THE RATIONAL ADOLESCENT: PRIVILEGE, POLICY, AND MYOPIC HUMAN CAPITAL ACQUISITION

ABSTRACT

Standard human capital models assume adolescents maximize discounted lifetime earnings when allocating effort to education. If adolescents are impatient, as evidence indicates, then attempts to explain present choices in terms of distant consumption may lack predictive power. This paper posits a model in which rational but myopic adolescents trade off privileges against leisure, while schools set an implicit "price" of leisure by revoking privileges for low effort choices. The response of effort choices and skill outcomes to changes in the price of leisure (as measured by an index of school-specific discipline policies) is estimated. Court climate and density of public interest lawyers instrument for the price of leisure, according to the following logic: Student-friendly appellate courts and public interest lawyers in a state increase administrators' fear of lawsuits, leading them to impose leisure prices. Results show that students appear to consume less leisure, as measured by truancy, when costs of leisure are higher; high school graduation and labor participation outcomes appear higher for students from schools with higher prices of leisure; and state or regional variations in the wage premium for educated workers do not explain observed truancy, education, or employment outcomes.

1 Motivation

1.1 Introduction

Through most of the 20th century, work force quality in the United States climbed—a major determinant of U.S. economic growth.[1] However, high school drop-out rates flattened for cohorts born after 1950 (Figure 1), and have remained flat during the past 23 years of increases in the wage premium for educated workers (Figure 2). Given that the return to education is high and rising, how do we explain the apparent weak response to wage incentives?

The question motivates an investigation of institutional factors that influence human capital investment decisions. This paper will argue, in particular, that parameters of short-run optimization influence early investment decisions, which in turn influence long-run outcomes. A model that emphasizes short-run trade-offs gives shape and structure to the empirical analysis. In the model, rational but myopic adolescents optimize by trading off privileges (or lack of punishment) against leisure, while schools set an implicit "price" of leisure by revoking privileges or imposing punishments for low effort choices. Empirically, price of leisure will be measured by an index of school-specific discipline policies. The paper estimates the response of student effort choices and long-run skill outcomes to changes in the price of leisure. Possible simultaneous determination of school policies and student effort choices casts doubt on the reduced form regressions, motivating an instrumental variables strategy. Appellate court climate and per capita density of public interest lawyers will instrument for the discipline index, according to the following logic: Student-friendly appellate courts induce a fear of lawsuits in administrators, and a high concentration of public interest lawyers in a state magnifies the threat by increasing the likelihood that student lawsuits reach the higher courts. Schools in these jurisdictions impose a lower price of leisure than they would have chosen in absence of this exogenous threat.

The analysis suggests a possible explanation for recent trends in skill acquisition: Because of legal reforms that filtered through education institutions in the mid-1970's and onward, school administrators' capacity to incentivize students may have eroded at the same time that the skilled wage premium increased, masking the effect of the latter. The paper does not claim to prove that this is the right explanation; it argues only that short-run incentives appear to have measurable effects on contemporaneous investment choices and long-run outcomes, and thus that systematic changes in short-run incentives could be an important and largely neglected component of the story. Main empirical findings include the following: 1) State-level judicial/legal climate appears to influence administrators; 2) Students appear to cut class less

[1] Delong, Goldin, and Katz (2003).

often when costs of leisure are higher; 3) High school graduation and labor participation outcomes appear higher for students who attended schools with higher prices of leisure; 4) Variations in lifetime income incentives (as captured by state or regional variations in wage premia for educated workers) do not appear to explain in any direct way the observed truancy, education, or employment outcomes.

The paper is organized as follows: Section 1 presents a case for reevaluating basic assumptions about adolescent choice; section 2 describes the model; section 3 lays out the empirical strategy; section 4 analyzes the results of the empirical analysis; section 5 explores theoretical extensions and discusses implications of the findings in a broader context; section 6 concludes.

1.2. The Case for Autonomy

The logic of the Ben-Porath model (1967) underlies many theoretical and empirical analyses of human capital acquisition. The Ben-Porath model portrays human capital investment as an intertemporal decision facing agents who maximize present discounted value of lifetime future earnings:

$$\max_{s(.),i(.)} \int_0^T (w(v) - Pi(v))e^{-rv}dv$$

$$s.t.$$

$$w(t) = R(1-s(t))k(t),$$

$$k'(t) = As(t)k(t)^{\gamma_1} i(t)^{\gamma_2},$$

Here, *w(t)* is the worker's wage at time *t*, *s(t)* is the fraction of the worker's time spent acquiring human capital, *k(t)* is the worker's stock of human capital, *i(t)* is the purchased inputs the worker used to acquire human capital, *R* is the rental rate on "efficiency units" of human capital, *P* is the price of purchased inputs, *r* is the interest rate, and *A* is the productivity constant for human capital creation. Workers trade off present consumption against the consumption that present investment in human capital would make possible in the future. The second constraint implies that the human capital production process, *k'(t)*, depends on purchased and acquired inputs, the fraction of time spent acquiring human capital, and an ability coefficient, *A*. For the purposes of the current inquiry, two of Ben-Porath's assumptions merit close attention. The first concerns the identity of the decision-maker. It is clear that five-year-olds do not maximize present discounted value of their lifetime future earnings and it is unlikely that 12-year-olds do so either. Ben-Porath assumes parents choose *s(·)* and *i(·)* for a child until the child reaches an age at which she is allowed and able to make her own decisions. The second assumption is that the ability coefficient, *A*, is constant over time.

In the context of compulsory primary education, the choice of *s* could be interpreted as an effort choice. Adolescents, whether they like it or not, must devote a certain portion of their time to education; however, there remains the choice of how much effort to put forth. Do parents choose a child's effort level? Though parents sometimes find ways to motivate their children, evidence and common sense imply that this influence has limits. In the National Longitudinal Survey of Adolescent Health (Add Health) in 1994-95, students in grades 7-12 were asked "How disappointed would your mother(father) be if you did not receive a high school diploma?" They were asked to rate the disappointment on a scale of 1 to 5. A follow-up questionnaire 7 years later revealed which students had received high school diplomas and which had not. 78% of the mothers in the sample used to generate Figure 3A would have been highly disappointed—the highest allowed response—if their sons or daughters did not receive a high school diploma. However, the sample used in Figure 3A consists precisely of those students who **did not** go on to receive a high school diploma (and, presumably, dropped out). Among students who graduated from high school (Figure 3B), 89% had mothers who would have been "highly disappointed" had they not done so. Fathers' attitudes were similar. Parents seem to exert some influence, then, but do not control these investment decisions: It would appear that nearly 80% of the time, students who chose not to invest in acquiring a high school diploma did so in opposition to their parents strongly expressed wishes.[2]

This result may not seem surprising. Parents rarely celebrate teen pregnancy, drug and alcohol use at school, violence, dropping out, or truancy.[3] Evidence and common sense imply that adolescents decide autonomously in these contexts—that they are utility maximizers, not passive instruments of parental volition. But every model simplifies. One might ask whether this particular simplification has important repercussions. I would argue that the repercussions of the

[2] Two nuances of interpretation merit comment. Students, rather than parents, responded to the question. The answers represent students' perceptions of parental attitudes, not the actual attitudes of parents. However, student perceptions would seem to be the more relevant measure. A parental attitude that goes unexpressed or undetected by the student could hardly be expected to influence the student. The second comment is that parental "disappointment" need not imply the student acted against parental wishes. It is possible that parents who, at the time of the survey, would have been "disappointed" to envision sons or daughters dropping out nevertheless wanted them to drop out a year or two later (perhaps because of an intervening financial problem). Or perhaps parents wanted sons and daughters to drop out, even though the necessity of their doing so was disappointing. While it is possible to parse the question in a way that generates ambiguities, it would seem likely that most adolescents—quicker to recall parental nagging than to parse sentences—interpreted the question to mean: "How strongly are your parents urging you to stay in school?" If one assumes parental opinions do not vary widely from year to year on this issue, then Figure 3 suggests that close to 80% of the time, students acted in opposition to parental attitudes that had been communicated to them.

[3] The Add Health data indicates that among sexually active adolescents, most had parents who would have disapproved of their behavior. Thus, adolescents appear to exhibit considerable autonomy in their sexual decisions, as well.

assumption of non-autonomous and farsighted adolescents are quite large. Autonomous adolescents who exert low effort, get pregnant, or drop out of high school may limit their future choice sets decisively and irreversibly.

More generally, there exists evidence that early investment decisions may be difficult or prohibitively costly to adjust, later in the lifecycle. Carneiro and Heckman (2003), who emphasize non-cognitve human capital, cite evidence from the cognitive psychology literature of early brain plasticity. Evidence suggests non-cognitive skills may be malleable through adolescence, but cease to be easily manipulated later in life.[4] The authors attribute to early human capital acquisition a dynamic complementarity: Early investments in human capital increase future productivity through two channels—by raising human capital directly, and by raising the individual's ability to produce more human capital. In the language of the Ben-Porath model, early investment raises the production constant, A, in addition to human capital stock, k. The authors find high rates of return to random assignment interventions early in the lifecycle, compared to interventions later in the lifecycle.[5] Bowles, Gintis, and Osborne (2000) assert that education may alter preferences, creating attitudes and habits of behavior that raise the agent's value in the labor market. In their model, monitoring costs cause employers to value agents who possess the "incentive-enhancing preferences" that education might produce. These might include a taste for education, itself, as well as low disutility of effort, low discount rates, and a willingness to work within hierarchies. (I will view these as acquired human capital rather than "preference changes"). Similarly, Becker and Mulligan (1996) argue that early investments in education might be most valuable as investments in "future-oriented human capital" similar to patience.

A growing literature suggests that early investment may be of unique importance as a determinant of long-run social and economic outcomes. Further, adolescents, acting autonomously, may be largely responsible for early investment decisions. These two observations, taken together, motivate a departure from the Ben-Porath model. Specifically, they motivate a model in which the child is the optimizer—a theoretical and empirical investigation of trade-offs salient to the rational adolescent.

[4] The prefrontal cortex, related to emotion and behavior, appears malleable through the teen-aged years. (Shonkof and Phillips, 2000, as cited in Carneiro and Heckman, 2003).
[5] For details on the measured effects of early intervention programs, see Heckman and Lochner(2000).

2. The Rational Adolescent

2.1 Adolescent Choice

There are at least two ways to account for children's failure to maximize present discounted value of lifetime future earnings. One could describe adolescents as impatient agents, fully aware of negative consequences to low-effort choices but unwilling to trade-off present leisure against future gains. Alternatively, the failure could be described as a problem of information: Adolescents underinvest in education effort because they do not know that acquiring human capital will make them better off in the long run. The analysis here is robust to either of these conceptual frameworks. The paper will focus on the description of adolescence that emphasizes impatience.

There exists experimental evidence that adolescents do exhibit less patience than adults. Coller and Williams(1999) conduct an experiment that elicits discount rates from adult agents. Bowdoin(2002) duplicates the experimental design of Coller and Williams, but performs the experiment on adolescents. Bowdoin observes discount rates approximately twice as high. It would seem plausible, then, that current period rewards and punishments influence adolescents strongly. If so, their decisions about human capital acquisition could be modeled as in Figure 4. School attendance is mandatory, but the effort-leisure decision belongs to the agent. Effort may be conceptualized as the fraction of the time in class a child pays attention, $e \in [0,1]$. Leisure is then the fraction of time in class when the child is not putting forth effort to learn, that is, when class time is no different from "recess." By assumption, the agent would prefer to put forth no effort—to enjoy perpetual recess—but there is a cost associated with leisure. The agent must trade off consumption of leisure against the rewards that result from given effort choices. In most school settings, privileges are revoked when effort choices are low. Low effort choices cause students to be reprimanded, sent to detention, suspended, expelled, forced to attend summer school, or held back a grade.

This simple schematic suggests an exercise in comparative statics: It may be possible to elicit higher levels of human capital acquisition through policies that manipulate the allowed set of trade-offs, e.g., by changing the slope of the boundary of the budget set. If privileges are revoked when consumption of leisure rises, there is an implied rate of exchange between leisure and privilege. Increasing the "rate" at which privileges are revoked—that is, imposing stricter consequences for low effort choices—is depicted in Figure 4B as an increase the price of leisure. Figure 4B decomposes the consumer's optimal response to an increase in the price of leisure into the usual income and substitution effects. The substitution effect will be in the direction of less

leisure. If leisure is a normal good, as indicated in the figure, then the income effect will be in the same direction as the substitution effect and the consumer will choose less leisure, unequivocally. If leisure is an inferior good, the consumer may choose more or less leisure in his or her optimal bundle, depending on the relative magnitude of the income and substitution effects. An increase in the price of leisure reduces the student's effort choice only if leisure is an inferior good for which the income effect is stronger than its substitution effect (that is, if leisure is a Giffen good).

A more fully articulated 2-period model that allows for heterogeneous endowments and parent/child strategic interaction is presented in section 5.1, as an extension. The main empirical findings of the paper, however, relate to this simpler framework. A central task will be to measure directions and magnitudes of price effects described above. Evidence will indicate that an increase in the price of leisure is associated with lower consumption of leisure—that leisure is not a Giffen good.

3. Empirical Strategy

3.1 Data and Specification

A major empirical challenge is to find plausible measures for the two axes: the effort/leisure choice for the horizontal axis and behavior policies for the vertical axis. Moreover, measures of long-run outcomes are necessary if one hopes to discern whether an observed effect of policy on effort choices is large enough to have long-run consequences.

The Add Health survey, conducted by the Carolina Population Center from 1994 to 2002, contains all of the above. It consists of data on adolescents in 132 schools across the country, grades 7-12. The in-school portion of the Wave 1 survey, conducted in 1994-1995, contains cross-section data on about 90,000 adolescents. The students filled out the main questionnaires. These will be the source of the effort/leisure measure. In addition, school administrators filled out questionnaires describing characteristics of the schools in the sample. These provide the source for the behavior policy measure. A subset of the initial sample, about 20,000 subjects, was selected for the in-home portion of Wave I in 1994-1995. Because parents were also interviewed in this smaller sample (and because students were interviewed more extensively) a large set of family and neighborhood controls is available. The in-home subjects were interviewed again in 1995-1996 (Wave II), and a final time in 2001-2002 (Wave III). The Wave III sample, 7 years after the initial surveys, will be the source of long-run employment and education outcomes.

When appropriate weights and cluster coefficients are used, regressions on data from each of the surveys, or from merged samples, yield results representative of the U.S. population.[6]

The measure of the student's effort-leisure choice is the frequency with which the student skipped class without an excuse. Seven discrete responses were options on the In-school questionnaire survey: never, once or twice a year, once a month or less, 2 or 3 days a month, once or twice a week, 3 to 5 days a week, nearly every day. There is also a measure of behavior policies. The school administrator answered questions about what the usual punishment would be for a variety of low-effort behaviors: cheating, bringing alcohol or drugs to school, disruption, abusing teachers, fighting. Punishments varied in strictness from verbal reprimands to permanent expulsion.[7] The administrator answered questions about punishments for first offences and second offences. An index of strictness of behavior requirements, derived from these measures, will be interpreted here as a proxy for the "price" of leisure—the slope of the boundary of the budget set. There were 24 dimensions of behavior in the questions of Add Health school administrator survey. In the questionnaire, allowed answers were restricted to the 5 discrete options displayed in Table 1A. The Punishment/Privilege Index (PPI), which I construct for each school, is the average of these 24 responses. The PPI is conceived as a proxy for a range of unobserved administrator policies and attitudes. Table 1, in panels B and C, shows descriptive statistics for the PPI and its component policies.

The focus on discipline policies was dictated by the available data. Some schools may offer rewards for student effort, but the rewards[8] are sometimes difficult to measure.[9] Given the available data in the Add Health, we can attempt to answer two questions motivated by the model. First, we can ask whether effort increases as the penalty for low-effort choices rises. This is roughly analogous to the question: Is own-price elasticity of leisure negative? The underlying behavior model for the ordered probit estimation is:

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[6] See Chantala and Tabor, 1999.

[7] Expulsion might seem a desired outcome for students who skip class. It is assumed here that expulsion does not lead to perpetual leisure, but to enrollment in a different school or a juvenile detention facility. This would be associated with a high cost of making new friends. Thus, expulsion could be a "punishment" even to students with no wish to attend class.

[8] Akerlof and Kranton(2002), for example, describe how school policies may raise the degree to which a student identifies with the goals of a school. Students whose characteristics place them too far from the effort level associated with the school's ideal may be tempted to become "burn-outs." If policy innovations create a greater sense of community, then the loss of identity-based utility that results from attempting to conform to the school's ideal is reduced. Thus, in this model, school investments may create subtle effort incentives. These investments, of course, would seem difficult to measure.

[9] Merit scholarships or "effort pay" are an exception. These may not be common practice in the U.S., but interesting research exists for programs elsewhere. Angrist and Lavy((2003), analyzing a program of merit-based scholarships in high schools in Israel, find that cash rewards improved test performance. Kremer, Miguel, and Thornton(2003) show that girls eligible for merit scholarships in Kenya scored significantly higher on scholastic tests than the comparison group that was not eligible.

$$l_{ij}^* = \beta_1 x_{ij} + \beta_2 s_j + \beta_3 p_j + \varepsilon_{ij}, \quad (1)$$

Here, l_{ij}^* is the latent variable from which the leisure choice is derived (where "leisure" is measured by the 7 discrete levels of cutting class described in the preceding), outcomes x_{ij} are student characteristics, s_j are school characteristics, p_j is the price of leisure or "strictness" of the school , and ε_{ij}, the standard probit error term, is such that $(\varepsilon_{ij} \mid x_{ij}, s_j, p_j) \sim N(0, 1)$. The object is then to test whether β_3 is negative.

From a policy perspective, a second and perhaps more meaningful goal would be to determine whether future economic outcomes are influenced by the "price" of leisure during middle or secondary school:

$$y_{ij}^* = \alpha_1 x_{ij} + \alpha_2 s_j + \alpha_3 p_j + \varepsilon_{ij}, \quad (2)$$

Here, the explanatory variables are the same as before, and y_{ij}^* is the latent variable for an observed binary outcome in the Wave III survey in 2001-2002, 7 years after the first interview. The specific long-run outcomes I will study are high school graduation, labor market participation, and single parenthood.

It will not be assumed that long-run incentives have no influence on adolescent choice. Effort choices and long-run skill-acquisition outcomes may depend on the wage premium for skilled labor, as predicted by the standard model. One concern is that behavior policies in a school could be correlated with the skilled wage premium in the geographical area. The Punishment/Privilege Index would then be a proxy for the return to education. To account for this possibility, and to allow for comparisons between the effects of short-run factors and long-run factors on investment decisions, the regressions will include state-level skilled wage premia as control variables.

3.2 Instruments

A negative coefficient on the punishment/privilege index would not, by itself, imply a causal relationship between price of leisure and student effort choices. It is likely that neighborhood context—and the endowments and preferences of parents who select into neighborhoods—affect student behavior and school policy. This could be characterized as a problem of omitted variables. In addition, PPI and student effort choices may be jointly determined. Administrators shape policy in response to student behaviors, just as students choose their behaviors based on policy. This is a problem of simultaneity. Extensive controls will be added to reduce omitted variable bias, and an instrumental variables strategy will be used to identify sources of variation in PPI that I will argue are exogenous to student behavior.

Evidence about the interaction between schools and the judiciary suggests a set of plausible instruments. The threat of lawsuits is a major concern for the administrators who create and enforce school behavior policies—a threat that varies in seriousness from state to state, depending on the climate of the appellate courts that set judicial precedents. According to the Baltimore Sun (March 23, 2003), teachers have been leaving the Baltimore County school system "because they grew frustrated with superiors who wouldn't discipline students who cursed in class, cheated on research projects and hit classmates." The administrators would not back up teachers because of a fear of lawsuits. Baltimore is not alone. Similar accounts have been published in the Los Angeles Times, the St. Petersburg Times (of Florida), and the Associated Press. Newsweek ran a cover story on the topic in December 2003 contending that "legal fear" among education professionals is a national phenomenon. Alan Bersin, superintendent of San Diego City Schools, quoted in Newsweek, calls the risk of being sued "'the anaconda in the chandelier'—it hangs overhead, threatening to strike at any time."

Beyond anecdotes in the popular press, there exists systematic evidence that schools and students have been influenced by case law. Arum, Beattie, et al (2003) examine 6,277 court cases that reached state and federal appellate courts between 1946 and 1992, identifying 1,204 cases that contest a school's right to discipline and control students. They argue that the involvement of courts in overturning school disciplinary policies altered the motivations of administrators and the expectations of students and families. The authors construct an index of court climate based on the "student-friendliness" of state and federal appellate courts. The student-friendliness measure is the relative frequency with which the court ruled in favor of students in discipline-related lawsuits. They go on to identify variation in court climate over time and—more important for the present purpose—across regions and jurisdictions. Student-friendliness of appellate courts, they find, correlates with decreases in strictness of discipline. (They use several measures of school discipline, including the existence of corporal punishment, and teacher and student perceptions of strictness). I will use this student-friendliness measure—the relative frequency with which state and regional appellate courts sided with students in discipline lawsuits between 1960 and 1992—to instrument for PPI.

The history of student rights litigation and case law motivates a second instrument. Large increases in school discipline cases in appellate courts took place after 1969 (from about 8 cases a year in 1960-1968 to an average of 76 cases a year between 1969 and 1975). Arum et al. identify and document carefully what appears to have been a major cause of the increase: Public interest law firms began to use school discipline lawsuits as a means of education reform. Without support from non-profit lawyers, it had been difficult for students or their families to bring

lawsuits and to persist until the lawsuits reached the appellate level. This paper takes no stand on the merit of the reforms. Early litigation focused on issues involving freedom of speech, and may well have led to improvements in the quality of education and ideological discourse. In later cases (1976-1992), drugs, alcohol, weapons, violence, and misbehavior tended more often to be the activities for which students had been disciplined, rather than acts of political protest. In both time periods, however, lawsuits brought by students and their families appear to have been made possible, in large part, by third parties engaged in reform advocacy.[10] In addition to whatever may have been accomplished with respect to the protection of a student's rights, the reforms appear to have had a number of unintended consequences. These relate to the present inquiry. If public interest law firms supported and sustained student lawsuits, then schools in states with lots of public interest lawyers may have had greater reason to fear litigation. The American Bar Association publishes statistical information on number of lawyers practicing law, by state and type of law practiced. From this data, I created a lawyer variable: the number of public interest lawyers per capita in the state in 1994 (the time of the Wave I surveys). Figure 5 displays levels of court climate and per capita public interest lawyers, by state, on a map of the U. S.

Validity of the instruments is a primary concern. Are court attitudes and the number of non-profit lawyers at the state-level uncorrelated with local factors that influence student behavior outcomes? Arum et al. argue that courts have been relatively autonomous from locally defined political cultures. As was demonstrated dramatically in local reactions to racial integration, state and federal court attitudes need not reflect the preferences of local regions. Strategies that work through the judiciary offer a distinct advantage for reformers. Local preferences can be superceded. If appellate court attitudes had simply mirrored the attitudes of local voters and local institutions, lawsuits would have been unnecessary or irrelevant. Arum et al. argue that the courts were "one of the institutional mechanisms whereby larger political and social pressures" filtered down to local schools and were brought to bear on administrators and students.

An IV ordered probit was used to estimate the two-stage analog of specification (1), and an IV probit, for the two-stage version of specification (2) with dichotomous outcomes. In the Add Health Survey, observations are weighted by probability and errors should be clustered at the school level to allow for arbitrary within-school correlation of unobserved student characteristics. Estimates were corrected to account for these design elements. State-level instruments are used in

[10] For example, Goss vs. Lopez, decided by the U.S. Supreme Court in 1975, was brought by OEO Legal Services and the Center for Law and Education at Harvard. It included "friends of the court" briefs from the ACLU, the NAACP, and the Children's Defense Fund. (See Arum et al.)

two-stage probit and two-stage ordered probit estimates. Consequently, errors were clustered at the state level in these regressions.

4 Results

4.1 PPI and Truancy

As a first pass at the data, Table 2 shows estimated coefficients from the ordered probit and IV ordered probit regressions based on specification (1). In the full sample, the Punishment/Privilege index is negatively correlated with the leisure choice, significant at the 5% level. Students who skip class less often are associated with stricter schools. IV estimates on PPI are larger in absolute value than their reduced form counterparts, a finding that will be discussed in more detail below.

The regressions include controls for skilled wage premia. The 2000 census was used to construct the state-level controls "H.S. (Mincer)" and "B.A. (Mincer)." These are Mincer coefficients on the dummy variables for high school graduation and 4-year college graduation, respectively, in a regression of log wages on these two dummy variables, age, age squared, race, sex, and marital status. The H.S. control captures the percentage increase in wages associated with completing high school in a given state (relative to the wage for not completing high school), and the B.A. control captures the additional percentage increase in wages associated with acquiring a 4-year degree. Signs and magnitudes of the wage premia coefficients will be discussed in more detail in the next set of regressions.

Coefficients on the other covariates have the expected signs. Older students cut class more often. Students from more educated families skip class less often, schools with larger class sizes and inexperienced teachers are associated with higher probability of truancy, the percentage of teachers with master's degrees does not influence truancy significantly, and students skip class more often when they feel unsafe. Columns 3-6 break down the regressions by gender. For males, the coefficients on PPI are larger in absolute value than for females. This finding recurs for the dependent variables reported in subsequent sections, across specifications and sample sizes. Subsequent regressions will be restricted to males, as their responses are more clearly distinguishable from the null.

The Add Health Wave I In-home sample contains a detailed set of family and neighborhood variables. Table 3 shows the descriptive statistics of variables that will be used to capture characteristics that could be a source of correlation between the PPI and the unobserved error term. Variables describing income distribution, population, crime, marital status, family structure, and other relevant neighborhood characteristics will be included in the next set of

regressions. Some of the variables are available at the census tract level, others at the county level only. In addition, the student's score on the Add Health Vocabulary Test and a more detailed set of family descriptive variables (also shown in Table 3) will be added to the list of right-hand variables. The descriptive variables come at a cost. They are available only for the In-home survey, so sample size is sacrificed.

Column 1 of Table 4 shows the baseline regression from Table 2. Column 2 shows the same regression calculated from the smaller In-home sample, without any additional controls. Column 3 estimates the model with added family-descriptive variables. Column 4 shows the results when the full set of neighborhood-descriptive variables is included, as well. Adding covariates appears to reduce the magnitude of the coeffcient on PPI, though the estimate remains significant at the 10% level.

In columns 5 through 8, court climate and public-interest lawyers instrument for PPI in IV ordered probit analogs to columns 1 through 4. The IV estimates for the In-home sample are smaller in absolute value than the IV estimates in the large sample. However, the PPI coefficients in the IV regressions do not move toward zero as controls are added. Interestingly, the IV estimates of the PPI coefficient are larger in absolute value than the estimates in the reduced form regressions. PPI may be a noisy measure of the price of leisure in schools. If the instruments are correlated with the informative portion of PPI variance in the sample, but not with the noise, then the estimates in the reduced form will be biased toward zero. In such a case, IV estimates may be larger in absolute value—as here. Also, if administrators in schools with high truancy respond by tightening discipline, then the reduced form estimates will be biased upward toward zero—and again, one might expect to see IV estimates more negative than reduced form estimates.

Marginal effects of changes in PPI on truancy have been calculated for each category of truancy choice. Weighted averages of the marginal effects (for all individuals in the sample) are displayed in Table 4. For all specifications, a 1 point increase in PPI shifts probability mass to choice 0—not skipping class at all—and away from all other categories. The probability of every non-zero truancy choice goes down, whether students have been skipping class often, or whether they have been doing so infrequently. To interpret the marginal effects, on could imagine a uniform change in all 24 behavior policies. For example, if punishments for each of the 24 infractions were to be raised in severity by one category (minor punishment to in school suspension, in school suspension to out of school suspension, and so on), this would be associated (in column 8) with a 17 percentage point increase in the probability that a student would not skip class, and respective decreases of 6.3, 2.9, 3.0, 1.7, .7, and 2.4 percentage points in the probabilities of skipping class once or twice a year, once a month or less, 2 or 3 days a month,

once or twice a week, 3 to 5 days a week, and nearly every day. Alternatively, one could imagine an exogenous change of one-standard deviation in the strictness of the school's behavior policy. The standard deviation of PPI is .31. The marginal effects in column 8, then, indicate that an increase in PPI of one standard deviation is associated with an increase of 5.3 percentage points in the probability of not skipping class at all, and decreases of 2.0, .9, .9, .5, .2 and .7 percentage points in the higher truancy categories.

Coefficients on skilled wage premia, by contrast, vary in sign and are not statistically significant. In all specifications, F-tests fail to reject that null that high school and college wage premia coefficients are jointly zero. Even if one were to take the point estimates at face value, the marginal effects seem small. In the preferred specification (column 8), a change in the high school wage premium of 100 percentage points is associated with a decrease of 6.9 percentage points in the probability of not skipping class. It would take an enormous change in the high school wage premium—about 75 percentage points—to duplicate the effect of a one-standard deviation change in PPI on the probability of not skipping class.

The first stages of the IV regressions show that the instruments have highly significant t-stats (and F-stats) in the expected direction for all specifications: Student-friendly courts and a high density of public-interest lawyers are associated with schools whose discipline practices are relatively less strict. Scatterplots in Figures 6A and 6B show a visible negative correlation between PPI and each of the instruments in the raw data. The excellent fit of the first-stage regressions may be of interest in itself. Have institutional changes arising from student rights litigation led to a weakening of school discipline? The first stage regressions support, and add to, the body of evidence presented by Arum et al. Their data allowed for a time series analysis that is not possible here; however, their inquiry focused largely on corporal punishment and perceptions of strictness. Here, the PPI derives from 24 discipline practices, and may be more nuanced than a measure based on corporal punishment alone. Moreover, if one worries about the subjective nature of perceptions of strictness, then evidence about specific practices, rather than perceptions, may offer some advantages.

In summary, findings indicate that for the range of discipline policies in place at sampled schools, price elasticity of leisure is negative.[11] The negative correlation is robust to the inclusion of family and neighborhood controls that characterize income distribution, public assistance,

[11] Estimates need not apply to schools with strictness that places them far outside the range of PPI in the sample. "Zero-tolerance" policies (some of which have required expulsion for possession of seemingly benign objects and medications) had not been implemented at the time of the Wave I surveys. These policies started with the Gun-Free Schools Act of 1994. States were required to have in effect by October, 1995 a law mandating expulsion from school for gun possession. The analysis above, then, does not speak in a direct way to the zero-tolerance debate.

crime, population, race, family structure, and a number of other socioeconomic traits. When instruments are used, the relationship persists and the absolute value of the coefficient rises. Long-run incentives, as measured by state-level wage premia for skilled labor, do not appear to drive the correlation or to explain effort choices perceptibly.

4.2 PPI and Future Outcomes.

The Wave III survey contains data on outcomes 7 years after the initial adolescent surveys. Specification (2) offers a second framework for drawing inferences about the relationship between price of leisure and effort choices. If the price of leisure during school influences effort choices and, through them, the acquisition of cognitive and non-cognitive skills, one would expect to observe a correlation between the price of leisure and future skill-related outcomes. Policies that do a better job of harnessing myopic effort incentives in adolescence should lead to outcomes indicative of higher skills.

In Table 5, high school graduation and labor force participation outcomes for Wave III males 7 years after the original Wave I survey (when agents were in grades 7 through 12) are regressed on PPI and the full set of control variables. The respondents' ages in Wave III are 20-25 years. High school graduation appears positively associated with PPI in both specifications, and significant in the IV specification. In Columns 3 and 4, agents are categorized as "Employed" if they are working at least 20 hours per week or still attending school.[12] The coefficients are positive in these regressions, as well, and significant for the IV specification. Attending a school with higher price of leisure is associated with a higher probability of having graduated from high school and a higher probability of being employed (or in school), 7 years later. If disruptive behavior occurs more often in schools serving unobservably bad neighborhoods, and if administrators respond to increased disruption by increasing penalties for disruption, then the OLS estimates are biased downward. Consistent with such an interpretation, IV probit estimates in column 2 and 4 exceed their reduced form counterparts.

Perhaps surprisingly, the wage premia for high school and college educated workers do not appear to explain education and employment outcomes in any straightforward way. Estimates are not significant in the "high school grad" regressions. Though both coefficients are significant in the IV specification of the employment regression, they have opposing signs. It could be that agents are mobile between states at low cost and thus do not respond to variation in state-level wage premia. Census regions, might capture the relevant wage premia more accurately, as mobility between large regions could be more costly. Wage premia were calculated for the 9

[12] In most cases, students still in "school" were in college.

Census regions and used instead of state-level wage premia in these and the previous regressions. Results were qualitatively similar.[13]

An increase in PPI of one standard deviation is associated (in columns 2 and 4) with a 4.1 percentage point increase in the probability of graduating from high school, and a 3.9 percentage point increase in the probability of being employed or in school. If policy driven, these effects would seem large enough to be of interest to parents, policy-makers, and the median voter.

Are the observed relationships policy driven? It could be that when courts offer more protections to students accused of misbehavior, they tend to do the same for criminals. States with stricter schools would feature harsher penalties for criminals and less restrictive forms of law enforcement. Education choices and labor participation in these states could be influenced by state-level determinants of crime prevention. State-level measures of court climate would then be correlated with the residuals in the IV regressions. To account for this possibility, I included the state-level crime rate from the FBI's Uniform Crime Report as a right-hand variable. It could also be that state-level minimum wage laws are correlated with the legal climate in the state and long-run skill-related outcomes. I added state-level minimum wage as a regressor to account for this possibility. Neither addition altered the results significantly. Results displayed in Table 5 were calculated with both crime and minimum wage covariates included.

In summary, high school graduation and labor participation outcomes appear to have been higher for students who attended schools with higher prices of leisure. State-level high school and college wage premia, do not appear to drive the observed correlation, or to explain the education and employment outcomes analyzed here.

5. Extensions

5.1 Heterogeneity of Endowments

The main empirical results of the paper were related to the simple framework of section 2. A number of extensions may be worth investigating. In this subsection, a more fully developed model that allows for parent child interaction and heterogeneous agents is presented and its predictions tested. The purpose is to push the basic framework into an explicit and carefully articulated model to see if it will yield more nuanced results.

[13] The 2000 Census was used to compute wage premia. In standard models, agents forecast the return to skill and make investment choices based on their estimates, so the 2000 Census would be appropriate (as Wave 3 surveys were conducted in 2001.) Wage premia from the 1990 census were used as an additional check in the above regressions, with similar results.

School-based rewards are not the student's only source of increased consumption associated with higher effort. Parents extend or revoke benefits based on effort choices made in the classroom. Consider the altruistic parent's optimization decision. The parent would prefer to make decisions for the child, as in the Ben-Porath model, but the child is autonomous. Incentives do not align because the parent is forward looking (with discount factor δ), whereas the child is myopic. Thus, the parent does not maximize child's utility. A 2-period model captures the intuition. In the first period the child responds to an effort wage, *w*, paid by the parent (and subsidized, in part, by the school). The adolescent chooses consumption, c^a, and effort, *e,* maximizing period 1 utility:

$$\max u^a (c^a, l) \qquad (3)$$
$$\text{s.t. } w(1-l) = c^a.$$

Concavity of u^a will yield interior solutions and an effort supply function $e(w)$. The parent derives utility from own consumption u^p in periods 1 and 2, and from the child's well-being in periods 1 and 2:

$$\max_{c_1, c_2, w, \tau} u^p(c_1) + \delta u^p(c_2) + v[e(w)(w - w_s) + \tau] + \delta v[f(e(w))] + \tilde{v}[1 - e(w)]$$
$$\text{s.t.} \qquad (4)$$
$$c_1 + \frac{c_2}{1+r} + e(w)(w - w_s) + \tau \le y_1 + \frac{y_2}{1+r}$$
$$\tau \ge 0$$

Here, w_s is an effort wage subsidy provided by the school, *f* is the child's period 2 earnings, τ is a parental transfer to the child, *v* denotes parental utility of child consumption, $\tilde{v}$ denotes parental utility of child leisure, *r* is the interest rate, and y_i is parental income in period *i*. The school effort subsidy is taken to be an in-kind reward, e.g. the absence of a punishment, rather than a monetary wage. [14]

The parent derives utility from own consumption and child's consumption. In the first period, the child's consumption comes from total effort earnings and from the transfer, τ. Parent utility from child consumption is then $v[e(w)(w - w_s) + \tau]$, the third term in the maximand above. Effort investment in period 1 leads to human capital acquisition and to period 2 consumption, $f(e(w))$, for the child (where $f'>0$). Parent (discounted) utility from this consumption is then $\delta v[f(e(w))]$. The parent also derives utility $\tilde{v}[1 - e(w)]$ from the child's leisure (either selfishly, through enjoyment of time spent with the child, or altruistically, through utility derived from the

[14] Thus, the child's period 1 consumption is $e(w)(w\text{-}w_s)$, rather than $e(w)w$.

child's utility). I assume *u, v, and* $\tilde{v}$ are concave and differentiable. The Lagrangian maximization problem may be written

$$\begin{aligned} Max\ & u^p(c_1)+\delta u^p(c_2)+v[e(w)(w-w_s)+\tau]+\delta v[f(e(w)]+\tilde{v}[1-e(w)] \\ & +\lambda[y_1+\frac{y_2}{1+r}-c_1-\frac{c_2}{1+r}-e(w)(w-w_s)-\tau]+\mu\tau \end{aligned} \tag{5}$$

and first-order conditions for an interior maximum are then:

$$u^p{}'(c_1)=\lambda \tag{6}$$

$$\delta u^p{}'(c_2)=\frac{\lambda}{1+r} \tag{7}$$

$$v'(e(w)(w-w_s)+\tau)=\lambda-\mu \tag{8}$$

$$\begin{aligned} & v'(e(w)(w-w_s)+\tau)\left[e'(w)(w-w_s)+e(w)\right]+\delta v'(f(e(w)))\cdot f'(e(w))\cdot e'(w) \\ & -\tilde{v}'(1-e(w))\cdot e'(w)=\lambda\left[e'(w)(w-w_s)+e(w)\right] \end{aligned} \tag{9}$$

$$\mu\tau=0\,, \tag{10}$$

and the budget constraint. Combining these conditions yields:

$$\frac{\delta v'(f(e(w)))\cdot f'(e(w))-\tilde{v}'(1-e(w))}{(w-w_s)+\dfrac{e(w)}{e'(w)}}=\mu\,. \tag{11}$$

Transfers raise the child's consumption, whereas wages increase both effort and consumption. As long as effort is valued, a dollar spent on wages raises the parent's utility more than a dollar spent on transfers. Parents spend on the effort wage until the marginal benefit from increased (present and future) child consumption elicited by the effort wage exceeds marginal (parental) disutility from reduced child leisure, at which point they begin spending on transfers. Define high endowment parents as those for whom the constraint on τ does not bind and so μ=0. These parents choose *w* to make the left side of (11) equal to zero. For high endowment types, marginal increases in the subsidy, w_s, cause no change in child effort because high endowment parents were already able to elicit optimal effort in absence of a subsidy increase. When the school contributes to effort elicitation, high endowment parents substitute into transfers and own consumption. For low endowment parents, μ>0. An increase in the subsidy lowers the denominator in (11). If effort is increasing in *w* with diminishing returns (*e*'>0, *e*''<0), then an increase in w will raise the denominator and lower the numerator in (11), unambiguously. By choosing higher *w*, the agent restores equality in (11). The purchasing power of parental income has risen. Low-endowment parents spend some of that increase to elicit additional effort.

In the crudest expression of this point, poor families cannot optimally bribe their children with expensive rewards and thus rely more on schools to induce desired behaviors.[15] If this characterization lacks subtlety, the model allows for a much more general interpretation of heterogeneity of endowments. Quite separate from bribes, wealthy or more educated families may be more adept at creating education-related effort incentives. A parent with a taste for education may communicate by example the rewards associated with acquiring skills. This would be equivalent to a lower cost of effort elicitation for high-endowment parents, but the same implications follow.[16] Specifically, one could replace cost of eliciting effort (w-w_s) with (w-w_s)/θ, where θ rises with endowments. This refinement allows for a more realistic interpretation of the model: high-endowment types are unconstrained not simply because their income is higher but because they are able to elicit effort at lower cost.

If the assumptions above are valid, then students from disadvantaged families will be more responsive than advantaged students to in-school changes in the price of leisure.[17] This prediction can be tested.

Table 6, panels A and B, shows regressions broken down by parental education.[18] Consistent with the model's prediction, estimates on PPI for both high school grad and employment outcome variables are higher for respondents whose interviewed parent went to college than for respondents with a less-educated parent. Parental income is a second measure of endowment. Panels C and E show regressions broken down by parental income. The pattern of stronger responses to PPI by low endowment agents holds up in the high school graduation regressions, but is reversed in the labor force participation regressions.

Results are suggestive but not conclusive.[19] Small sample problems may account, in part, for the mixed results. Or it could be that parents, regardless of their endowments, are not able to elicit optimal effort from their children without the assistance of institutional influences. A fully developed model with better predictive power is a project for future research.

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[15] In a related model, Weinberg(2001) theorizes that corporal punishment may be more common among low-income families than among high-income families because poor families lack the material resources that would allow them to discipline their children effectively in other ways.

[16] Specifically, one could replace cost of eliciting effort (w-w_s) with (w-w_s)/θ, where θ rises with endowments. This refinement allows for a more realistic interpretation of the model: high-endowment types are unconstrained not simply because their income is higher but because they are able to elicit effort at lower cost.

[17] There are parallels and contrasts here with the literature on education standards. The raising of education standards (the minimal level of achievement required to pass a standardized test) may have different effects on students with different tastes or different abilities, making some students acquire more skill and some students acquire less skill. See Betts (1998), Costrell, (1994).

[18] In the majority of cases, the respondent's mother was the parent interviewed.

[19] In truancy regressions, broken down by high/low education and income, results are also mixed.

5.2 Single Parenthood

If agents acquire non-cognitive skills in ways that are responsive to short-run incentives, then the relationship between PPI and other measures of long-run "non-cognitive" human capital may merit analysis.

The relationship between PPI and the long-run outcome of single parenthood is explored in Table 7. The sample was restricted to respondents who had a child at the time of the Wave III interviews,[20] and the data were clustered and weighted as in the previous regressions. The coefficient on PPI is negative and significant in both specifications. Attending a school with higher price of discipline was associated with a lower probability of single parenthood. The population mean of marginal effects expresses this association in practical terms: Given that the respondent has a child, an increase of one standard deviation in the PPI of the school the respondent attended 7 years earlier is associated with an 8.8 percentage point decrease in the probability that the respondent is presently unmarried.

Single parenthood outcomes appear responsive to the price of leisure in school. This may indicate that the acquisition of non-cognitive skills—such as persistence, low disutility of effort, far-sightedness, and other arguably beneficial habits—may be linked to short-run incentives that influence investment decisions early in the lifecycle.

5.3 Catholic Schools

The evidence presented above suggests a relationship between price of leisure in schools and the long-run acquisition of skills. Neal (1997) and Neal and Grogger (2000) find evidence that attendance at a Catholic school leads to higher levels of human capital acquisition for disadvantaged students. Lazear (2001) theorizes that Catholic schools substitute discipline for small class size in the education production function.

There are 5 Catholic schools in the Add Health sample, as shown in Table 8. The mean Punishment/Privilege index for Catholic schools, at 4.35, measures 1.2 standard deviations higher than for the other schools in the sample. With respect to mean class sizes, Catholic schools, at 29.8, exceed non-Catholic schools by 1.3 standard deviations. These findings lend support to Lazear's theory: Catholic schools rely on a different production technology, substituting discipline for smaller class size.[21]

[20] Both males and females were included. Females were the vast majority. Respondents who were already single parents at the time of the Wave I interviews were excluded.

[21] Findings in the Add Health data are also broadly consistent with Neal and Grogger and Neal: Attending Catholic school is associated with higher probability of having graduated from high school, 7 years later.

Why might Catholic schools choose a different production technology? One answer may be that discipline is less costly for Catholic schools to impose than it is for public schools. Consistent with the notion that judicial/legal climate influences discipline policies and that private schools may be less vulnerable to lawsuits, the New York Post (Sept. 14, 2004) reports the following: "In 289 schools run by the Catholic Archdiocese of New York, parents and students 'must agree to not sue the archdiocese, their parish or school over disciplinary and academic measures such as expulsion or being held back.'"

5.4 Policy Implications

The empirical evidence suggests that stricter discipline among Add Health schools in 1994 is correlated with higher effort choices and higher skill acquisition among students. Policies that raise the price of leisure, then, might improve skill-related outcomes. There is a caveat: The Add Health data on school policies predate the Zero Tolerance movement, a movement that made some types of school policies stricter. Ironically, the movement appears to have reduced administrators' discretion, as suspension and/or expulsion became mandatory for some behaviors. If early court decisions led to unintended consequences that prevented educators from calibrating effort incentives, then blanket requirements of strictness might lead to similar distortions. In other words, laws that mandate strict behavior policies (like the Gun-Free Schools Act of 1994) may not be the ideal solution. It could be that a lack of allowed discretion, rather than persistent errors of judgment by administrators, prevents institutions from eliciting optimal effort. The most obvious policy recommendation, then, would be to institute legal reforms that temper the due process requirements faced by educators.

The difference between public and private schools merits attention in the policy discussion. Fear of litigation influences private schools less than public schools. In Goss vs. Lopez, the U.S. Supreme Court ruled that due process must be accorded students before they are suspended from school because state laws on public provision of compulsory education established, in effect, the right to a public education. In stark contrast, the right to a private school education has never been recognized by the courts. Students suing private schools have recourse to fewer legal justifications and win their cases less frequently. Public schools, then, face higher costs of effort elicitation because the potential litigation costs are higher. They are restricted in their use of a technology for education production.

The best solution would be to grant public schools access to this education technology. It may not be realistic to expect that public schools will break free of judicial/legal constraints, but vouchers might be a second-best option. This would be true only if courts did not choose in the

future to recognize the right to a private school education (if funded by vouchers) or otherwise alter the expectations of private school students and administrators. Either way, research about price of leisure as a policy instrument sheds light on an interesting facet of the voucher debate that has not been emphasized.

6. Summary and Conclusion

Traditional models of human capital acquisition assume adolescents maximize discounted lifetime earnings when choosing effort in school. Observed adolescent myopia suggests that short-run trade-offs—in addition to lifetime income incentives—may influence investment decisions. This paper posited a model of myopic optimization and used Add Health data on schools students, parents, administrators, and neighborhoods to test implications. An index, interpreted as proxy for the price of leisure, was constructed from administrators' characterizations of school discipline and behavior policies. Outcomes related to effort choices and stocks of acquired skill were regressed on this index. To account for endogeneity of school policies, student-friendliness of regional appellate courts and per capita density of public interest lawyers were used as instruments. Results included several main findings: Schools appeared to be influenced by the state-level legal-judicial climate with respect to student rights; students appeared to consume less leisure, as measured by truancy, when costs of leisure were higher; high school graduation and labor participation outcomes appeared higher for students who had attended schools with higher prices of leisure; and state or regional variation in the wage premium for educated workers did not appear to explain observed truancy, education, or employment outcomes. Lifetime income incentives do not appear to tell the whole story. Moreover, they appear less important, as determinants of skill investment by adolescent agents, than factors that define short-run trade-offs.

A number of factors related to adolescent optimization, ignored in this analysis, merit further investigation. The time trend in skill acquisition remains a puzzle. It may be possible to explain the flat high-school graduation rates during more than 2 decades of increases in the return to skill as the result of both long-run and short-run factors—return to skill increasing at the same time that short-run incentives eroded due to changes in the judicial/legal climate. More research is necessary. Secondly, the battle for autonomy between the adolescents who acquire education and the parents who fund the acquisition process would seem a central component of the skill acquisition decision. It would be interesting, in a framework that takes myopia seriously, to investigate this aspect of strategic choice. (A first effort here yielded predictions only weakly

supported by the data.) Also, reductions in adolescent behavior problems generate positive externalities in the education production process.[22] The model presented here assumed no externalities. One reason long-run outcomes might respond to small changes in PPI is that the effects of these changes may be amplified by spillovers associated with a social multiplier. It would be interesting to develop a set of models that featured strategic interactions, and to test them empirically using social network data in the Add Health database.

If the strength of the economic approach to human behavior is its emphasis on incentives and trade-offs, the goal in this exercise has been to retain that strength while modifying a traditional assumption that may not have been entirely realistic. Though data limitations required that the story be told in broad strokes, the analysis offered some intriguing evidence that case law may influence the expectations of students and educators, that a policy-driven price of leisure may affect early rates of human capital acquisition, and—more generally—that rational adolescents may optimize myopically in measurable ways.

[22] Disruptive behavior in a classroom prevents learning by agents who did not, themselves, disrupt (Lazear, 2001). In addition, peer studies suggest that adolescent choices are interdependent.

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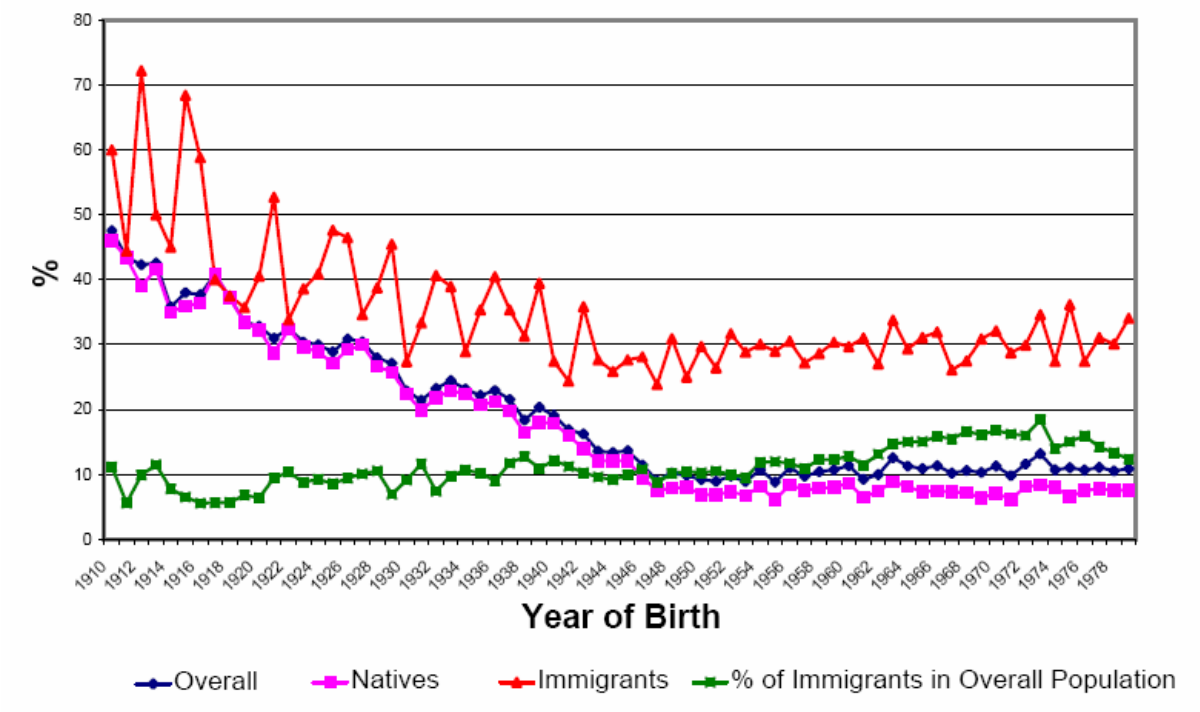
Figure 1

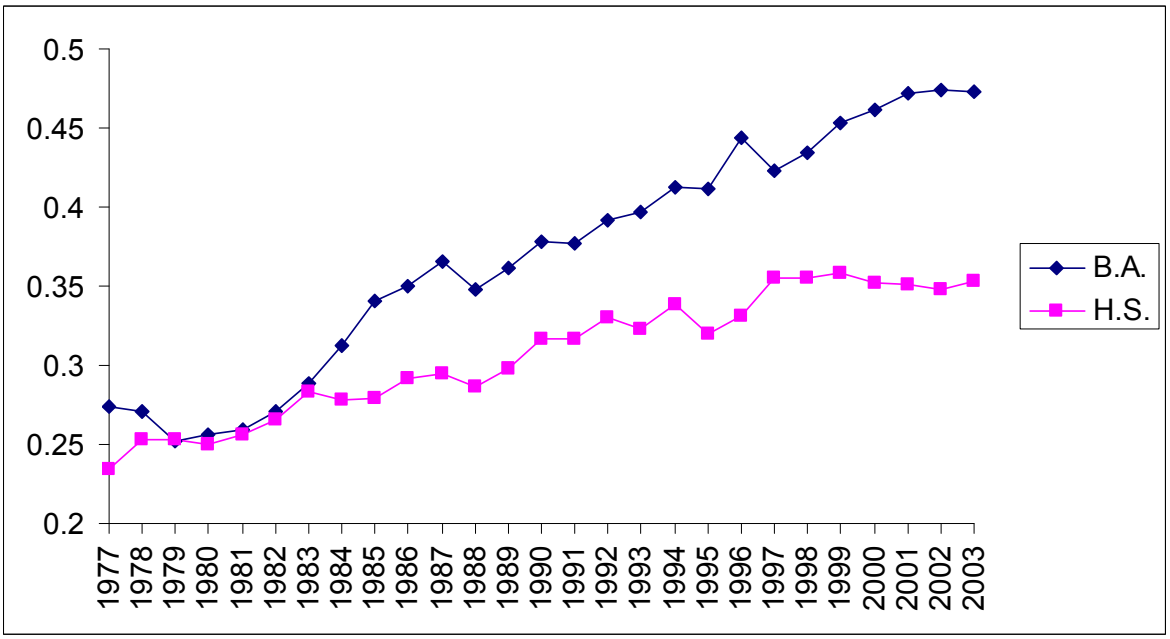
Drop-out Rates by Birth Cohort



Source: Carneiro and Heckman(2003)

Figure 2

Wage Premium for High School Graduation/4-Year College Degree



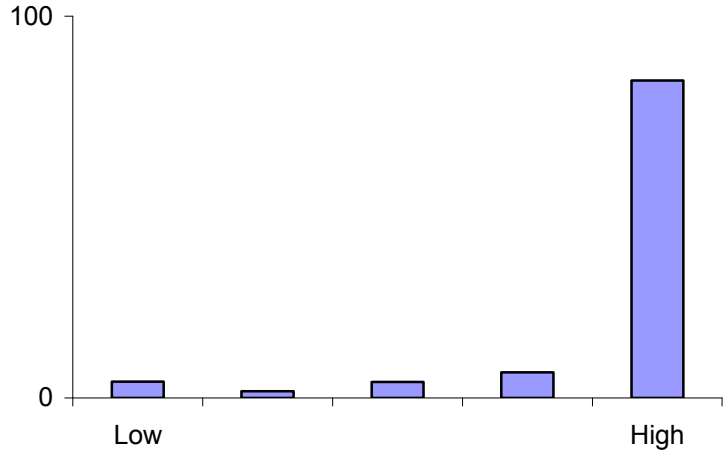
Data from CPS, 1977-2003. Vertical axis shows coefficients on dummy variable for graduating high school [or 4 year college] in a regression of log wages on age, sex, age-squared, race, marital status, high-school graduation and college graduation.

Figure 3

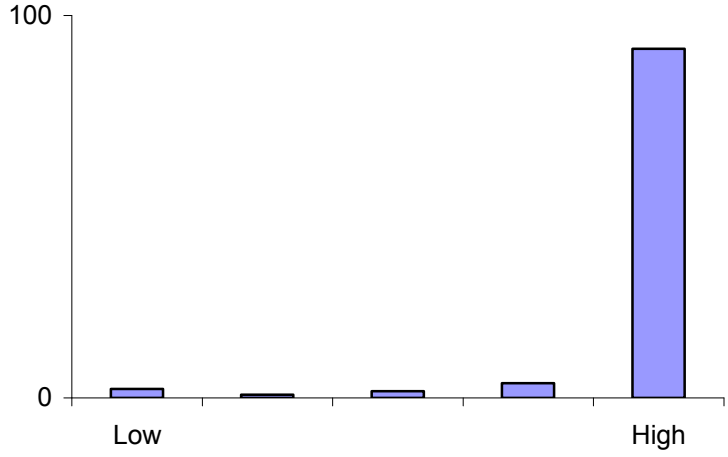
Mother's Disappointment

(If child drops out of HS)

A. Students Who Later Dropped Out



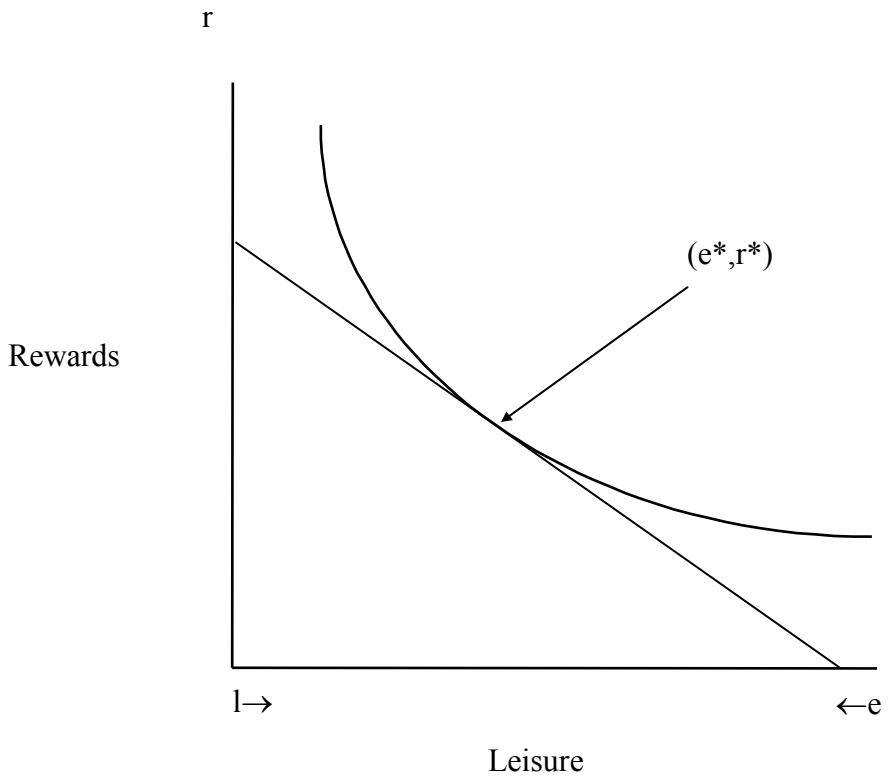
B. Students Who Later Graduated



[Calculated From Add Health Survey, Grades 7-12: Wave I, 1994-1995, Wave III 2001-2002]

Figure 4

A. Adolescent Optimization



B. Changing the Budget Set (Rewards and Punishments)

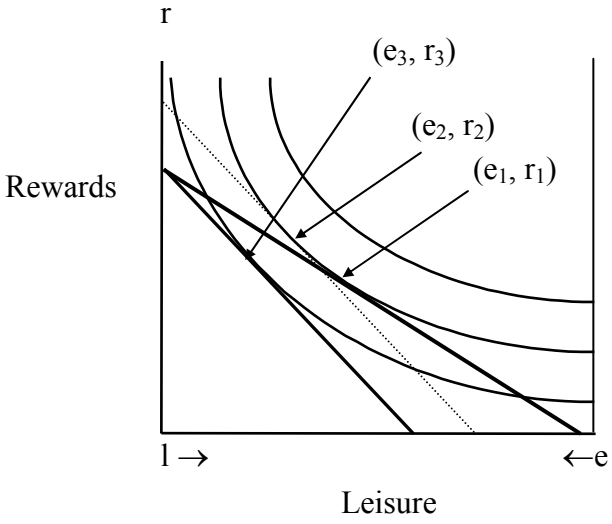
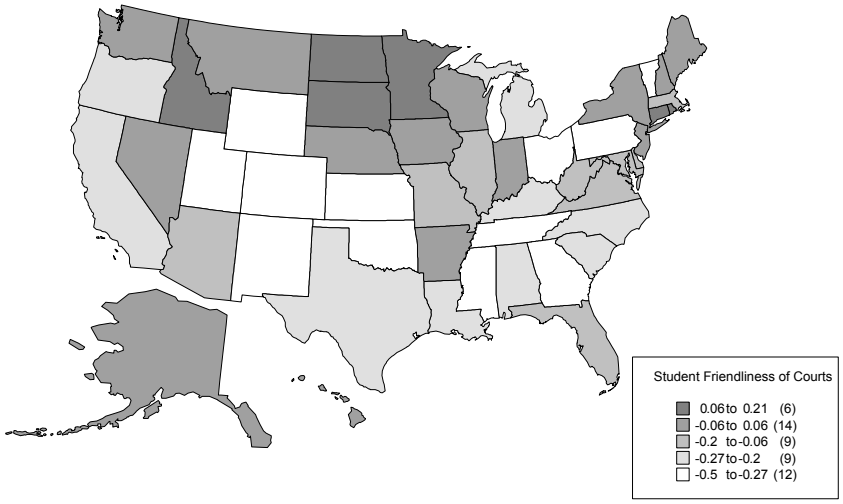
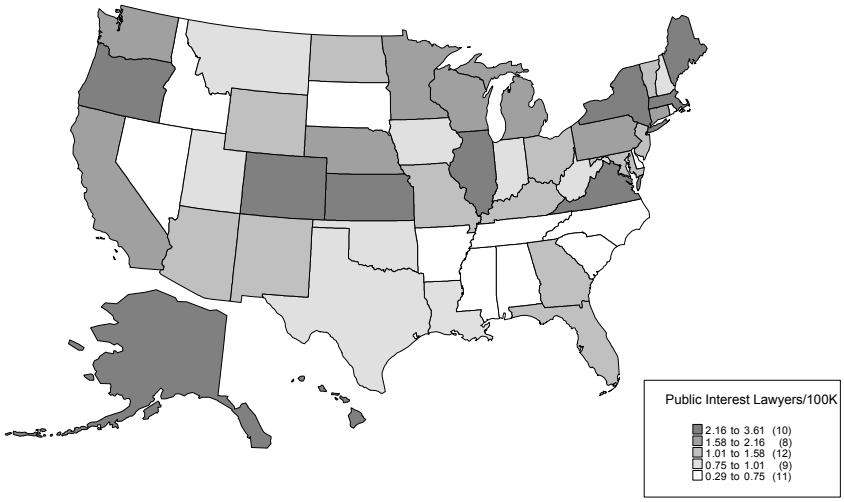


Figure 5

A. Court Climate*



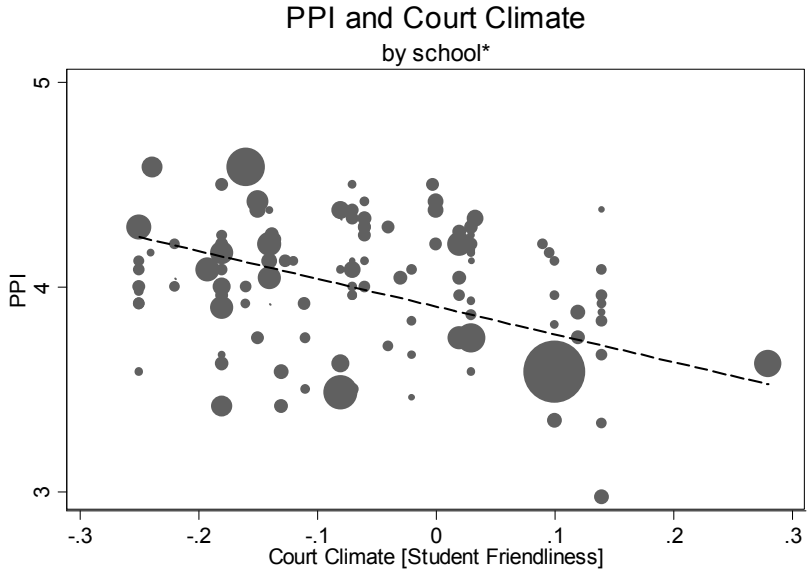
B. Lawyers



***More positive numbers for Court Climate index imply greater student friendliness.**

Figure 6

A.


PPI and Court Climate
by school*
PPI
5
4
3
-.3
-.2
-.1
0
.1
.2
.3
Court Climate [Student Friendliness]

B.

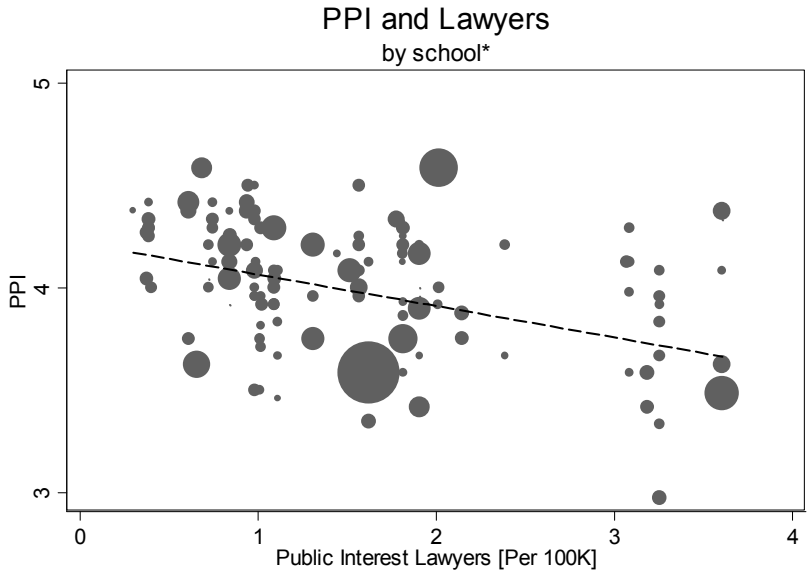

PPI and Lawyers
by school*
PPI
5
4
3
0
1
2
3
4
Public Interest Lawyers [Per 100K]

Table 1

Construction and Descriptive Statistics for the Punishment/Privilege Index

A. Allowed discrete responses to the question: What is the typical punishment imposed for [specific behavior infraction]?

0	No policy
1	Verbal warning
2	Minor action
3	In-school suspension
4	Out-of-school suspension
5	Expulsion

B. Punishment/Privilege Index

Mean : 4.00 StDv: 0.31 Min: 2.97 Max 4.63

C. Component Policies

Description	Mean	StDv	Min	Max
Penalty for cheating, 1st occ.	1.93	0.87	0	4
Penalty for cheating, 2nd occ.	2.64	1.03	0	5
Penalty for fighting, 1st occ.	3.58	0.71	1	5
Penalty for fighting, 2nd occ.	3.98	0.56	2	5
Penalty for injuring student, 1st occ.	3.63	0.75	1	5
Penalty for injuring student, 2nd occ.	4.20	0.65	2	5
Penalty for possess alcohol, 1st occ.	3.97	0.59	2	5
Penalty for possess alcohol, 2nd occ.	4.39	0.62	2	5
Penalty for possess drug, 1st occ.	4.24	0.56	2	5
Penalty for possess drug, 2nd occ.	4.69	0.48	3	5
Penalty for possess weapon, 1st occ.	4.71	0.47	3	5
Penalty for possess weapon, 2nd occ.	4.91	0.28	4	5
Penalty for drink alcohol, 1st occ.	4.06	0.56	2	5
Penalty for drink alcohol, 2nd occ.	4.52	0.57	2	5
Penalty for use drug, 1st occ.	4.29	0.53	3	5
Penalty for use drug, 2nd occ.	4.70	0.47	3	5
Penalty for smoking, 1st occ.	3.09	0.89	1	5
Penalty for smoking, 2nd occ.	3.73	0.71	1	5
Penalty for verbal abuse teacher, 1st	3.21	0.92	0	5
Penalty for verbal abuse teacher, 2nd	3.97	0.82	0	5
Penalty for injure teacher, 1st occ.	4.65	0.52	3	5
Penalty for injure teacher, 2nd occ.	4.88	0.34	3	5
Penalty for steal sch. prop., 1st occ.	3.68	0.71	0	5
Penalty for steal sch. prop., 2nd occ.	4.33	0.69	0	5

Table 2
Dependent Variable: Days of Class Skipped w/o Excuse
Ordered Probit

	All (O-Prob) 1	All (IV O-Prob) 2	Boys (O-Prob) 3	Boys (IV O-Prob) 4	Girls (O-Prob) 5	Girls (IV O-Prob) 6
P/P Index	-.215**	-.461	-.273***	-.516*	-.147	-.357
	(.0832)	(.297)	(.0827)	(.296)	(.0951)	(.305)
H.S. (Mincer)	.667	.495	.318	.162	1.08*	.93
	(.527)	(.576)	(.51)	(.601)	(.611)	(.594)
B.A. (Mincer)	-1.58*	-1.33	-1.28	-1.03	-1.93**	-1.72*
	(.863)	(.975)	(.861)	(1.03)	(.963)	(.953)
Age	.174***	.173***	.188***	.187***	.128***	.126***
	(.0137)	(.0142)	(.0165)	(.016)	(.0187)	(.0209)
Mother's education	-.0235***	-.0236***	-.02***	-.0199***	-.0296***	-.0299***
	(.00329)	(.00359)	(.00368)	(.00387)	(.00607)	(.00580)
Mother employed	.0584**	.0541**	.0183	.0135	.0936***	.0906***
	(.0234)	(.0261)	(.0295)	(.0351)	(.0271)	(.0274)
Class size	.0163***	.0159***	.0124**	.012**	.0204***	.0199***
	(.00495)	(.00535)	(.00479)	(.00553)	(.00576)	(.00596)
% New teachers	.00236**	.00274	.00205**	.00247	.00281**	.00311*
	(.00106)	(.00188)	(.000916)	(.00193)	(.00128)	(.00184)
% Teachers M.A.	.000866	.000934	.000318	.000477	.00147	.00144
	(.00109)	(.00129)	(.001)	(.00124)	(.00134)	(.00145)
% PTA participation	-.0012	-.00103	-.000657	-.000445	-.002	-.00191*
	(.00102)	(.00112)	(.000972)	(.00115)	(.00126)	(.00127)
% Students@grade level	.0061**	.00695**	.0076***	.00836**	.00428*	.00515
	(.00246)	(.00326)	(.00271)	(.00345)	(.00244)	(.00325)
% Students below grade	.00519	.00635	.00807*	.00908*	.00172	.00293
	(.00382)	(.00520)	(.00413)	(.00533)	(.00376)	(.00526)
"Unsafe" neighborhood	.0789***	.0774***	.0879***	.0867***	.0759***	.0745***
	(.00817)	(.0077)	(.0104)	(.0116)	(.0128)	(.0115)
"Unsafe" school	.103***	.105***	.11***	.111***	.0944***	.0967***
	(.00947)	(.00897)	(.0119)	(.0127)	(.0117)	(.0132)
Obs	76363	76363	37767	37767	38596	38596

Based on AddHealth In-school Wave I, 1994-1995. Grade and race dummies, dummy variables for drug and alcohol programs, and dummy variables for missing data are included as covariates in these and subsequent regressions.

* significant at 10% level
** significant at 5 % level
*** significant at 1% level

Table 3
Individual, Family, and Neighborhood Contextual Variables

In-School (Baseline controls)*:	Mean	Std. Dv.
Age	14.86	1.78
Race (black)	.20	.40
Race (asian)	.05	.22
Race (amer ind)	.06	.24
Race (other)	.08	.27
Mother's education	13.83	2.41
Mother works	.82	.39
Ave class size	25.48	5.04
New teachers (%)	9.91	14.73
Teachers with M.A. or higher (%)	50.93	24.97
Families in PTA(%)	23.45	22.25
Students testing @ grade level(%)	58.63	23.88
% testing >one grade below	20.71	14.85
Student feels safe in neighborhood	2.01	1.07
Student feels safe at school	2.26	1.10
Family Variables:		
Parent married	.73	.44
Receives public assistance	.09	.29
Household income (1000s)	45.74	45.17
Receives AFDC	.07	.26
Receives food stamps	.12	.33
Add Health Vocabulary Test	101.32	14.81
Census Tract Variables		
Black(%)	.14	.25
Asian(%)	.03	.08
Other(%)	.04	.09
Aged 5-17 non english speaking(%)	.02	.04
Fem HH w/chld, no husb pres (%)	.07	.05
Marr-cpl fam w/chld(%)	.29	.09
Children not living w/both pars (%)	.25	.17
HHs w/ income < $15,000(%)	.26	.15
Median family income(1000s)	33.95	13.39
Age 25+ w/ college degree(%)	.23	.13
Unemployment rate	.08	.05
County Level Variables		
Total serious crimes/100,000	5666.82	2657.54
Juvenile serious crimes/100,000	345.50	168.44
State Level Controls		
Wage Premium: HS Grad	.23	.06
Wage Premium: B.A.	.44	.04
Minimum wage	4.28	.15
Crime rate	5267.38	1146.97

*Controls also include grade dummies and indicator variables for schools with drug and alcohol counseling/abuse/awareness programs.

Table 4

Dependent Variable: Days of Class Skipped w/o Excuse[a,b]

	Ordered Probit				IV Ordered Probit			
	Large	In-home Sample			Large	In-home		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
P/P Index	-.273***	-.235**	-.217**	-.178*	-.516*	-.476*	-.504*	-.566*
	(.0827)	(.096)	(.0969)	(.0923)	(.296)	(.286)	(.277)	(.294)
Mfx (0)	.0856	.0717	.0656	.0533	.1621	.1466	.1598	.1702
Mfx (1)	-0.0287	-.0266	-.0243	-.0198	-0.05432	-.0544	-.0592	-.0631
Mfx (2)	-0.0134	-.0122	-.0112	-.0091	-0.0254	-.025	-.0273	-.029
Mfx (3)	-0.01589	-.0127	-.0117	-.0095	-0.03014	-.0261	-.0284	-.0303
Mfx (4)	-0.00978	-.0073	-.0067	-.0054	-0.01853	-.015	-.0163	-.0174
Mfx (5)	-0.00459	-.0029	-.0026	-.0021	-0.0087	-.0058	-.0063	-.0068
Mfx (6)	-0.01321	-.01	-.0091	-.0074	-0.02501	-.0203	-.0222	-.0236
H.S. (Mincer)	.318	-.188	-.423	-.375	.162	-.381	-.643	-.232
	(.510)	(.57)	(.572)	(.689)	(.601)	(.758)	(.762)	(.643)
Mfx (0)	-.0997	.0573	.1277	.1125	-.0509	.1166	.1944	.0692
Mfx (1)	.0334	-.0213	-.0474	-.0418	.0171	-.0433	-.0721	-.0257
Mfx (2)	.0156	-.0098	-.0218	-.0192	.008	-.0199	-.0332	-.0118
Mfx (3)	.0185	-.0102	-.0227	-.02	.0095	-.0207	-.0346	-.0123
Mfx (4)	.0114	-.0058	-.013	-.0115	.0058	-.0119	-.0198	-.0071
Mfx (5)	.0053	-.0023	-.0051	-.0045	.0027	-.0047	-.0077	-.0028
Mfx (6)	.0154	-.008	-.0177	-.0156	.0079	-.0162	-.027	-.0096
B.A. (Mincer)	-1.28	-.85	-.811	-1.59	-1.03	-.530	-.442	-.661
	(.861)	(1.03)	(1.01)	(1.01)	(1.03)	(1.31)	(1.25)	(1.25)
Mfx (0)	.3997	.2594	.2449	.4756	.3248	.1633	.1087	.1926
Mfx (1)	-.1341	-.0963	-.0909	-.1767	-.1088	-.0606	-.0403	-.0715
Mfx (2)	-.0626	-.0442	-.0417	-.081	-.0509	-.0279	-.0186	-.0328
Mfx (3)	-.0742	-.046	-.0435	-.0844	-.0604	-.029	-.0194	-.0343
Mfx (4)	-.0457	-.0264	-.025	-.0484	-.0371	-.0167	-.0111	-.0197
Mfx (5)	-.0214	-.0104	-.0097	-.0189	-.0174	-.0065	-.0043	-.0077
Mfx (6)	-.0617	-.0361	-.034	-.0661	-.0501	-.0227	-.0151	-.0267
Family Controls	No	No	Yes	Yes	No	No	Yes	Yes
Neighborhood Controls	No	No	No	Yes	No	No	No	Yes
F-Test: HS=BA=0 (Prob>F)	.33	.49	.30	.14	.54	.46	.29	.65
Obs	37767	6302	6302	6302	37767	6302	6302	6302
					First Stage:(Dep. Variable : PPI)			
Court Climate[c]		NA			-.468**	-.503**	-.505**	-.520**
					(.206)	(.211)	(.200)	(.209)
Lawyers[c]		NA			-.096***	-.109***	-.110***	-.125***
					(.029)	(.033)	(.033)	(.033)
F-test: Court Cl. & Lawyers		NA			12.27	8.54	9.09	11.75
Prob >F					.000	.000	.000	.000

[a] Sample of males in Wave I In-School and In-Home surveys. Standard errors in parentheses.

* significant at 10% level ** significant at 5 % level *** significant at 1% level

[b] Mfx(0), Mfx(1), Mfx(2), Mfx(3), Mfx(4), Mfx(5), Mfx(6) refer to the population mean of the marginal effect for the choice to skip class (respectively): never, once or twice a year, once a month, 2 or 3 days a month, once or twice a week, 3 to 5 days a week, and nearly every day.

[c] In linear analog to IV Ordered Probits, tests of the overidentifying restriction on the instruments fail to reject the null at 23%, 59%, 18%, and 76% for columns 5,6,7 and 8, respectively.

Table 5
Long-Run Skill-Related Outcomes[a,b]

	Dependent Variable:			
	H.S. Grad (Probit) 1	H.S. Grad (IV-Prob) 2	Employed (Probit) 3	Employed (IV-Prob) 4
P/P Index	.138	.551*	.241**	.574***
	(.109)	(.300)	(.104)	(.220)
Mfx	[.033]	[.132]	[.053]	[.127]
H.S. (Mincer)	.925	1.05	-1.24	-1.21*
	(1.05)	(.646)	(1.14)	(.657)
Mfx	[.221]	[.252]	[-.274]	[-.267]
B.A. (Mincer)	.296	-.0668	2.11*	1.89**
	(1.04)	(.942)	(1.12)	(.895)
Mfx	[.071]	[-.016]	[.189]	[.416]
Obs	6510	6510	6510	6510
HS=BA=0 (Prob>F)	.34	.15	.18	.08

[a]Wave III males.

[b]"Employed" is defined as working at least 20 hrs/wk or still attending school.

[c]For the linear probability analogs of IV probits, tests of the overidentifying restriction on the instruments fail to reject the null at 23% and 12% for columns 2 and 4 respectively.

* significant at 10% level

** significant at 5 % level

*** significant at 1% level

Table 6
Long-Run Skill-Related Outcomes[a,b]

	Dependent Variable:			
	H.S. Grad (Probit)	H.S. Grad (IV-Prob)	Employed (Probit)	Employed (IV-Prob)
	3	4	5	6
A. Low Parental Ed: <=High School				
P/P Index	.303*	.973***	.315**	.989**
	(.154)	(.355)	(.142)	(.412)
Obs	2539	2539	2539	2539
B. High Parental Ed: >High School				
P/P Index	-.343**	.285	.159	.105
	(.158)	(.319)	(.153)	(.315)
Obs	3066	3066	3066	3066
C. Low Parental Income: <=40k				
P/P Index	-.0691	.79**	-.0598	-.152
	(.153)	(-.354)	(.135)	(.419)
Obs	2474	2474	2474	2474
D. High Parental Income: >40k				
P/P Index	-.0108	.259	.572***	.853***
	(.166)	(.309)	(.173)	(.292)
Obs	2497	2497	2497	2497

[a]Wave III males.

[b]"Employed" is defined as working at least 20 hrs/wk or still attending school.

* significant at 10% level

** significant at 5 % level

*** significant at 1% level

Table 7

Long-Run Outcome: Single Parent[a]

	(Probit) 1	(IV-Prob) 2
P/P Index	-.403***	-.839*
	(.150)	(.437)
Mfx	[-.137]	[-.285]
Obs	2312	2312

[a]Wave III males and females. Conditional on not having been a parent at the time of Wave I interview. Includes dummy variable for male gender.

* significant at 10% level

** significant at 5 % level

*** significant at 1% level

Table 8
Catholic vs. Non-Catholic Schools: PPI and Class Size

	PPI	Class Size	Obs
Non-Catholic Schools	3.93 (.336)	21.863 (6.299)	125
Catholic Schools	4.35 (.315)	29.793 (6.697)	5