our data provides measures on the quality of the parent-child interaction as well as friendship that can help tease out whether the parental strategies have dynamic impacts.

Notes

[1]For specific program see Table H-6 of the U.S. House of Representatives, Committee on Ways and Means 2000 Green Book for details.

[2]For example, the Center for Substance Abuse in their 1998 pamphlet titled "Keeping Children Drug Free: Using Family-Centered Approaches—A Parent and Community Guide," conclude that "Families play the most important role in determining how children handle the temptations to use alcohol, cigarettes, and illegal drugs." Within the medical literature, Resnick et al. (1997) influential piece concludes with "High levels of connectedness to parents and family members were associated with less frequent alcohol use among both [7th-8th and 9th-12th grade] groups of students. Among older students, more frequent parental presence in the home was associated with less frequent use." "With notable consistency across the domains of risk, the role of parents and family in shaping the health of adolescents is evident. While not surprising, the protective role that perceived parental expectations play regarding adolescents' school attainment emerges as an important recurring correlate of health and healthy behavior. Likewise, while physical presence of a parent in the home at key times reduces risk (and especially substance use), it is consistently less significant than parental connectedness (e.g., feelings of warmth, love, and caring from parents)."

[3]While the role of parenting style as a determinant of adolescent outcomes has a long history in developmental psychology and sociology, determining causality remains a challenge. This research has demonstrated that parental involvement associates with adolescent behavior, primarily through monitoring behavior on the part of parents. Parents who spend more time supervising their children have children who engage in fewer risky behaviors (e. g. Christopher et al. (1993), Donovan and Jessor (1985), Perkins et al. (1998), Shilts (1991), Small and Luster (1994) and Wilder and Watt (2002)).

[4]It is doubtful that assessment of the recently introduced US state level programs discussed in footnote 2 will provide enough insight since the programs themselves are broad in scope and have multiple goals, such as promoting job readiness and increasing access to social services.

[5]Economists tend to view the relationship between parental characteristics and child development through the Becker and Tomes (1986) model of family production. This model builds on Becker (1981) that introduced the notion of making investments in child quality. Most recently, Lizzeri and Siniscalchi (2007) develop a model of optimal parenting whosepredictions are consistent with several findings in the behavioral genetics literature.

[6]See Havemann and Wolfe (1995) for a survey of the contribution of economists to this literature.

[7]Indirect evidence exists from studies that examines how parenting has changed as a response to the vast increase in maternal employment. Some of the strongest evidence in this literature draws from experimental welfare-to-work demonstrations. For instance, in the Self-Sufficiency Project, mothers who were required to participate in the labor force were better gatekeepers as they find more likely to enroll their preschool and elementary-school-age children in formal child care programs than were mothers in the control groups. The evaluators concluded that the program was not responsible for this result but rather it was increased financial resources from employment. Other parenting strategies such as warmth, control, cognitive stimulation and routines exhibited no gains.

[8]Well cited contributions in anthropology include Blurton-Jones (1993) and from Baumrind (1967) to Baumrind (1991) one can get a sense of the history of this literature in psychology.

[9]While one could subdivide authoritarian parents into two types: nonauthoritarian-directive or authoritarian-directive as well as dividing indulgent parents into demo-

cratic or nondirective parents, the boundaries are not sharp.

[10]In addition, this elimination includes a handful of families that refused to participate or could not be located. This data has been used in a large number of studies in the dvelopmental psychology such as Tremblay et al. (1991) but Lehrer et al. (2005) present the first use of this data within economics.

[11]The items were: steal from school; steal from store; steal from home, keep object worth less than $10; steal bicycle, sell stolen goods, keep object worth between $10 and $100, steal objects worth more than $100, breaking and entering; enter without paying; trespassing; take drugs; take alcohol, get drunk, destroy school material, destroy other material, vandalism at school, destroy objects at home, vandalize car, set a fire, strong-arm, gang fights, use weapon in a fight, fist fight, beat up someone, carry a weapon, throw objects at persons.

[12]For all but one participant did the information match. This participant reported himself as dropped out although he was registered with the School board and it is likely that he dropped out after the official lists were compiled.

[13]Our results are not sensitive to contemporaneous family structure, but we employ the earlier measure in our analysis since it is more prevalent in the data.

[14]For example, Gonzales, Cauce, and Mason (1996) examined agreement between mothers and daughters of maternal support and maternal control against independent observer ratings. They found that adolescent ratings of these maternal behaviors were more valid than those reported by the mother.

[15]Note several of the child and adolescent outcomes including fighting and criminal activity are indexes and constructed from multiple questions. We treat these the dependent variable in these cases as if it were continuous although it only has support on multiple discrete points. Finally, equations to estimate several outcomes such as report card scores would be derived from a different first stage of the model in which parents also selected education inputs which would enter into an education production

function.

[16]While unreported in this version of the text we also considered fixed effects instrumental variables methods using lageed parental behaviors as instruments. We use estimates from these alternative approaches to conduct specification tests that can shed light on the source of the endogeneity of parental behaviors. This analysis is avaialble upon request.

[17]The inconsistency of the 2SLS estimates depends on the relevance of the instrumental variable. Hahn and Hausman (2003) show that the finite sample bias of these estimates is inversely related to the first stage F-statistic.

[18]These results are available from the author by request.

[19]The FWER maintains the overall probability of making a Type I error at a fixed α (i.e. 5%) but with an ever increasing number of tests this comes at the cost of making more Type II errors. The sequential procedure we use performs tests in order of increasing p-values with smaller p-values tested at a tougher threshold to maintain the FWER at a desired level.

[20]Note information on several outcomes were not collected in the surveys prior to 1992.

[21]If random assignment cannot separate one parental child rearing practive, it is hard to imagine that any nurture or environmental factor could break the statistical association between these dimensions of parenting style. This issue does not have a simple solution.

[22]We have experimented with several breakdowns but they do not seem that natural and appear ad-hoc. These results and further details are available on request.

[23]In all specifications we assume separability between inputs.There remains some strange behavior with the bootsrtapping of the standard errors and as a result we only present coefficient estimates. QRIV estimates of the other factors are available fom the authors by request. We present only results for achievement in mathematics

and French as these are the easiest to interpret.

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Table 1: Summary Statistics

Variable	Full sample	Younger Ages	Older Ages
Rules total	1.7822 (1.5288)	2.507 (1.575)	1.1544 (1.1679)
Supervising totals	4.314 (1.5489)	4.4965 (1.527)	4.1073 (1.5477)
Mother years of schooling	10.4946 (2.6082)	10.4946 (2.6082)	10.4946 (2.6083)
Father years of schooling	10.5628 (2.9857)	10.5628 (2.9858)	10.5628 (2.986)
Family Income (*5000$)	6.5508 (2.8176)	6.3756 (2.7554)	6.726 (2.868)
PreSchool IV	.4706 (.4992)	.4706 (.4992)	.4706 (.4992)
Kidergarten intervention	.1483 (.3554)	.1483 (.3554)	.1483 (.3554)
Sold drugs	.0639 (.2446)	N/A	.0639 (.2446)
Marijuana	.2494 (.4328)	N/A N/A	.2494 (.4328)
Alcohol	.6193 (.4857)	N/A N/A	.6193 (.4857)
Drop Out of School 1=yes 0=no	.0766 (.2661)	N/A N/A	.0766 (.2661)
Gang Member	.1298 (.3362)	N/A N/A	.1298 (.3362)
Stealing totals Max=42	12.9169 (3.2536)	12.4873 (2.5382)	13.4011 (3.8493)
Delinquency total Max=93	33.3334 (7.6062)	32.0712 (6.2571)	34.7591 (8.6698)
Drugs total Max=12	4.6681 (2.2299)	3.6585 (1.093)	5.8064 (2.6054)
Fighting totals Max=28	8.9654 (2.6474)	9.1245 (2.6295)	8.7859 (2.6563)
Destroys stuff totals Max =21	6.7901 (1.4599)	6.8038 (1.3294)	6.7747 (1.5945)
Report card score in French	65.6556 (12.2172)	N/A N/A	65.6556 (12.2172)
Report card score in Math	66.5197 (21.8584)	N/A N/A	66.5197 (21.8584)
Tried a hard drug	.1382 (.3452)	N/A N/A	.1382 (.3452)

Note: Standard Deviation in Parentheses.

Table 2: OLS Estimates of the Determinants of Adolescent Outcomes

	Sells Drugs	Marihuana Use	Smokes Cigarette	Got Drunk	Drop Out of School	Gang Member	Stealing totals	Delinquency total	Drugs total	Fighting totals	Destroys stuff totals	French mark	Math Score	Tried a hard drug
Rules total	0.001 (0.005)	0.001 (0.008)	0.018 (0.010)	-0.020 (0.009)*	-0.011 (0.005)*	0.015 (0.006)*	0.072 (0.038)	0.125 (0.086)	-0.025 (0.019)	0.019 (0.029)	0.062 (0.017)**	-0.728 (0.224)**	-0.445 (0.453)	0.017 (0.011)
Super-vision	-0.027 (0.005)**	-0.050 (0.007)**	-0.068 (0.008)**	-0.057 (0.007)**	-0.014 (0.004)**	-0.031 (0.005)**	-0.707 (0.045)**	-1.841 (0.102)**	-0.305 (0.024)**	-0.573 (0.033)**	-0.253 (0.019)**	0.666 (0.173)**	1.166 (0.237)**	-0.041 (0.007)**
Mother Schooling	0.005 (0.010)	-0.003 (0.017)	0.012 (0.020)	0.017 (0.019)	-0.016 (0.012)	0.009 (0.011)	-0.035 (0.092)	-0.083 (0.228)	0.003 (0.063)	-0.047 (0.080)	-0.006 (0.035)	-0.409 (0.426)	-0.539 (0.540)	-0.001 (0.016)
Mother Schooling Squared	0.006 (0.050)	0.058 (0.082)	-0.015 (0.091)	-0.019 (0.092)	0.054 (0.047)	-0.041 (0.045)	0.165 (0.394)	0.330 (0.958)	0.104 (0.305)	-0.010 (0.325)	0.081 (0.147)	3.640 (1.887)	4.174 (2.321)	0.026 (0.073)
Father Schooling	0.003 (0.008)	-0.001 (0.014)	-0.033 (0.018)	-0.000 (0.016)	-0.014 (0.009)	-0.008 (0.011)	0.049 (0.087)	0.102 (0.197)	-0.022 (0.051)	0.032 (0.063)	0.043 (0.033)	-0.295 (0.350)	-0.290 (0.542)	-0.016 (0.022)
Father Schooling Squared	-0.030 (0.032)	-0.011 (0.056)	0.123 (0.073)	-0.020 (0.066)	0.038 (0.033)	0.009 (0.042)	-0.245 (0.329)	-0.787 (0.743)	-0.018 (0.211)	-0.270 (0.241)	-0.253 (0.122)*	2.300 (1.445)	2.918 (2.064)	0.050 (0.081)
Family Income	-0.000 (0.003)	-0.003 (0.004)	-0.000 (0.005)	0.013 (0.004)**	-0.005 (0.002)*	0.000 (0.003)	-0.048 (0.024)	-0.078 (0.055)	0.020 (0.015)	-0.022 (0.018)	-0.028 (0.009)**	0.255 (0.108)*	0.097 (0.164)	-0.005 (0.004)
IQ proxy	-0.001 (0.004)	0.012 (0.005)*	-0.009 (0.007)	0.047 (0.006)**	-0.018 (0.004)**	-0.010 (0.004)*	0.008 (0.040)	-0.065 (0.094)	0.032 (0.021)	-0.064 (0.031)*	-0.038 (0.015)*	1.291 (0.151)**	0.942 (0.206)**	-0.002 (0.008)
Constant	0.157 (0.064)*	0.352 (0.115)**	0.822 (0.146)**	0.264 (0.135)	0.486 (0.092)**	0.336 (0.081)**	16.681 (0.689)**	44.075 (1.730)**	6.483 (0.433)**	12.668 (0.620)**	8.204 (0.285)**	50.231 (2.852)**	53.966 (4.079)**	0.441 (0.149)**
Obs.	2505	2490	2491	2492	2432	3027	6145	6141	6145	6144	6141	2790	2715	2505
R-squared	0.04	0.11	0.07	0.14	0.11	0.06	0.14	0.19	0.35	0.17	0.12	0.13	0.05	0.03

Note: Robust standard errors in parentheses clustered at the individual level in parentheses. Specifications also include family structure, home environment, occupation prestige and year effects. * significant at 5%; ** significant at 1%

Table 3: 2SLS Estimates of the Determinants of Adolescent Outcomes

	Sells Drugs	Marihuana Use	Smokes Cigarette	Got Drunk	Drop Out of School	Gang Member	Stealing totals	Delinquency total	Drugs total	Fighting totals	Destroys stuff totals	French mark	Math Score	Tried a hard drug
Rules total	-0.027 (0.198)	-0.167 (0.293)	-0.282 (0.342)	-0.406 (0.377)	-0.042 (0.143)	-0.089 (0.181)	-0.006 (1.040)	0.845 (2.766)	-0.009 (0.612)	0.631 (0.976)	0.280 (0.524)	-3.800 (6.311)	-8.881 (8.964)	-0.062 (0.229)
Super-vision	-0.095 (0.044)*	-0.144 (0.073)*	-0.134 (0.093)	-0.022 (0.089)	-0.073 (0.050)	-0.187 (0.072)**	-1.723 (0.477)**	-4.632 (1.131)**	-0.539 (0.241)*	-1.554 (0.392)**	-0.778 (0.203)**	5.261 (2.070)*	5.767 (2.743)*	-0.081 (0.053)
Mother Schooling	-0.001 (0.015)	-0.017 (0.024)	-0.004 (0.032)	-0.001 (0.034)	-0.012 (0.013)	-0.001 (0.017)	-0.105 (0.111)	-0.225 (0.275)	-0.012 (0.070)	-0.071 (0.095)	-0.033 (0.047)	-0.293 (0.545)	-0.626 (0.814)	-0.008 (0.021)
Mother Schooling Squared	0.025 (0.059)	0.100 (0.095)	0.021 (0.128)	0.020 (0.145)	0.038 (0.054)	-0.006 (0.069)	0.441 (0.431)	0.991 (1.069)	0.162 (0.311)	0.162 (0.380)	0.215 (0.183)	3.128 (2.268)	4.218 (3.481)	0.048 (0.082)
Father Schooling	-0.001 (0.010)	-0.008 (0.017)	-0.042 (0.021)*	-0.005 (0.022)	-0.016 (0.011)	-0.020 (0.017)	0.011 (0.092)	-0.000 (0.214)	-0.033 (0.051)	-0.004 (0.074)	0.025 (0.040)	0.045 (0.449)	-0.154 (0.747)	-0.019 (0.023)
Father Schooling Squared	-0.013 (0.039)	0.020 (0.068)	0.159 (0.085)	-0.011 (0.092)	0.052 (0.040)	0.059 (0.062)	-0.033 (0.358)	-0.190 (0.817)	0.043 (0.213)	-0.052 (0.284)	-0.145 (0.153)	0.716 (1.834)	1.735 (2.745)	0.064 (0.082)
Family Income	0.001 (0.003)	0.000 (0.005)	0.003 (0.007)	0.015 (0.007)*	-0.003 (0.003)	0.005 (0.005)	-0.018 (0.029)	0.008 (0.066)	0.027 (0.016)	0.009 (0.023)	-0.011 (0.011)	0.122 (0.142)	0.052 (0.191)	-0.004 (0.005)
IQ proxy	-0.001 (0.013)	0.004 (0.019)	-0.025 (0.022)	0.025 (0.025)	-0.019 (0.009)*	-0.018 (0.013)	0.031 (0.100)	0.075 (0.264)	0.043 (0.058)	0.014 (0.093)	-0.002 (0.049)	1.100 (0.471)*	0.406 (0.633)	-0.006 (0.017)
Constant	0.526 (0.519)	1.157 (0.805)	1.797 (0.956)	0.990 (0.990)	0.766 (0.406)	1.291 (0.629)*	21.202 (3.815)**	54.123 (9.478)**	7.448 (1.939)**	15.257 (3.185)**	9.878 (1.841)**	35.215 (18.619)	51.658 (28.560)	0.808 (0.575)
Obs.	2505	2490	2491	2492	2432	3027	6145	6141	6145	6144	6141	2790	2715	2505

Note: Robust standard errors in parentheses clustered at the individual level in parentheses. Specifications also include family structure, home environment, occupation prestige and year effects. * significant at 5%; ** significant at 1%.

Table 4 Fixed Effects Estimates of the Determinants of Adolescent Outcomes

	Sells Drugs	Marihuana Use	Smokes Cigarette	Got Drunk	Drop Out of School	Gang Member	Stealing totals	Delinquency total	Drugs total	Fighting totals	Destroys stuff totals	French mark	Math Score	Tried a hard drug
Rules total	-0.002 (0.006)	-0.013 (0.009)	0.011 (0.009)	-0.016 (0.000)	0.000 (0.006)	0.007 (0.007)	0.078 (0.031)*	0.178 (0.069)**	0.011 (0.020)	0.031 (0.025)	0.064 (0.016)**	-0.298 (0.239)	-0.164 (0.303)	0.022 (0.000)
Super-vision	0.000 (0.005) (0.039)	0.002 (0.007) (0.068)	-0.026 (0.008)** (0.085)	-0.016 (0.008) (0.092)	-0.002 (0.005) (0.040)	-0.006 (0.006) (0.062)	-0.383 (0.028)** (0.358)	-1.035 (0.062)** (0.817)	-0.174 (0.018)** (0.213)	-0.325 (0.022)** (0.284)	-0.149 (0.014)** (0.153)	0.057 (0.195) (1.834)	0.234 (0.248) (2.745)	-0.014 (0.011) (0.082)
Family Income	-0.025 (0.021)	-0.022 (0.029)	-0.033 (0.030)	0.003 (0.032)	0.000 (0.000)	0.033 (0.029)	-0.031 (0.038)	-0.023 (0.084)	-0.011 (0.024)	0.022 (0.030)	-0.001 (0.019)	-0.664 (0.855)	-0.445 (1.069)	-0.044 (0.045)
Current Family structure not intact	-0.014 (0.021)	0.015 (0.030)	0.032 (0.031)	0.019 (0.033)	0.055 (0.018)**	-0.016 (0.024)	0.474 (0.158)**	0.773 (0.348)*	0.156 (0.100)	0.194 (0.125)	-0.034 (0.079)	-1.680 (0.762)*	-0.816 (0.976)	-0.028 (0.046)
Constant	0.269 (0.147)	0.419 (0.206)*	0.732 (0.213)**	0.728 (0.226)**	0.029 (0.022)	-0.112 (0.202)	15.339 (0.303)**	39.395 (0.666)**	6.315 (0.192)**	10.282 (0.239)**	7.424 (0.151)**	70.712 (6.199)**	70.677 (7.794)**	0.494 (0.316)
Obs.	2505	2490	2491	2492	2432	3027	6145	6141	6145	6144	6141	2790	2715	2505
Number of individuals	884	883	883	883	858	879	976	976	976	976	976	830	829	884
R-squared	0.03	0.17	0.04	0.11	0.08	0.05	0.09	0.15	0.45	0.11	0.07	0.04	0.05	0.02

Note: Robust standard errors in parentheses clustered at the individual level in parentheses. Specifications also include parental education, home environment, occupation prestige and year effects. * significant at 5%; ** significant at 1%.

Table 5: Estimates of the First Stage Equations

	Rules total	Supervising totals
Mother Schooling	-0.032 (0.048)	-0.095 (0.047)*
Mother Schooling Squared	0.028 (0.224)	0.334 (0.200)
Father Schooling	-0.005 (0.035)	-0.082 (0.041)*
Father Schooling Squared	-0.002 (0.141)	0.337 (0.157)*
Family Income	-0.002 (0.010)	0.010 (0.012)
Current Family structure not intact	-0.274 (0.067)**	-0.352 (0.107)**
Verbal IQ proxy	-0.086 (0.015)**	0.012 (0.017)
Observational treatment	-0.282 (0.139)*	-0.445 (0.197)*
Eligible for randomization	0.187 (0.118)	0.024 (0.158)
Bimodal treatment	-0.020 (0.177)	-0.046 (0.211)
Preventive treatment	0.051 (0.054)	0.026 (0.066)
Home Environment	0.125 (0.142)	-0.672 (0.205)**
First Stage F statistic	12.389	15.337

Note: Robust standard errors in parentheses clustered at the individual level in parentheses. Specifications also include al exogenous controls in Table 3 including year effects. * significant at 5%; ** significant at 1%.

Table 6: OLS, 2SLS and Fixed Effects Estimates of Parental Discipline and Supervision at Alternative Ages

	Stealing totals	Delinquency total	Drugs total	Fighting totals	Destroys stuff totals
EARLY AGES (1988 – 1991)					
Rules total OLS	-0.002	0.022	-0.001	-0.012	0.040
	(0.033)	(0.079)	(0.014)	(0.033)	(0.017)*
Super-vision OLS	-0.549	-1.564	-0.157	-0.622	-0.236
	(0.042)**	(0.102)**	(0.016)**	(0.042)**	(0.022)**
Rules total 2SLS	0.774	3.897	0.393		0.819
	(0.725)	(2.326)	(0.332)		(0.482)
	-1.110	-3.722	-0.224		-0.625
Super-vision 2SLS	(0.407)**	(1.293)**	(0.177)	(0.609)**	(0.277)*
	-0.027	-0.024	0.010	-0.021	0.036
Rules total Fixed effects	(0.037)	(0.086)	(0.016)	(0.037)	(0.021)
	-0.297	-0.900	-0.106	-0.350	-0.148
Super-vision Fixed effects	(0.038)**	(0.088)**	(0.016)**	(0.038)**	(0.022)**
LATER AGES (1992 – 1995)					
Rules total OLS	0.182	0.243	-0.094	0.070	0.088
	(0.076)*	(0.170)	(0.043)*	(0.049)	(0.033)**
Super-vision OLS	-0.839	-2.065	-0.419	-0.534	-0.266
	(0.070)**	(0.160)**	(0.040)**	(0.046)**	(0.028)**
Rules total 2SLS	-1.573	-5.675	-1.044	-1.669	-1.226
	(2.561)	(7.125)	(1.586)	(2.117)	(1.390)
Super-vision 2SLS	-1.915	-5.129	-0.883	-1.381	-0.876
	(0.709)**	(1.793)**	(0.390)*	(0.527)**	(0.347)*
Rules total Fixed effects	0.153	0.253	0.030	0.082	0.060
	(0.057)**	(0.119) *	(0.037)	(0.041)*	(0.029)*
Super-vision Fixed effects	-0.214	-0.527	-0.054	-0.167	-0.090
	(0.045)**	(0.095) **	(0.029)	(0.032)**	(0.023)**

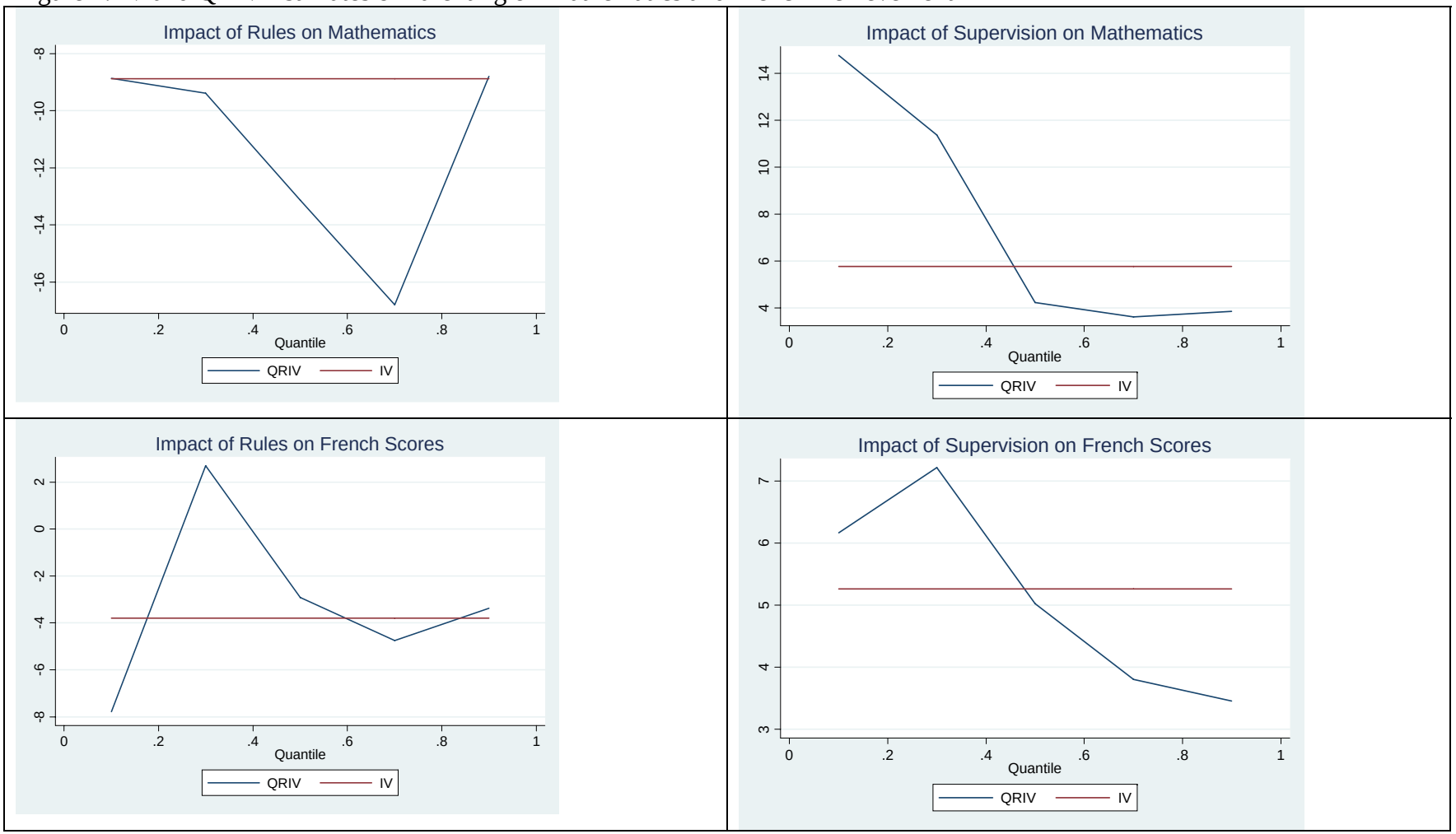
Note: Robust standard errors in parentheses clustered at the individual level in parentheses for OLS and 2sls estimates. Specifications include the same set of controls as in the corresponding Tables 2, 3 and 4. * significant at 5%; ** significant at 1%.

Table 7: OLS, 2SLS and Fixed Effects Estimates of Adolescent Outcome Equations Which Only Contain One Proxy for Child Rearing Practices

	Sells Drugs	Marihuana Use	Smokes Cigarette	Got Drunk	Drop Out of School	Gang Member	Stealing totals	Delinquency total	Drugs total	Fighting totals	Destroys stuff totals	French mark	Math Score	Tried a hard drug
Rules total OLS	-0.004 (0.005)	-0.008 (0.008)	0.007 (0.010)	-0.031 (0.009)**	-0.013 (0.005)*	0.012 (0.006)	-0.020 (0.042)	-0.111 (0.098)	-0.065 (0.021)**	-0.054 (0.032)	0.030 (0.017)	-0.621 (0.224)**	-0.293 (0.461)	0.010 (0.011)
Rules total 2SLS	-0.006 (0.193)	-0.120 (0.266)	-0.224 (0.325)	-0.419 (0.373)	0.051 (0.111)	0.041 (0.125)	-0.562 (1.348)	-0.328 (3.396)	-0.142 (0.658)	0.197 (1.103)	0.122 (0.620)	-5.723 (6.725)	-12.251 (10.527)	-0.032 (0.230)
Rules total Fixed Effects	-0.002 (0.006)	-0.012 (0.009)	0.009 (0.009)	-0.017 (0.010)	0.000 (0.006)	0.008 (0.007)	0.038 (0.032)	0.000 (0.071)	0.007 (0.020)	0.001 (0.025)	0.051 (0.006)**	-0.297 (0.235)	-0.133 (0.298)	0.021 (0.013)
Super-vision OLS	-0.027 (0.005)**	-0.050 (0.006)**	-0.067 (0.008)**	-0.060 (0.007)**	-0.015 (0.004)**	-0.030 (0.005)**	-0.682 (0.042)**	-1.788 (0.097)**	-0.298 (0.022)**	-0.568 (0.032)**	-0.237 (0.017)**	0.608 (0.170)**	1.130 (0.253)**	-0.039 (0.007)**
Super-vision 2SLS	-0.092 (0.042)*	-0.135 (0.062)*	-0.115 (0.075)	-0.009 (0.068)	-0.063 (0.043)	-0.177 (0.062)**	-1.519 (0.434)**	-4.148 (1.042)**	-0.567 (0.223)*	-1.381 (0.363)**	-0.642 (0.179)**	5.122 (2.017)*	5.929 (2.497)*	-0.036 (0.065)
Super-vision Fixed effects	-0.000 (0.005)	0.002 (0.007)	-0.025 (0.007)**	-0.017 (0.008)*	-0.002 (0.005)	-0.006 (0.006)	-0.368 (0.025)**	-0.999 (0.055)**	-0.164 (0.016)**	-0.328 (0.020)**	0.138 (0.013)**	0.131 (0.000)	0.260 (0.245)	0.01500 (0.011)

Note: Robust standard errors in parentheses clustered at the individual level in parentheses for OLS and 2sls estimates. Specifications include the same set of controls as in the corresponding Tables 2, 3 and 4. * significant at 5%; ** significant at 1%.

Figure 1: IV and QRIV Estimates of Parenting on Mathematics and French Achievement



Note: QRIV stands for Quantile regression instrumental variables.