Crime and Expected Punishment: Changes in Perceptions at the Age of Criminal Majority

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This paper assesses whether perceived punishment severity changes discontinuously when an individual becomes an adult in the eyes of the courts. I find that the perceived chance of jail increases by 5.2 percentage points at the age of criminal majority, which is over and above the general effect of aging. The magnitude of this subjective change in the chance of jail at the age of majority appears to be substantially smaller than that found in objective data. Finally, a reduced-form analysis of whether self-reported criminal behavior changes discontinuously at the age of criminal majority finds little consistent evidence of deterrence. (*JEL* D01, K42)

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1. Introduction

Economists commonly assume that individuals have objectively correct or rational expectations. Likewise, when studying the impact of policy interventions on behavior, we assume that changes in subjective expectations correspond to the resulting changes in objective measures. However, though these assumptions are common, they are generally difficult to defend or verify.

A new body of empirical literature has recently emerged, which takes advantage of survey data on expectations to validate these assumptions; see Manski (2004) for a comprehensive review of this subjective expectations literature.[1] Yet, there is still minimal knowledge of how expectations are formed (Manski, 2004).[2] This is a significant shortcoming given that it is necessary to know how an individual's expectations change when policies change to credibly predict how policies will alter behavior. Unfortunately, there are few situations in which longitudinal expectations data coincide with relevant policy changes.

Thus, this paper begins to fill in this gap by taking advantage of the inherent "policy" change that exists in the United States juvenile and adult justice systems. In particular, I assess whether there is a discontinuous change in perceived punishment severity when an individual becomes an adult in the eyes of the courts. The economics of crime literature typically assumes that individuals are knowledgeable of objective measures of the probability and severity of punishment. Consequently, researchers typically use official measures of arrest, conviction, and incarceration rates to test the implications

1. Most of this literature is based on survey questions in the Health and Retirement Study (Hurd and McGarry, 1995; Hurd, Smith, and Zissimopoulos, 2002), the Survey of Economic Expectations (Dominitz, 1998; Manski and Straub, 2000; Dominitz, Manski, and Heinz, 2003), the Michigan Survey of Consumers (Dominitz and Manski, 2003), and the 1997 National Longitudinal Survey of Youth (Fischhoff et. al., 2000; Lochner, 2005). Other surveys that contain questions soliciting subjective expectation measures include the Bank of Italy's Survey of Household Income and Wealth and the Dutch VSB Panel Survey.

2. A handful of papers assess how individual expectations change in response to "events" experienced by the individual. For instance, Dominitz (1998) studies how earnings expectations change from one period to another after experiencing actual earnings. Dominitz and Manski (2003) study how mutual fund expectations change over time as the S&P stock index changes. Lochner (2005) assesses how the perceived chance of arrest responds to changes in the criminal and arrest history of the individual and his siblings.

of Becker's (1968) economic model of crime, i.e., individuals should be deterred as the expected probability or severity of punishment increases.[3] Yet, Nagin (1998) points out that criminal justice policies designed to deter crime will only be successful if these policies can actually manipulate perceptions.

In the United States, juveniles and adults who are charged with a crime are subject to different laws. These laws are determined at the state level and vary greatly across states. The age at which individuals are processed in the adult criminal justice system rather than the juvenile justice system is the age of criminal majority and is also state dependent. In 38 states, the age of criminal majority is 18; an 18-year old will be tried in the criminal courts. The age of criminal majority is 17 in ten states and 16 in three states. There are, of course, exceptions to these age cutoffs. Individuals who are below the age of majority, but who commit sufficiently serious crimes, can be transferred to the adult courts. Depending on the state and crime, such transfers may either be mandatory or left up to prosecutorial discretion.[4]

It is generally taken as common knowledge that, conditional on the crime committed, individuals receive a harsher punishment if sentenced in the criminal courts rather than the juvenile courts. The punishment can be more severe in a number of ways, including an increased likelihood of imprisonment, longer prison sentences, and worse prison conditions. Glassner et al. (1983) provides anecdotal evidence from a survey of subjects in New York State that individuals are aware of the differences in how the adult and juvenile systems treat criminals. For instance, one interviewee said: "I try to be as careful as much as I can these days. 'Cause you know, I know I can go to jail, 'cause they changed the law. You can go to jail at sixteen." The age of criminal majority in New York is 16.

Thus, the main goal of this paper is to assess whether there is systematic empirical evidence of such belief updating, i.e., that individual perceptions change at the age of criminal majority to reflect the changes in objective measures of punishment severity. In addition to furthering our knowledge on

3. A vast and continually growing number of papers are included in this literature. See, for instance, Witte (1980), Myers (1983), Grogger (1991), Tauchen, Witte, and Griesinger (1994), and Levitt (1997, 1998).

4. It is important to note that auto theft, the focus of this paper, is generally considered to be a minor enough crime that it is not subject to these transfer provisions.

how expectations form, this is an important contribution to the economics of crime literature for two reasons. First, though criminologists have given a fair amount of attention to the role played by perceptions, economists studying crime seem to have given little thought to the correspondence between objective and subjective measures.[5] One notable exception is Lochner (2007), who finds that the perceived chance of arrest responds to changes in one's own criminal history as well as to that of one's siblings. Second, there are at least two fairly prominent papers in the economics of crime literature (Levitt, 1998; Lee and McCrary, 2005) that study whether observed criminal activity changes at the age of criminal majority. Lee and McCrary (2005) use detailed administrative arrest data in Florida to test for a deterrence effect of punishment severity at the age of majority, but find no evidence of a systematic drop in arrest rates. Levitt (1998), in contrast, finds evidence of deterrence using state-level panel data to examine changes in cohort-specific arrest rates at the age of criminal majority. Both of these papers essentially assume that subjective measures of punishment severity correspond to objective measures at the age of criminal majority. Thus, this paper provides a rare opportunity to assess the validity of this assumption.

The analysis in this paper is based on the sample of males in the geocoded version of the 1997 National Longitudinal Survey of Youth (NLSY97). An individual's perception of punishment severity is measured by the following survey question. "*Suppose you were arrested for stealing a car, what is the percent chance that you would serve time in jail?*" This question is asked in the first five survey rounds; during this time period, more than 80 percent of the sample reaches the age of criminal majority.

The paper begins by presenting objective data of how the chance of jail conditional on being arrested for a particular crime changes at the age of criminal majority from a variety of sources, including national and state-level data, as well as the NLSY97. Each of these data sources has its weaknesses. For instance, it is quite common for sentencing data to bundle motor vehicle

5. The criminology literature is concerned both with the formation of perceptions of the criminal justice system and how such perceptions affect crime rates, including the deterrent effects of the perceived probability and severity of punishment. For instance, see Paternoster (1987), Klepper and Nagin (1989), and Horney and Marshall (1992). Recent papers also address the determinants of changes in perceptions (Pogarsky, Piquero, and Paternoster, 2004; Matsueda, Kreager, and Huizinga, 2006). To the best of my knowledge, none of these papers assess how perceptions change at the age of majority.

theft into the broader larceny category. Regardless, consistent support of the belief that adults receive harsher punishments than juveniles is seen across these sources.

Section 4 presents two strategies to identify whether perceived punishment severity varies discontinuously at the age of majority. First, a difference-in-difference design is used, which takes advantage of the fact that the age of majority varies across states. For instance, the change in perceived punishment severity between the ages of 15 and 16 in states where the age of majority is 16 (i.e., the treatment group) is compared to states where the age of majority is 17 (i.e., the comparison group). This results in an estimated 6.9 percentage point increase in the perceived chance of jail for males. However, the size and significance of the estimated jump depends on both the treatment and comparison groups being considered.

The second estimation strategy takes advantage of the longitudinal nature of the data and a regression discontinuity design to identify within individual changes in perceptions. Specifically, perceived punishment severity is regressed on a third-order age polynomial and whether the respondent has reached the age of adult jurisdiction; individual fixed effects are also included to control for unobservable heterogeneity. A discontinuous change in perceptions is observed, such that the perceived chance of jail increases by 5.2 percentage points, on average, when the individual becomes an adult in the eyes of the courts. This effect is over and above underlying trends in age and is not sensitive to the inclusion of a large set of time-varying controls, such as criminal activity, justice system interactions, educational variables, and household structure. It is also fairly robust to alternative ways of controlling for age. This estimated change in the subjective chance of jail conditional on arrest for stealing a car is substantially smaller than the changes observed in the objective data.

Lastly, Section 5 presents a reduced-form analysis of whether self-reported criminal behavior changes discontinuously at the age of criminal majority. This analysis cannot distinguish changes in behavior due to changes in the perceived chance of jail from those due to changes in, for instance, perceived sentence length. Five crime categories are considered: auto theft, thefts less than $50, thefts more than $50, drug sales, and assault. Thefts of less than $50 is the only crime category for which any consistent evidence of deterrence was found. And, even this evidence was sensitive to how age entered the specification.

2. Objective Measures of Punishment Severity

Before turning to the subjective analysis, I present objective data from a number of sources for both juveniles and adults in Table 1. Both national and state-level data are considered, as well as the National Longitudinal Survey of Youth 1997 (NLSY97), on which the subjective analysis is based. Recall that the focal survey question asks respondents about the chance of jail conditional on being arrested for stealing a car. What are the appropriate corresponding objective measures? First, should the objective analysis use a literal interpretation of the word "jail" and exclude, for instance, adults sentenced to prisons rather than jails from the analysis? I choose a less literal interpretation and focus on sentences to "outside placement". I believe that broadening the definition in this way makes the juvenile and adult terminologies more comparable; for instance, "jails" generally do not play a primary role in juvenile justice systems.[6]

Second, the objective data would ideally focus on motor vehicle theft. These data were surprisingly hard to come by. One of the primary issues is that motor vehicle theft is often not separated out from other larcenies in sentencing data. Most other offenses included in the broad larceny category are significantly less serious than motor vehicle theft; in addition, motor vehicle thefts make up just a small proportion of all thefts. Consequently, much of the following discussion focuses on burglary, which, according to the federal sentencing guidelines, is fairly comparable to motor vehicle theft in terms of offense severity.[7] A third issue is that sentencing data for the same crime category must be obtained for both juveniles and adults in order to identify the change in punishment severity at the age of criminal majority. However, the vast majority of states do not maintain detailed sentencing records for juveniles.[8]

6. This assumes that juveniles are also not familiar with, for instance, the distinction between jails and prisons; I believe this to be a reasonable assumption.

7. According to the federal sentencing guidelines, the basic offense level of a burglary is either 17 or 12 points, depending on whether it is a residential or nonresidential burglary, respectively. The basic offense level of a larceny is 6–7 points; however, if a motor vehicle is involved, it is at least 14 points and depends on the value of the stolen car. Of course, each state may classify such crimes differently.

8. Conversations with juvenile justice employees in Pennsylvania, for instance, indicated state-level data would be incredibly difficult to come by and that national estimates may be the best available data.

Table 1. Percentage of juvenile and adult cases resulting in outside placement

	(1)	(2)	(3)
Offense category	Juvenile	Adult	Difference
	Panel 1: National estimates[a]		
Violent index crimes	19	39	20
Property index crimes	9	24	15
Drug offenses	9	26	17
Robbery	26	63	37
Burglary	17	48	31
Larceny (including motor vehicle theft)	7	11	4
	Panel 2: State-level data		
Oregon[b]			
Burglary	18	32	14
Theft (including motor vehicle theft)	6	7	1
Indiana[c]			
Burglary	14	56	42
Motor vehicle theft	16	47	31
Texas[d]			
Burglary	11	55	44
Motor vehicle theft	13	32	19
Pennsylvania[e]			
Burglary	10	27	17
	Panel 3: NLSY97 Data[f]		
Robbery	33	46	13
Burglary	27	39	12

[a]Column (1) displays the percentage of juvenile case referrals resulting in outside placement in 2000, i.e., residential placement and are obtained from the National Juvenile Court Data Archive, National Center for Juvenile Justice, Pittsburgh, PA. They are available online in the OJJDP Statistical Briefing Book. Note that 2000 is the year in which the case was disposed. Column (2) displays the percentage of adult arrests in 2000 resulting in a jail or prison sentence and includes sentences in both state and federal courts. National estimates for adults are based on the 2000 FBI Crime in the United States report and a 2003 Bureau of Justice Statistics Bulletin, "Felony Sentences in State Courts, 2000". Note that the conviction data is for the most serious offense.

[b]Column (1) presents the percentage of juvenile referrals resulting in the following dispositions: commitment/custody to a Non-Youth Authority Agency, probation and commitment/custody to a Non-Youth Authority Agency, probation and Youth Authority community placement, and Youth Authority correctional facility placement in 2001. If anything, the use of all of these dispositions biases upward the percentage of juvenile referrals sentenced to outside placement. The juvenile data is sourced from a 2001 Oregon Youth Authority publication. Column (2) presents the percentage of adult arrests resulting in a sentence to jail or prison in 1998. Adult arrest data was obtained from the Portland State University Population Research Center website and sentencing data from "Felony Sentencing in Oregon 1998."

[c]Column (1) displays the percentage of juvenile arrests resulting in commitment to the Indiana Department of Corrections in 2006. Column (2) displays the percentage of adult arrests resulting in commitment to the Indiana Department of Corrections in 2006. Arrest data is sourced from the FBI publication of "Crime in the United States, 2006." Sentencing measures were obtained from the monthly Offender Population Statistical Report publications by the State of Indiana Department of Corrections.

[d]Column (1) presents the percentage of juvenile arrests that result in commitment to the Texas Youth Commission. The commitment data can be found at the following website: http://travis.tyc.state.tx.us/research/profile.html. Column (2) presents the percentage of adult arrests that result in an admission to prison or jail; sentencing data if from the Texas Department of Criminal Justice Statistical Report. Data for all variables is for 2003. Arrest data, for both juveniles and adults, is from the Texas Department of Public Safety Crime Report for 2003.

[e]Column (1) presents the percentage of allegations that result in placement for juveniles in Pennsylvania in 2001 and is from the Juvenile Court Judges' Commission's Juvenile Court Delinquency Disposition Database; note that this is based on the number of dispositions rather than the number of juveniles. Column (2) presents the percentage of adult arrests that result in a sentence to jail or prison, according to the Pennsylvania Commission on Sentencing Annual Data Report 2001.

[f]Column (1) presents the percentage of juvenile *charges* resulting in a sentence to a juvenile facility, jail, or prison from 1997 to 2001 in the NLSY97. Column (2) presents the corresponding percentage of adult *charges* resulting in such a sentence. Note that offense-specific arrest data is not available in the NLSY97. Survey respondents are defined as juveniles (adults) if they are below (above) the age of criminal majority as of the interview date.

2.1. National Estimates

Panel 1 of Table 1 presents national estimates of the chance of jail conditional on arrest for various crime categories for both juveniles and adults in 2000. For juveniles, I report the percent of referrals that result in placement in a residential facility. These statistics are available online in the Office of Juvenile Justice and Delinquency Prevention Statistical Briefing Book. For adults, I report the percent of arrests that result in a sentence to jail or prison by either a state or federal court. It should also be pointed out that the measures for adults are conservative estimates since all sentencing statistics are based on the most serious conviction offense. Motor vehicle theft measures cannot be reported for this data source since it can often not be distinguished from other thefts in the adult sentencing data.

The first three rows of panel 1 present the data for violent index crimes, property index crimes, and drug offenses. The objective chance of outside placement for juveniles referred for a violent crime is 19 percent; it is 9 percent for both property crimes and drug law violations. The objective chance of jail or prison for adults is 39 percent for violent crimes, 24 percent for property crimes, and 26 percent for drug law violations. The differences between the adult and juvenile placement rates are 20, 15, and 17 percentag points for violent crimes, property crimes, and drug law violations, respectively.

Given that the subjective data pertain to auto theft, the most relevant objective measures presented thus far are those for indexed property crimes, which include burglary, larceny theft, and motor vehicle theft. What if sentencing for auto theft systematically differs from that for other crimes? Thus, the last three rows of panel 1 of Table 1 present placement rates for robbery, burglary, and larceny (including motor vehicle theft). The differences between juvenile and adult placement rates for robbery and burglary are 37 and 31 percentage points, respectively. The difference for the broad category of larceny, however, is much smaller—just 4 percentage points. But, as stated earlier, it is important to remember that this statistic is likely skewed down since it consists of a substantial proportion of offenses that are significantly more minor than motor vehicle theft.

Overall, the national estimates indicate that there is an increase in the chance of jail conditional on arrest at the age of criminal majority. Though motor vehicle theft cannot be looked at directly, evidence of this jump is seen across a number of crime categories.

2.2. State-Level Estimates

Panel 2 of Table 1 presents data for Oregon, Indiana, Texas, and Pennsylvania, which have comparable offense-specific measures for juveniles and adults. Burglary and thefts (inclusive of motor vehicle theft) are presented for Oregon. The juvenile data are for 2001 and reports the percentages of referrals that result in a disposition of commitment to either a non-Youth Authority Agency or a Youth Authority institution.[9] The percentage of adult arrests resulting in a sentence to jail or prison in 1998 is also presented. Unfortunately, data for the same year for both juveniles and adults was not readily available. A 14 percentage point increase in the chance of placement is seen for burglary when comparing juveniles and adults. As in the national data, a much smaller increase (just 1 percentage point) is observed when considering all thefts.

Table 1 also displays the percent of juvenile and adult burglary and motor vehicle theft arrests in Indiana that result in commitment to the Indiana Department of Corrections in 2006, which manages both juvenile and adult sentences. For burglary, there is an increase of 42 percentage points in the chance of placement when comparing juveniles and adults. An increase of 32 percentage points is observed for motor vehicle theft.

Similar patterns for burglary and motor vehicle theft are also seen for Texas in 2003. Table 1 presents the percent of juvenile arrests that result in commitment to the Texas Youth Commission and the percent of adult arrests that result in an admission to prison or jail. There is an increase of 44 and 19 percentage points for burglary and motor vehicle theft, respectively, in the chance of placement when comparing juveniles and adults. Finally, Table 1 also presents objective data for juvenile and adult burglaries in Pennsylvania in 2001. Comparable to Oregon, there is a 17 percentage point increase in the chance of outside placement.[10]

9. Note that this uses a broad definition of placement and includes commitment/custody to a Non-Youth Authority Agency, probation and commitment/custody to a Non-Youth Authority Agency, probation and Youth Authority community placement, and Youth Authority correctional facility placement.

10. Juvenile placement rates for motor vehicle theft were also available and are comparable to those in both Texas and Indiana (14 percent); unfortunately, adult sentencing data in which motor vehicle theft was broken out from other thefts were not found in Pennsylvania.

These data are noteworthy for at least four reasons.

(i) Motor vehicle theft data are actually available in Texas and Indiana and a large increase in the chance of placement is observed.
(ii) The increase for motor vehicle theft is comparable to that of burglary in these states; this provides some reassurance that focusing on burglary in the absence of available motor vehicle theft data is appropriate.
(iii) There is heterogeneity in placement rates across states; some states appear to sentence individuals to outside placement at rates higher than the national estimates while other states utilize such sanctions at a lower rate.
(iv) Regardless of this heterogeneity, however, the state-level objective data are generally in line with the national estimates.

2.3. NLSY97 Estimates

Panel 3 of Table 1 presents the objective chance of outside placement using the NLSY97 dataset, which will be described in more detail in the next section. In each survey round, respondents are asked the number of times that they have been arrested since the last survey round. For each arrest, they are then asked questions that characterize the offense with which they are charged and their progress through the justice system, including whether they are sentenced to a correctional institution. As with the national data, motor vehicle theft is not broken out as a separate crime category; thus, I focus on burglary and robbery offenses. In addition, offense categories are only known for arrests that result in a charge. Finally, an individual's age as of each survey date is available, but not the age at the time of arrest.

Thus, for the first five survey rounds combined, I present estimates of the percentage of juvenile and adult *charges* that result in a sentence to a juvenile correctional facility, jail, or prison. Respondents are defined as juveniles (adults) based on whether they are below (above) the age of criminal majority as of the interview date. This is likely to result in conservative estimates of the difference between juvenile and adult sentencing rates for two reasons. One, adult sentencing rates may be biased down since it is possible for a respondent who committed an offense as a juvenile to be counted as an adult if he has just reached the age of majority. Two, juvenile sentencing rates may be biased up due to the counting of respondents as juveniles who are sentenced in the adult courts because of offense or criminal history severity.

The results indicate an increase, at the age of criminal majority, in the chance of outside placement conditional on being charged with a robbery or burglary, respectively, of 13 and 12 percentage points. These estimates are somewhat lower than those seen in the national data; this is to be expected, however, since the national data include all adults while the NLSY97 adults are still quite young and less criminally experienced.

3. Data

The NLSY97 consists of 8984 individuals who were between the ages of 12 and 16 as of December 31, 1996. Each round of the NLSY97 asks the respondents a battery of questions regarding illegal activity, including: self-reported criminal activity, arrest, charge, conviction, and sentencing. Finally, the first five survey rounds also contain a series of questions regarding an individual's perceptions of the justice system; this paper focuses on the perceived chance of jail conditional on having been arrested for stealing a car. I create a panel data set of the first five surveys, including identifiers for the respondent's state of residence. State of residence was obtained from the NLSY97 Geocoded data and allows the appropriate age of criminal majority to be merged into the data. During the first survey round, 59 percent of respondents lived in a state where the age of criminal majority is 18; approximately 29 and 12 percent, respectively, resided in states with ages of majority equal to 17 and 16.

Table 2 provides variable definitions and summary statistics for the sample of males in each survey round on which the remainder of the analysis is based. The average age is 14.3 years (177.8 months) in 1997 and increases to 18.9 years (233.2 months) in 2001. Thus, just 5.0 percent of the sample reached the age of criminal majority in 1997 while 87.7 percent would be tried as adults in 2001. Control variables, such as those characterizing criminality, justice system interactions, and educational attainment and enrollment are also included in Table 2.[11] Criminal activity and justice system

11. Note that self-report studies tend to find a much higher proportion of the juvenile population involved in delinquent behavior than official reports since self-report studies can capture delinquent behaviors that never come to the attention of juvenile justice agencies. Official records may systematically underestimate juvenile crime for a number of reasons. For instance, not all juvenile cases are actually referred to a juvenile justice agency and not all delinquent acts result in arrest (Snyder and Sickmund, 1999).

Table 2. Selected summary statistics for the sample of males

Survey round	Variable definition	1997 mean	1998 mean	1999 mean	2000 mean	2001 mean
Perceived chance arrest	Perceived chance of arrest conditional on stealing a car (0–100)	0.588	0.564	0.604	0.586	0.578
Perceived chance arrest and jail	Perceived chance of jail if arrested for stealing a car (0–100)	0.464	0.484	0.522	0.555	0.566
Age (in years)	Age of respondent in years at date of interview	14.3	15.9	16.9	18.0	18.9
Age (in months)	Age of respondent in months at date of interview	177.8	197.4	208.7	221.4	233.2
Adult_Jur	1 If respondent has reached the age of criminal majority as of the interview date	0.050	0.290	0.476	0.697	0.877
Black	1 If respondent is Black	0.253	0.258	0.254	0.255	0.248
Hispanic	1 If respondent is Hispanic	0.210	0.211	0.209	0.209	0.212
Any Auto Theft[a]	1 If respondent self-reports stealing any cars since last interview	0.017	0.018	0.0095	0.0081	0.0064
Any Thefts < $50[a]	1 If respondent self-reports stealing anything worth less than $50 since last interview	0.360	0.154	0.104	0.098	0.070
# of Thefts > $50	Number of self-reported thefts of anything worth more than $50 (including autos) since date of last interview	0.51	0.59	0.25	0.34	0.27
# Assaults	Number of self-reported attacks/assaults since last interview	0.71	0.81	0.54	0.64	0.40
# Drug Sales	Number of self-reported drug sales since date of last interview	0.93	2.05	1.89	2.32	2.44
# Arrests[a]	Number of self-reported arrests since date of last interview	0.25	0.19	0.15	0.19	0.15

# Charges[a]	Number of self-reported charges since date of last interview	0.072	0.098	0.079	0.099	0.089
# Convictions[a]	Number of self-reported convictions since date of last interview	0.035	0.062	0.042	0.063	0.066
# Incarcerations[a]	Number of self-reported sentences to incarceration in a jail, juvenile facility, or adult facility since date of last interview	0.0084	0.030	0.016	0.032	0.028
Gang member	1 If self-reports being a gang member since last interview.	0.035	0.037	0.030	0.032	0.022
Live in MSA central city	1 If respondent currently lives in the central city of an MSA	0.310	0.299	0.300	0.304	0.300
Live in two parent household	1 If respondent currently lives in a two parent household	0.644	0.629	0.614	0.563	0.528
Enrolled in school	1 If respondent is enrolled in school as of interview date	0.975	0.876	0.782	0.651	0.522
Highest grade completed	Highest grade completed by respondent as of interview date	7.6	9.2	10.1	10.8	11.5
Sample size[b]		4,407	4,072	3,994	3,948	3,912

[a]All crime and justice system interaction variables for the 1998 through 2001 survey rounds correspond to the self-reported behavior since the date of the last interview. Since 1997 is the first survey round, the variable definition varies slightly for this year. When possible, measures were created that describe criminal behavior in the 12 months prior to the 1997 survey round. However, for the following variables, measures could only be created that describe all criminality leading up to the 1997 survey round: Any auto theft, Any thefts < $50, # Arrests, # Charges, # Convictions, and # Incarcerations. Also note that Thefts of < $50, auto theft, and gang membership can only be measured at the extensive margin; all other crime variables are measured at the intensive margin.

[b]Summary statistics are presented for those individuals for whom % chance of arrest and jail is not missing. The sample size listed corresponds to those responding to the question regarding the: "% Chance Arrest and Jail."

interaction variables are measured at the intensive margin when available. This is not possible for all crime categories, including auto theft and thefts less than $50; for these offenses, the extensive margin (i.e., whether the individual committed any such offenses) is used.

The following question is used to measure perceived punishment severity: "Suppose you were arrested for stealing a car, what is the percent chance that you would serve time in jail?" Table 2 indicates that the average *perceived* chance of going to jail conditional on being arrested for stealing a car for males increased by more than 10 percentage points during the first five years of the survey, from 46.4 percent to 56.6 percent. In contrast, there is little change over time in the perceived chance of arrest, as seen in the first row of Table 2.

This survey question elicits a probabilistic measure of perceived punishment severity; rather than asking whether the chance of jail is very likely, fairly likely, not too likely, or not at all likely, the survey asks for the *chance* of jail. Probabilistic measures of this sort are advantageous because (i) they are based on a well-defined numerical scale, which should be interpersonally comparable, and (ii) they can be compared to objective measures (Manski, 2004). However, probabilistic measures are also subject to criticism. First, it may be difficult to express beliefs as numerical probabilities and individuals may, consequently, only give responses of 0, 50, and 100 percent. Individuals may even say there is a 50 percent chance of jail when, in reality, they simply think there is some chance but do not know how to quantify it. Though the entire range of probabilities is used in response to this survey question, there are three mass points; approximately 18, 20, and 22 percent of the responses indicate that there is no chance, a certain chance, and a fifty-fifty chance of jail, respectively.[12] Note that the results presented in the paper are robust to the exclusion of these mass points.

A second criticism is that an individual's responses may not reveal his true expectations. Though this is impossible to directly test, one can at least assess whether there is some internal validity. That is, is a greater perceived chance of jail observed when one would expect? Table 3 explores whether the perceived chance of jail varies with the extent to which respondents

12. Manski (2004) indicates that there is evidence that respondents use the full expanse of the 0–100 scale, typically rounding to the nearest 5 percent, and that there tends to be some bunching around 50.

Table 3. Average perceived chance of jail for different subsamples of males

Subsample	For all survey rounds
All males	51.7 %
Juvenile jurisdiction	47.9
Adult jurisdiction	56.1
Ever arrested males	58.3
Juvenile jurisdiction	53.7
Adult jurisdiction	61.1
Ever incarcerated males	70.0
Juvenile jurisdiction	63.6
Adult jurisdiction	72.4
Males who ever stole a car	58.7
Juvenile jurisdiction	54.5
Adult jurisdiction	61.7

This table reports the average perceived chance of jail if arrested for stealing a car for various subsamples of the data. For example, the first set of rows considers the sample of males as well as juvenile males and adult males.

have interacted with the justice system. On average, males believe that the chance of jail is 51.7 percent. Not surprisingly, criminally "experienced" males perceive a greater chance of jail; arrested and incarcerated males believe there to be a 58.3 and 70.0 percent chance, respectively.[13]

Table 3 also compares the perceived chance of jail for respondents who are considered juveniles or adults by the criminal justice system. On average, "juvenile" males believe that the chance is 47.9 percent while "adults" believe there to be a 56.1 percent chance; this represents an approximately 8 percentage point difference between juveniles and adults. Even when considering just arrested males, incarcerated males, or males who ever stole a car, one still observes a similar difference between the perceptions of juveniles and adults.

A number of other issues may remain regarding the appropriate interpretation of this survey question. For example, the survey is based on a random sample of individuals and not a random sample of participants in criminal markets. One could argue that it is the perceptions of the latter group that are the most relevant, especially with regard to understanding the potential

13. Fischhoff et al. (2000) also present evidence of the validity of other probabilistic expectations questions in the NLSY97. In particular, they state that there are sensible correlations between probability judgments and responses to related questions and that both gender and race/ethnic differences seem to reflect reality.

impacts of policies designed to decrease crime. To the extent that this is the case, the analysis will consider whether there is heterogeneity in how perceptions change at the age of criminal majority across individuals with different degrees of criminal experience.[14]

Other potential concerns include how the respondent interprets the question. Is he thinking about what would happen if *he* is arrested for stealing a car or is he thinking about what would happen if *one* is arrested for stealing a car? The intention of the survey is for the respondent to interpret the question according to the former meaning, as it asks for the chance that *you* would serve time in jail. Evidence that respondents actually interpret the question in this way is seen in Table 3; individuals with higher chances of jail (e.g., because they have criminal records) actually perceive the chance of jail to be higher.

Another concern is whether the respondents interpret the question to be asking about jail at the time of arrest (i.e., before being convicted of a crime) or jail after being convicted (i.e., as a part of the sentence). The context of this question in the survey points toward the latter interpretation. Specifically, this question is the fourth question asked about an individual's perceptions and is asked after questions about the chance of: (i) arrest, (ii) release without charges or dismissal at court, and (iii) only a fine.[15] This is an important point, as one can only interpret this question as a measure of perceived punishment severity if the respondent interprets the question to be asking about punishment.

4. Does Perceived Punishment Severity Vary Discontinuously at the Age of Majority?

The previous section suggests that the perceived chance of jail increases as individuals get older. This section identifies whether any of this change can be attributed to reaching the age of criminal majority, over and above the effect of aging in general.

14. On the other hand, basing the analysis on a random sample of individuals results in the inclusion of potential offenders; i.e., individuals who have not yet entered the market for crime.

15. There are also no questions about pretrial detention asked throughout the rest of the survey.

Table 4. Difference in difference estimates of the increase in the perceived chance of jail at the age of criminal majority

Age	Age 16 states	Age 17 states	Age 18 states
	Panel A		
15	41.6 (35.8)	46.8 (36.3)	47.9 (36.3)
16	50.6 (34.7)	48.9 (36.6)	48.5 (36.5)
17	50.7 (36.6)	53.5 (35.9)	50.9 (36.8)
18	55.9 (37.1)	55.9 (36.8)	56.7 (35.6)
19	52.5 (36.0)	56.5 (36.1)	58.7 (35.4)
	Panel B		
15–16	9.0	2.1	0.6
16–17	0.1	4.6	2.4
17–18	5.2	2.4	5.8
18–19	−3.4	0.6	2.0
	Panel C		
DD estimates for states with age 16 cutoff			
Using age 17 states as comparison group	6.9 (2.12)		
Using age 18 states as comparison group	8.4 (2.78)		
DD Estimates for states with age 17 cutoff			
Using age 16 states as comparison group	4.5 (1.50)		
Using age 18 states as comparison group	2.2 (1.13)		
DD Estimates for states with age 18 cutoff			
Using age 16 states as comparison group	0.6 (0.23)		
Using age 17 states as comparison group	3.4 (1.66)		

The above analysis is based on the sample of males. Panel A presents the average perceived chance of jail if arrested for stealing a car by age and type of state, in terms of when the age of majority is reached; standard deviations are in parentheses. Panel B presents the changes in the average perceived chance of jail from one age to another. Panel C presents the difference-in-difference estimates; t-statistics are in parentheses.

4.1. Difference-in-Difference Estimates of the Change in Perceptions at the Age of Majority

The cross-state variation in the age of criminal majority allows one to use a difference-in-difference (DD) design to estimate whether the perceived chance of jail increases at the age of majority. Table 4 presents this analysis for the sample of males. For each age between 15 and 19 and each group of states, panel A indicates the average perceived chance of jail. Panel B indicates the change in perceptions between each successive age group, e.g., 15–16 or 16–17.

As an example, define individuals in states with the age of criminal majority equal to 16 as the treatment group. Thus, 15-year olds in these states are juveniles and believe there to be a 41.6 percent chance of jail, on

average, while 16-year olds are adults and believe there to be a 50.6 percent chance. This 9 percentage point difference between the perceived chance of jail of 15- and 16-year olds is reflected in the first row of panel B. To identify whether this difference is due to becoming an adult or simply becoming a year older, one needs to subtract out the change in perceptions for a group that does not reach the age of majority at 16. Either the age 17 or 18 states can be used as such a comparison group. The average perceived chance of jail in these states increases by 2.1 and 0.6 percentage points, respectively, between the ages of 15 and 16 and can only be attributed to general aging. Panel C presents the results of subtracting out the change in perceptions in the comparison group states from that in the treatment group states, i.e., the DD estimates. Depending on the comparison group, there is an either 6.9 or 8.4 percentage point increase in the perceived chance of jail at the age of criminal majority. Regressions indicate that these estimates are significant at the 5 percent level.

DD estimates of the change in perceptions at the age of criminal majority are also presented for age 17 and 18 states. Though the largest change in perceptions occurs between ages 16 and 17 in age 17 states and 17 and 18 in age 18 states, the DD estimates in panel C are not significant. The estimates also depend on the comparison group chosen; yet, it is not clear what the appropriate comparison group should be.

Overall, the DD estimates provide some evidence of a discontinuous change in perceptions at the age of criminal majority. However, the estimates are especially sensitive to the chosen comparison and treatment groups. In addition, the DD estimator only yields an unbiased estimate of the effect of reaching the age of criminal majority if there are no other systematic differences between 17- and 18-year olds, for instance, in the comparison and treatment group states. It is certainly feasible that such differences exist. Thus, I supplement this first set of estimates with those that explicitly take advantage of the panel nature of the data.

4.2. Within Individual Estimates of the Change in Perceptions at the Age of Majority

4.2.1. Empirical Design. This section presents estimates of the change in perceptions at the age of majority that is identified solely off of within individual changes rather than differences in perceptions across the sample. The intuition underlying this identification strategy parallels that of a regression

discontinuity (RD) design.[16] An RD design can be implemented when individuals are assigned to a "treatment" on the basis of a known and measured assignment score. Any individual whose assignment score falls on or above a prespecified cutoff is assigned to the treatment while any individual whose score falls below the cutoff is not. Identification is based on the idea that the sample of individuals within a very small interval around the cutoff point is very similar to a randomized experiment at the cutoff—they have essentially the same assignment score value. Thus, the comparison of average outcomes of individuals on either side of the cutoff provides a good estimate of the treatment effect.

In the context of the current paper, one can think of the individual's age as the known and measured assignment score. The prespecified cutoff is the state-specific age of criminal majority. When an individual reaches the age of criminal majority, he becomes an adult in the eyes of the courts; i.e., he is subject to "treatment." To truly implement an RD design, one would want to compare the perceived chance of jail for individuals in the days just before they reach the age of criminal majority to that in the days just after reaching the age of majority (i.e., in the small interval around the cutoff). However, this is not possible since measures of perceived punishment severity are only obtained on an annual basis. As is typical of the RD literature, I deal with this issue empirically by using the entire sample of males and controlling for a polynomial of age, the underlying score. To get as precise an estimate as possible, an individual's age is measured in months rather than years. As noted by Card and Lee (2008), however, the true functional form is unknown; thus, the age polynomial chosen may introduce measurement error. Ignoring this measurement error would result in an overstatement of the precision of the estimates. To deal with this issue, standard errors are clustered, as suggested by Card and Lee (2008), on the discontinuity, i.e., age. Results are also presented, however, that indicate that the findings are robust to alternative functional forms and clustering strategies.

Equation (1) presents the basic specification taken to the data, where i, s, and t represent the individual, state of current residence, and survey round,

16. Regression discontinuity designs have been increasingly used in economics. See Thistlethwaite and Campbell (1960), Seaver and Quarton (1976), Trochim (1984), Angrist and Lavy (1999), van der Klaauw (2001), and Jacob and Lefgren (2002). Crime papers that utilize this design include: Berk and Rauma (1983), Berk and de Leeuw (1999), Chen and Shapiro (2007), and Kuziemko (2007).

respectively.

$$P_{ist} = \alpha + \beta_0 Adult\_Jur_{ist} + \beta_1 Age_{ist} + \beta_2 Age_{ist}^2 + \beta_3 Age_{ist}^3 + X_{ist}\gamma + \mu_i + \lambda_s + \varepsilon_{ist}. \quad (1)$$

Perceived punishment severity, *P*, is regressed on a dummy variable indicating whether the individual has reached the age of adult jurisdiction in his state of residence, *Adult_Jur* (i.e., the cutoff variable), as well as a third-order polynomial of an individual's age (in months) at the time of the survey. For instance, *Adult_Jur* would equal zero for a 17-year old living in a state where the age of criminal majority is 18, but would equal one when the individual is 18 (i.e., in the following survey round). Thus, β_0 captures the effect of becoming an adult in the eyes of the courts on an individual's perception of punishment severity, over and above the effect of aging in general. Individual fixed effects, μ_i, are included and control for individual characteristics that are fixed over time. Moreover, including fixed effects implies that the identification of β_0 is based on within individual changes in perceptions rather than a comparison of perceptions across individuals, some who have reached the age of criminal majority and some who have not.

A primary underlying assumption of the RD design is that all unobservables vary continuously at the cutoff. While one clearly cannot directly test whether this is the case, one can look at the extent to which observables vary discontinuously at the cutoff. Thus, some specifications also control for observed time-varying individual characteristics, *X*, including: self-reported criminal activity, justice system interactions, gang membership, educational attainment and school enrollment, household structure, and whether the respondent lives in a central city. If these variables do not vary discontinuously when individuals reach the age of criminal majority, then the estimated effect of becoming an adult in the eyes of the courts (β_0) will not be sensitive to their inclusion in the analysis.

Lastly, it is possible that some individuals move during the course of the survey; that is, state of residence is another potential time-varying characteristic. Thus, state fixed effects, λ_s, are included in equation (1). Of course, with individual fixed effects already included, there is little variation left in the state dummies. State fixed effects would be quite important, however,

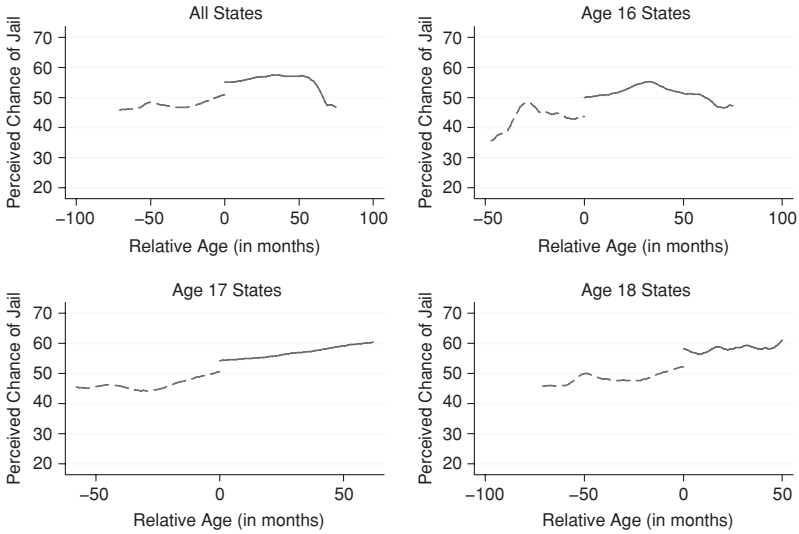

Figure 1. Perceived chance of jail conditional on arrest versus relative age for males. The graphs present the Epanechnikov kernel-weighted local polynomial estimates, using a bandwidth of 5.0, of the relationship between the perceived chance of jail conditional on being arrested for stealing a car and an individual's relative age. Relative age measures the individual's age in months relative to the age of criminal majority of his state; a relative age of zero is the first month that an individual is an adult in the eyes of the courts. The dashed line represents kernel-weighted local polynomial estimates for individuals with a relative age less than or equal to zero while the solid line represents estimates when the relative age is greater than or equal to zero. Each graph includes a different subset of states: the first graph includes all states, the second graph includes those states where age 16 is the age of criminal majority, the third graph uses age of majority 17 states, and the final graph uses age of majority 18 states.

when individual fixed effects are omitted and identification comes from across individuals; laws other than the age of criminal majority may vary across states.

4.2.2. Graphical Analysis. Figure 1 provides a preliminary sense of whether the perceived chance of jail changes discontinuously at the age of criminal majority. Specifically, Figure 1 plots nonparametric kernel weighted local polynomial estimates of the relationship between the perceived chance of jail and an individual's age (measured in months) relative to the state-specific age of criminal majority. An individual's relative age is zero during his first month in the adult justice system. Separate estimates are

presented for relative ages less than or equal to the age of criminal majority (i.e., the dashed line) and those greater than or equal to the age of majority (i.e., the solid line). All graphs use a Epanechnikov kernel function and a bandwidth of 5.0.

The upper left-hand graph includes all males and indicates a slight upward trend in the perceived chance of jail as individuals get older. Most importantly, a discontinuity is observed at the age of criminal majority. The remaining three graphs of Figure 1 present the results separately for states with ages of criminal majority equal to 16, 17, and 18, respectively. In each group, jumps are observed in the perceived chance of jail at the age of criminal majority.

Figure 2 replicates this analysis for the perceived chance of arrest for stealing a car. In contrast to the results for the perceived chance of jail, little evidence is seen of a discontinuity in the perceived chance of arrest at the age of criminal majority. This is particularly true when looking at the sample of males from all states as well as age 16 and age 18 states; however, a small jump is seen in age 17 states.

4.2.3. Estimation Results. Table 5 presents the results of estimating equation (1) for the entire sample of males; additional controls, *X*, are included in each column. All specifications include individual fixed effects. The first column controls only for the third-order monthly age polynomial and *Adult_Jur*. Once again, a significant jump in the perceived chance of jail occurs at the age of criminal majority. The perceived chance of jail is approximately 5.2 percentage points higher for males who have reached the age of criminal majority relative to males who are still juveniles, over and above controls for age.

Column (2) of Table 5 controls for self-reported criminal activity (i.e., auto theft, thefts of less than $50, thefts of more than $50, assault, and drug sales), interactions with the justice system (i.e., arrest, charge, conviction, and incarceration), and gang membership. One may expect the crime and justice system interaction variables to be particularly relevant to how perceptions evolve. For instance, committing a crime without getting caught or being arrested and sentenced to jail provides respondents with previously unknown information. Column (3) controls for whether the individual lives in the central city of a metropolitan statistical area, lives in a two parent household, is enrolled in school, and the highest grade completed. Finally,

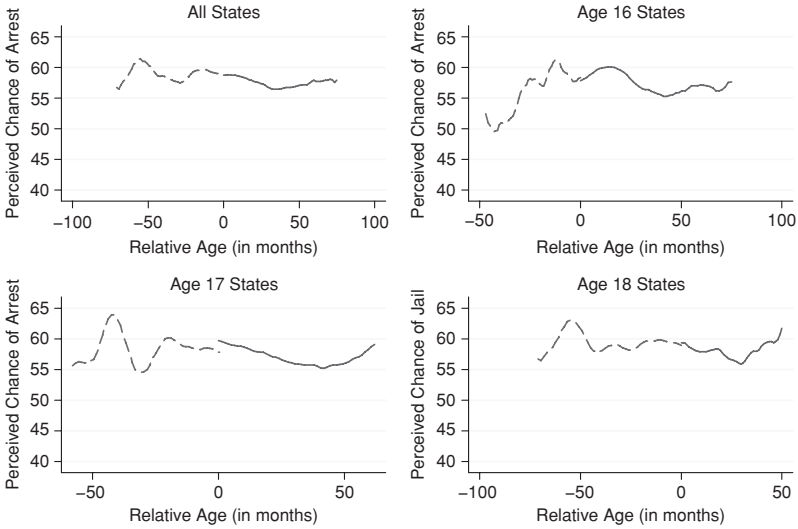

Figure 2. Perceived chance of arrest versus relative age for males. The graphs present Epanechnikov kernel-weighted local polynomial estimates, using a bandwidth of 5.0, of the relationship between the perceived chance of arrest for stealing a car and an individual's relative age. Relative age measures the individual's age in months relative to the age of criminal majority of his state; a relative age of zero is the first month that an individual is an adult in the eyes of the courts. The dashed line represents kernel-weighted local polynomial estimates for individuals with a relative age less than or equal to zero while the solid line represents estimates when the relative age is greater than or equal to zero. Each graph includes a different subset of states: the first graph includes all states, the second graph includes those states where age 16 is the age of criminal majority, the third graph uses age of majority 17 states, and the final graph uses age of majority 18 states.

column (4) includes state fixed effects. The inclusion of all of these variables has virtually no effect on the coefficient corresponding to *Adult_Jur*. "Adults" still believe that the chance of jail is, on average, 5.3 percentage points greater than that perceived by "juveniles."[17]

Thus, consistent with the objective data, there is evidence of a jump in the perceived chance of jail at the age of criminal majority. However, the

17. As stated previously, the crime and justice system interaction variables are measured at the intensive margin when possible. The results are not sensitive, however, to the use of the extensive margin for all variables.

Table 5. Determinants of perceived chance of arrest and jail for males

	(1)	(2)	(3)	(4)
Adult_Jur	5.206***(0.750)	5.255***(0.742)	5.314***(0.740)	5.306***(0.742)
Age (in months)	−1.959 (1.274)	−1.764 (1.315)	−2.317*(1.321)	−2.445*(1.329)
Age^2	0.010 (0.006)	0.009 (0.006)	0.013**(0.006)	0.013**(0.006)
Age^3	−0.000 (0.000)	−0.000 (0.000)	−0.000**(0.000)	−0.000**(0.000)
Any auto theft		−2.132 (2.621)	−2.208 (2.678)	−2.260 (2.676)
Any theft < $50		−0.996 (0.794)	−1.106 (0.791)	−1.035 (0.789)
# Thefts > $50		−0.100 (0.072)	−0.077 (0.071)	−0.076 (0.071)
# Assaults		−0.031 (0.064)	−0.032 (0.064)	−0.033 (0.064)
# Drug sales		0.008 (0.026)	0.003 (0.026)	0.004 (0.026)
# Arrests		0.617 (0.499)	0.524 (0.505)	0.538 (0.507)
# Charges		1.198 (1.213)	1.480 (1.185)	1.566 (1.179)
# Convictions		2.809*(1.628)	2.573 (1.627)	2.540 (1.636)
# Incarcerations		1.396 (1.797)	1.419 (1.814)	1.429 (1.814)
Gang member		−2.854*(1.638)	−2.910*(1.629)	−3.023*(1.618)
Live in MSA central city			−0.078 (1.176)	−0.197 (1.215)
Live in two-parent household			0.043 (0.820)	0.030 (0.819)
Enrolled in school			1.159*(0.690)	1.146*(0.691)
Highest grade completed			−1.406***(0.407)	−1.443***(0.408)
Constant	166.124*(86.072)	154.789*(88.859)	185.016**(89.351)	174.991*(90.313)
Individual fixed effects	YES	YES	YES	YES
State fixed effects	NO	NO	NO	YES
Observations	20205	20106	19942	19942
# of Individuals	4589	4588	4588	4588

Robust standard errors clustered on age in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Note that all measures of criminal activity are at the intensive margin with the exception of thefts less than $50 and auto theft. The number of such offenses cannot be calculated for each survey round; rather, one can only calculate whether any such offenses occurred, i.e., the extensive margin. Individual fixed effects are included in all specifications.

size of the jump is perceived to be smaller than that which is measured in the various types of objective data.

4.2.4. Robustness and Heterogeneity. The results presented thus far restrict the underlying trend in age to be a third-order polynomial. If this is miss-specified, then it is possible that the 5.3 percentage point increase in the perceived chance of jail can be partly attributed to trends in age. For instance, using a linear age trend (not shown) rather than a polynomial results in a more than 6 percentage point increase in the perceived chance of jail.

Therefore, rows (2) through (6) of Table 6 assess the sensitivity of these findings to alternative specifications. Row (1) of Table 6 presents the baseline results, which corresponds to the estimation of equation (1) with the full set of observable controls and state fixed effects (see column (4) of Table 5). Row (2) estimates equation (1) with monthly age dummies rather than a third-order age polynomial. Even with this fairly demanding and flexible specification, a 4.2 percentage point jump in perceptions is still observed in the month when the individual reaches the age of criminal majority. However, this specification does not allow one to separate out the effect of that last month in age from the effect of reaching the age of majority. Row (3) replicates the baseline specification but also includes interactions between age and race, the highest grade completed, living in a central city, and school enrollment; including these interactions has virtually no impact on the estimated effect. Similarly, there is little change in the results when an annual or quarterly age polynomial is used rather than a monthly polynomial (see rows (4) and (5)).[18] All of the above results are clustered on age. However, this ignores the panel nature of the data. Thus, row (6) of Table 6 estimates the baseline specification using a clustered bootstrap, which is clustered on monthly age and individual identifiers; the standard errors increase slightly but do not affect the overall significance of the results.[19]

18. Since the surveys are conducted approximately annually (give or take a couple of months), there is a little extra variation in the monthly age measures, but not a significant amount.

19. A number of additional robustness tests were conducted. For instance, these jumps in perceptions are robust to excluding the approximately 4000 observations for which the perceived chance of jail is exactly equal to 50 as well as all observations for which the perceived chance of jail equals 0, 50, or 100. In addition, a falsification test

Table 6. Robustness and heterogeneity

Row	Specification description	Coefficient on *Adult_Jur*	Standard error	# of Obs.	# of Ind.
Baseline					
1	See column 4 of Table 5–includes full set of controls, individual and state fixed effects, and monthly age polynomial	5.306***	0.742	19942	4588
Robustness to alternative specifications of age					
2	Monthly age dummies instead of polynomial	4.156***	0.956	19942	4588
3	Baseline + interactions between age and Black, highest grade completed, living in an MSA central city, and school enrollment	5.275***	0.742	19942	4588
4	Baseline with annual age polynomial rather than monthly age polynomial	5.259***	0.831	19942	4588
5	Baseline with quarterly age polynomial rather than monthly age polynomial	5.286***	0.793	19942	4588
6	Baseline estimated with clustered bootstrap (on monthly age and individual identifiers)	5.306***	0.837	19942	4588
Heterogeneity by age of criminal majority					
7	Baseline for sample of age 16 states	4.19	2.647	2375	601
8	Baseline for sample of age 17 states	2.954*	1.625	5907	1451
9	Baseline for sample of age 18 states	5.945***	1.149	11660	2754
Heterogeneity by criminal experience					
10	Baseline for males arrested at least once prior to age of criminal majority	1.634	2.244	3519	816
11	Baseline for males never arrested prior to age of criminal majority	6.060***	0.836	15522	3543
12	Baseline for males who report committing a crime at least once prior to age of criminal majority	4.594***	0.996	12791	2895
13	Baseline for males who report never committing a crime prior to age of criminal majority	6.671***	1.382	6250	1464
Heterogeneity by race					
14	Baseline for sample of Black males	3.955***	1.494	5012	1167
15	Baseline for sample of Hispanic males	5.039***	1.797	4171	974

Unless otherwise noted, robust standard errors clustered on age in column 4. * significant at 10%; ** significant at 5%; *** significant at 1%.

The remainder of Table 6 explores whether the magnitude of the change in perceptions varies across different subsamples of the data. Rows (7) through (9) present the results of estimating equation (1) for states with different ages of criminal majority and parallels the graphical analysis presented in Figure 1. Point estimates indicate a 4.2 percentage point jump in age 16 states, a 3.0 percentage point jump in age 17 states, and a 5.9 percentage point jump in age 18 states. Only the latter two estimates are significant; however, there are just three age 16 states with 601 males included in the analysis.

Rows (10) through (13) assess whether the effect varies with the extent to which individuals are "criminally experienced." Two measures of criminal experience are considered: whether an individual reports being arrested prior to reaching the age of majority and whether he reports committing any crimes. Becoming an adult in the eyes of the court does not affect perceived punishment severity for previously arrested individuals, but it does increase the perceived chance of jail by 6.1 percentage points for individuals who were not arrested. When considering criminal activity rather than arrest, becoming an "adult" significantly increases perceptions for both criminals (4.6 percentage points) and noncriminals (6.7 percentage points).

Why is a discontinuity in perceptions at the age of criminal majority not observed for individuals who have a prior arrest record? This is perhaps counterintuitive, as one might expect experienced criminals to be more knowledgeable of the justice system. One possible explanation is that individuals who have been arrested become eligible for the adult courts before reaching the age of majority. As mentioned in Section 1, for instance, juveniles that commit serious enough crimes can be transferred to the adult courts in many states. A number of states also have a policy that says "once an adult, always an adult." Alternatively, it may be that arrested individuals update their beliefs at the time of arrest upon realizing that this arrest puts them at an increased risk to be treated as an adult in the future.[20]

that allows the jump in perceptions to occur a year earlier or later than it theoretically should provides some evidence that this change in perceptions is really attributable to individuals reaching the age of criminal majority.

20. One referee suggested that this finding could potentially be explained by a change in how juvenile histories are treated as individuals' transition from the juvenile to adult courts. Most states, however, actually now have procedures that give the criminal courts access to juvenile records, at least for a window of a few years after the individual has become an adult (Greenwood, 1995).

These findings are important in that they indicate that arrested individuals may not be deterred from future crimes upon reaching the age of criminal majority because their perceptions do not change at that time. However, Lee and McCrary's (2005) analysis of arrest behavior around the age criminal majority in Florida is based on a sample of individuals who have at least one felony arrest by age 17. Thus, this is a potential explanation of their nondeterrence findings.

Finally, rows (14) and (15) estimate the baseline specification for the samples of Black and Hispanic males, respectively. Significant jumps in the perceived chance of jail at the age of criminal majority are observed in both subsamples. Blacks perceive the chance of jail to increase by approximately 4.0 percentage points while Hispanics perceive a 5.0 percentage point increase.[21]

5. Does Reaching the Age of Criminal Majority Deter Criminal Behavior?

The economic model of crime implies that an individual's criminal propensity decreases as expected punishment increases. Thus, if expected punishment increases at the age of criminal majority, then there should be a corresponding reduction in crime. The change in expected punishment at the age of majority is a function of a number of factors, including changes in the probability of jail, sentence length, and prison conditions. This

21. I have also considered whether there is heterogeneity in the change in perceptions at the age of criminal majority: (i) across states with varying degrees of relative punitiveness of the adult to juvenile systems and (ii) across individuals with varying initial levels of perceptions. Similar to Levitt (1998), I measure relative punitiveness by calculating the ratio of adult to juvenile incarceration rates for the initial year of the survey. Though one would expect that reaching the age of criminal majority has a larger impact on the perceived chance of jail in states with a high relative punitiveness measure, the estimated effect of becoming an adult on the perceived chance of jail is fairly homogeneous across these states with varying degrees of relative punitiveness. There is, however, much heterogeneity across individuals who, in the survey round immediately prior to reaching the age of criminal majority, believed the chance of jail to be less than 50 percent, equal to 50 percent, and greater than 50 percent. The effect is hugely positive for the first group and hugely negative for the last. These findings are consistent with Pogarsky, Piquero, and Paternoster (2004), who conclude that the manner in which new information affects the perceived certainty of punishment depends on the initial level of perceived certainty. However, it is also consistent with a regression to the mean scenario.

section assesses whether there is a discontinuous decrease (i.e., deterrence) in criminal behavior at the age of criminal majority.

5.1. Empirical Design

The empirical specification depicted in equation (2) mimics that used when looking at the perceived chance of jail; the only difference is the dependent variable. Specifically, self-reported criminal activity, *C*, in period $t + 1$ is regressed on: (i) whether or not the individual has reached the age of criminal majority, *Adult_Jur*; (ii) a third-order age polynomial; (iii) individual fixed effects; (iv) a vector of time-varying individual characteristics, *X*, which is identical to those used in the perceptions specifications; and (v) state fixed effects. Crime in period $t + 1$ is used to ensure the study of criminal activity *after* the individual has reached the age of criminal majority.

$$C_{ist+1} = \alpha + \beta_0 Adult\_Jur_{ist} + \beta_1 Age_{ist} + \beta_2 Age_{ist}^2 + \beta_3 Age_{ist}^3 + X_{ist}\gamma + \mu_i + \lambda_s + \varepsilon_{ist}. \quad (2)$$

Equation (2) represents a reduced form analysis of the relationship between reaching the age of criminal majority and criminal activity. That is, one cannot necessarily link any deterrent effects that are observed (i.e., $\beta_0 < 0$) to the changes in the perceived chance of jail measured in the first part of the paper. Rather, β_0 captures the effect of all factors that change at the age of criminal majority, including longer sentence lengths and harsher prison conditions.[22]

22. Earlier versions of the paper used an instrumental variables approach to look at the relationship between the perceived chance of jail and criminal behavior, where the perceived chance of jail was instrumented for with whether the individual reached the age of criminal majority. That is, the analysis presented in the first part of the paper was basically the first stage of the two-stage estimation. One concern with this two-stage analysis is that reaching the age of criminal majority is a weak instrument. F-statistics associated with *Adult_Jur* in the first-stage regression are approximately equal to 21 when using the whole sample and 14 when using the sample of age 18 states; however, *F*-statistics for age 17 and 16 states are less than two. Partial *R*-squares also tend to be quite small. Thus, there is some evidence that this is a weak instrument, particularly for states with ages of majority equal to 17 and 16. The results from this instrumental variables analysis are qualitatively identical to the reduced form results presented in the current version of the paper and are available upon request from the author.

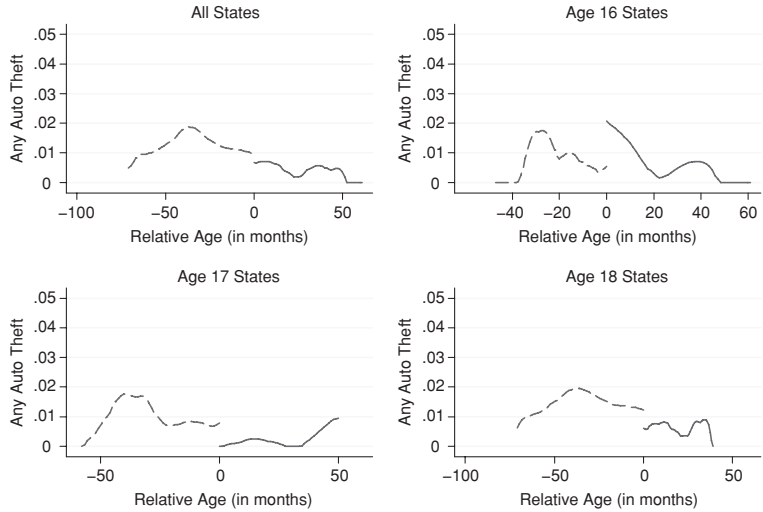

Figure 3. Auto theft behavior versus relative age for males. The graphs present Epanechnikov kernel-weighted local polynomial estimates, using a bandwidth of 5.0, of the relationship between whether the individual self-reports committing any auto thefts in period $t + 1$ and his relative age. Relative age measures the individual's age in months relative to the age of criminal majority of his state; a relative age of zero is the first month that an individual is an adult in the eyes of the courts. Note that even though the relative age is in months, auto theft is based on the $(t + 1)$th survey round. The dashed line represents kernel-weighted local polynomial estimates for individuals with a relative age less than or equal to zero while the solid line represents estimates when the relative age is greater than or equal to zero. Each graph includes a different subset of states: the first graph includes all states, the second graph includes those states where age 16 is the age of criminal majority, the third graph uses age of majority 17 states, and the final graph uses age of majority 18 states.

5.2. Graphical Analysis

I first present a series of graphs that plot nonparametric kernel-weighted local polynomial estimates of the relationship between various types of self-reported criminal behavior at the extensive margin in period $t + 1$ and an individual's monthly age relative to the age of criminal majority. Separate estimates are again presented for relative ages less than or equal to the age of majority (i.e., the dashed line) and those greater than or equal to the age of majority (i.e., the solid line). All graphs use an Epanechnikov kernel function and a bandwidth of 5.0.

Figure 3 presents the relationship between auto theft behavior and relative age. A discontinuous decrease in auto thefts is observed when looking at

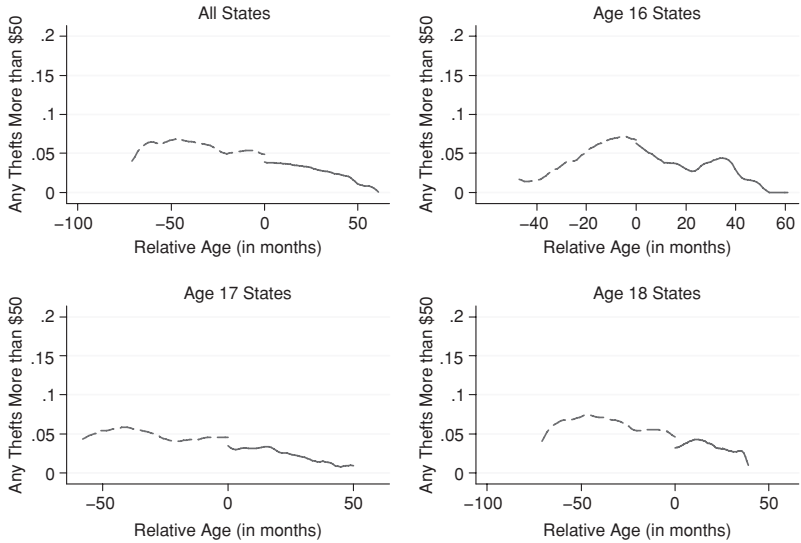

Figure 4. Thefts of more than $50 versus relative age for males. The graphs present Epanechnikov kernel-weighted local polynomial estimates, using a bandwidth of 5.0, of the relationship between whether the individual self-reports committing any thefts of more than $50 in period $t + 1$ and his relative age. Relative age measures the individual's age in months relative to the age of criminal majority of his state; a relative age of zero is the first month that an individual is an adult in the eyes of the courts. Note that even though the relative age is in months, thefts of more than $50 is based on the $(t + 1)$th survey round. The dashed line represents kernel-weighted local polynomial estimates for individuals with a relative age less than or equal to zero while the solid line represents estimates when the relative age is greater than or equal to zero. Each graph includes a different subset of states: the first graph includes all states, the second graph includes those states where age 16 is the age of criminal majority, the third graph uses age of majority 17 states, and the final graph uses age of majority 18 states.

all states and age 17 and age 18 states; however, an increase is actually observed when looking at age 16 states. When considering thefts of more than $50 (Figure 4) and thefts of less than $50 (Figure 5), jumps consistent with deterrence are once again observed for all states as well as age 17 and age 18 states; no jump is observed for age 16 states. Figure 6 presents the results for drug sales and Figure 7 presents the results for assaults. No evidence of deterrence is seen for these two crime categories, overall or in any subsample of states. In fact, there is an increase in both of these behaviors in age 16 states at the age of criminal majority.

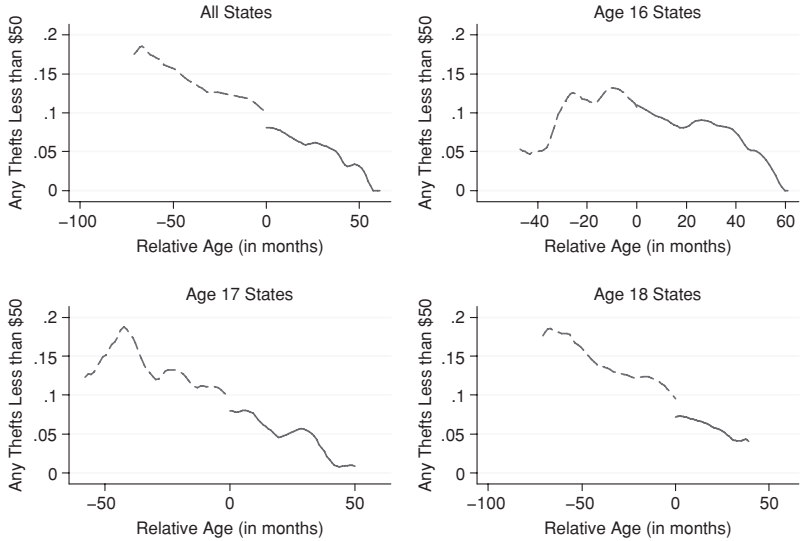

Figure 5. Thefts of less than $50 versus relative age for males. The above graphs present Epanechnikov kernel-weighted local polynomial estimates, using a bandwidth of 5.0, of the relationship between whether the individual self-reports committing any thefts of less than $50 in period $t + 1$ and his relative age. Relative age measures the individual's age in months relative to the age of criminal majority of his state; a relative age of zero is the first month that an individual is an adult in the eyes of the courts. Note that even though the relative age is in months, thefts of less than $50 is based on the $(t + 1)$th survey round. The dashed line represents kernel-weighted local polynomial estimates for individuals with a relative age less than or equal to zero while the solid line represents estimates when the relative age is greater than or equal to zero. Each graph includes a different subset of states: the first graph includes all states, the second graph includes those states where age 16 is the age of criminal majority, the third graph uses age of majority 17 states, and the final graph uses age of majority 18 states.

While there appears to be some evidence of deterrence for property crimes at the age of criminal majority, the analysis presented thus far does not assess whether these decreases in criminal activity are actually significant or sensitive to observable and unobservable controls.

5.3. Estimation Results

Table 7 presents the results of estimating equation (2) for the same five crime categories: auto theft, thefts less than $50, thefts greater than $50, drug sales, and assault. Each crime category is measured at the extensive margin. Though the full set of controls are included in each specification,

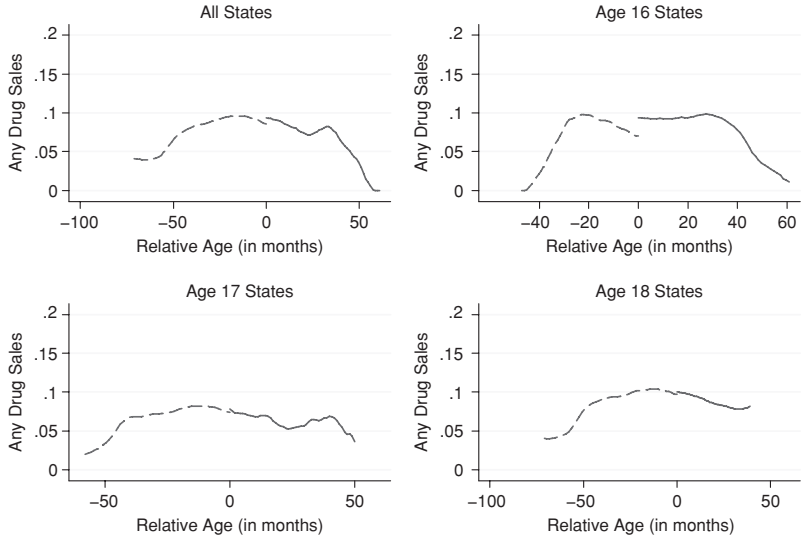

Figure 6. Drug sales versus relative age for males. The graphs present Epanechnikov kernel-weighted local polynomial estimates, using a bandwidth of 5.0, of the relationship between whether the individual self-reports selling drugs in period $t + 1$ and his relative age. Relative age measures the individual's age in months relative to the age of criminal majority of his state; a relative age of zero is the first month that an individual is an adult in the eyes of the courts. Note that even though the relative age is in months, drug sales is based on the $(t + 1)$th survey round. The dashed line represents kernel-weighted local polynomial estimates for individuals with a relative age less than or equal to zero while the solid line represents estimates when the relative age is greater than or equal to zero. Each graph includes a different subset of states: the first graph includes all states, the second graph includes those states where age 16 is the age of criminal majority, the third graph uses age of majority 17 states, and the final graph uses age of majority 18 states.

only the coefficient on *Adult_Jur* is presented in the table. Panel 1 presents the results for males in all states while panels 2, 3, and 4 consider states with an age of criminal majority equal to 18, 17, and 16, respectively.

Panel 1 indicates that there is a negative relationship between reaching the age of criminal majority and criminal behavior in every crime category except assault. The results, however, are generally not significant at a 10 percent level; the coefficient on thefts of less than \$50 (−0.013) is marginally significant with a *P*-value of 0.107. Similar results are seen when looking at the subsample of males in age 18 states in panel 2. Negative coefficients are observed for all property crime categories. For thefts

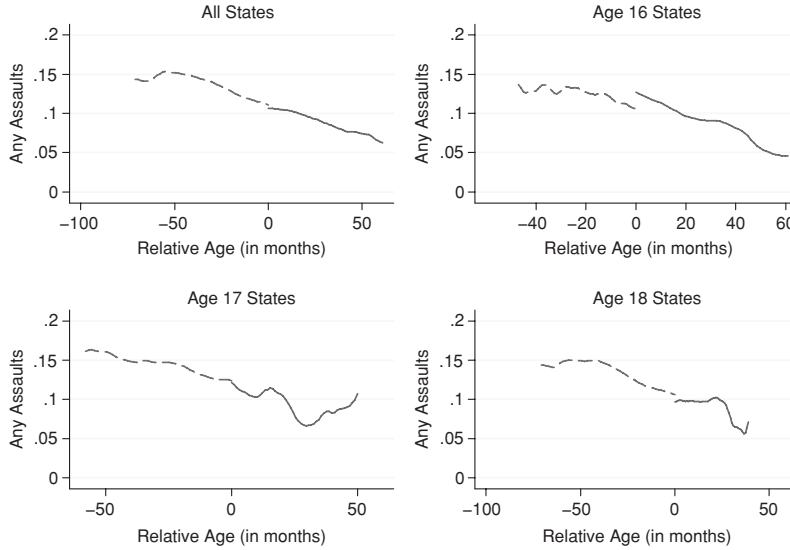

Figure 7. Assault behavior versus relative age for males. The above graphs present Epanechnikov kernel-weighted local polynomial estimates, using a bandwidth of 5.0, of the relationship between whether the individual self-reports committing any assaults in period $t + 1$ and his relative age. Relative age measures the individual's age in months relative to the age of criminal majority of his state; a relative age of zero is the first month that an individual is an adult in the eyes of the courts. Note that even though the relative age is in months, assaults is based on the $(t + 1)$th survey round. The dashed line represents kernel-weighted local polynomial estimates for individuals with a relative age less than or equal to zero while the solid line represents estimates when the relative age is greater than or equal to zero. Each graph includes a different subset of states: the first graph includes all states, the second graph includes those states where age 16 is the age of criminal majority, the third graph uses age of majority 17 states, and the final graph uses age of majority 18 states.

of less than \$50, there is a coefficient of −0.032, which is significant at the 1 percent level. Thus, males who reach the age of criminal majority in age 18 states are 3.2 percentage points less likely to commit a theft of less than \$50. The results for age 17 and age 16 states are generally similar. Though four of the five point estimates are negative for age 17 states, none are statistically significant. In age 16 states, a significant deterrence effect is once again observed for thefts of less than \$50. However, consistent with the graphs, a positive and significant coefficient is actually observed for auto theft. Thus, the only crime category for which there is fairly consistent

Table 7. Reduced-form estimates of effect of reaching age of criminal majority on next period crime behavior

	(1)	(2)	(3)	(4)	(5)
	Auto theft	Steal < $50	Steal > $50	Drug Sales	Assault
		Panel 1: All States			
Adult_Jur	−0.00171 (0.00283)	−0.01267 (0.00785)	−0.00367 (0.00520)	−0.00428 (0.00613)	0.01100 (0.00893)
# Observations	15719	15646	15644	15637	15647
# Individuals	4412	4404	4405	4404	4404
		Panel 2: Age 18 States			
Adult_Jur	−0.00583 (0.00471)	−0.03169*** (0.01018)	−0.01030 (0.00824)	0.00036 (0.00862)	0.00815 (0.01270)
# Observations	9198	9165	9164	9158	9161
# Individuals	2637	2634	2635	2634	2634
		Panel 3: Age 17 States			
Adult_Jur	−0.00248 (0.00402)	−0.00909 (0.01648)	−0.00983 (0.00990)	−0.01195 (0.01400)	0.01575 (0.01666)
# Observations	4601	4573	4572	4575	4577
# Individuals	1367	1362	1362	1363	1363
		Panel 4: Age 16 States			
Adult_Jur	0.01794** (0.00741)	−0.04361*(0.02437)	−0.01932 (0.01729)	−0.02342 (0.02440)	0.02379 (0.02424)
# Observations	1920	1908	1908	1904	1909
# Individuals	559	558	558	557	557

Robust standard errors clustered on age in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The above table presents the results of regressing crime in period $t + 1$, where the crime type is listed at the top of each column, on whether the individual has reached the age of criminal majority, a third-order age polynomial, state fixed effects, and the full set of time-varying observable controls. All specifications are restricted to the sample of males and include individual fixed effects. Only the coefficient on Adult_Jur is presented for each specification. Panel 1 reports the results for the entire sample of males while Panels 2, 3, and 4 report the results for age 18, 17, and 16 states, respectively.

evidence of deterrence at the age of criminal majority is thefts of less than $50.

One concern with the specifications presented in Table 7 is that individuals in period $t + 1$ could be committing fewer crimes simply because they are incapacitated during this period; i.e., incarceration may result in a decrease in crime because offenders are isolated from society (National Research Council, 1978). In fact, the ability to distinguish between deterrence and incapacitation is a challenge that is commonly encountered in the economics of crime literature. Thus, it is important to ask whether it is possible that the estimated deterrence effects, to the extent that any were found, are actually capturing incapacitation. I conduct two tests. First, I estimate equation (2) with additional controls for incarceration at the time of the interview and incarceration in period $t + 1$. Second, I estimate equation (2) excluding all individuals who were ever incarcerated. Both alternative specifications yield very similar results as those presented in Table 7; the only evidence of deterrence observed is for thefts of less than $50.

It is well known that criminal/delinquent behavior changes a lot during the teenage years. Thus, it is not surprising that the above results are extremely sensitive to how age enters the specification. For instance, if a linear trend in age had been used rather than a third-order age polynomial, significant evidence of deterrence would have been found in every crime category except assault when considering all states. However, the graphical analysis indicates that a linear age trend is rarely appropriate. In addition, virtually all evidence of deterrence disappears when allowing for the most flexible specification of monthly age dummies.

6. Conclusions

This paper studies how perceptions change when individuals are faced with different laws. Specifically, I estimate how the perceived chance of jail conditional on arrest changes when an individual reaches the age of majority. I find that males, on average, perceive the chance of jail to increase by 5.2 percentage points, over and above the effects of aging in general. The fact that there is a discontinuous change in perceptions indicates that changes in subjective measures of punishment severity correspond to some extent to changes in objective measures. However, the objective data presented in

Section 2 provides some evidence that individuals underestimate the change in punishment severity at the age of criminal majority. In addition, heterogeneity analyses indicate that there is no significant change in perceptions for individuals with an arrest record at the age of criminal majority. Thus, one potential explanation for Lee and McCrary's (2005) nondeterrence findings at the age of criminal majority in Florida is that their sample only includes individuals who have at least one felony arrest by age 17.

The analysis also finds little evidence of a discontinuous change in delinquent behavior, over and above general aging trends, at the age of criminal majority. Significant evidence of deterrence is only consistently seen when considering thefts of less than $50. These results conflict with Levitt (1998), who finds that violent crime rates fall by almost 25 percent and property crime by 10–15 percent in states that punish adults particularly harshly relative to juveniles compared to states where adult punishments are relatively lenient. In contrast, confidence intervals on the point estimates from my paper indicate that deterrence effects of greater than approximately 6 percent can be ruled out for assault, 20 percent for drug crimes, and around 30 percent for thefts. Thus, while Levitt's (1998) property crime estimates fall within a reasonable range, a large discrepancy exists for violent crimes. One possible explanation is that the Levitt (1998) estimate captures both deterrence and incapacitation.[23] Though unlikely to be as large as those found by Levitt (1998), the estimates of this paper do leave open the possibility that a deterrence effect of non-negligible size exists at the age of criminal majority.

What implications do these results have with regard to the potential impacts of other policy changes? The analysis only found a small change in perceptions, and one that appears significantly smaller than the objective change. Given that the distinction between the juvenile and adult justice systems is arguably one of the best known features of the U.S. justice system, this finding certainly increases concerns that other (lesser known) policies designed to deter crime will not result in large changes in subjective measures and, thus, not be very successful.

23. Of course, it must also be recognized that my NLSY estimates are based on all states rather than a comparison of relatively harsh and lenient states. In addition, the NLSY data do not look at the broad property crime and violent crime categories, but rather specific offenses.

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