GUNS AND JUVENILE CRIME*

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ABSTRACT

Using a nationally representative panel data set of U.S. high school students, this paper investigates the effect of gun availability at home on robbery, burglary, theft, and property damage for juveniles. Controlling for a very large number of personal and family characteristics and exploiting the time variation in criminal activity and gun availability, we show that gun availability at home is positively related to the propensity to commit crime for juveniles. It is unlikely that gun availability is merely a measure of the unobserved home environment because it does not influence other behaviors of juveniles such as drinking and fighting, being expelled from school, and having sex. No support is found for the hypothesis that gun availability decreases the propensity for being victimized.

I. INTRODUCTION

DESPITE the decline in juvenile crime since the early 1990s, opinion polls indicate that the public overwhelmingly believes that juvenile crime is a serious problem facing the country (Soler 2001). Investigation of the determinants of juvenile crime is important for a number of reasons. First, the social cost of youth crime is estimated to be \$60–\$300 billion per year, and the overwhelming majority of this cost is an externality to the society (Levitt and Lochner 2001).[1] Second, participation in illegal activities early in life has implications for the future well-being of the individual. For example, Mocan, Billups, and Overland (2005) show that current criminal activity makes future criminal activity more likely by increasing criminal human capital and depreciating legal human capital. Thus, engaging in crime when young would make one less likely to be successful in the legal labor market later in life. Along the same lines, Allgood, Mustard, and Warren (1999)

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[1] Levitt and Lochner (2001) report the upper limit of the social cost of youth crime as \$300 billion, but they indicate that this may be an overestimate because the typical youth crime is less serious than an adult crime.

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show that youth criminal behavior has a negative effect on earnings as an adult, and Bound and Freeman (1992) and Freeman and Rodgers (2000) document a negative relationship between youth criminal record and labor market outcomes. Because teenagers are responsible for a disproportionate share of all crime, investigation of determinants of juvenile crime has welfare implications for both the present and the future.[2]

Levitt and Lochner (2001) present a four-part classification scheme to explain criminal activity, which involves biological, social, criminal justice system, and economic factors. For example, social factors include the extent of parental supervision and behaviors of neighborhood peers (Glaeser, Sacerdote, and Scheinkman 1996; Mocan and Rees 2005; Case and Katz 1991). The influence of increased punitiveness of the criminal justice system is documented by Corman and Mocan (2000) and Levitt (1996, 1998a, 1999), and examples of the research on the relationship between economic conditions and crime include Corman and Mocan (2005), Gould, Mustard, and Weinberg (2002), and Raphael and Winter-Ebmer (2001).[3]

Access to firearms is a potentially important determinant of criminal activity, although the extent of the relationships between guns and crime has not been identified clearly. Blumstein (1995) suggests that the rise in juvenile homicide rate between the mid-1980s and early 1990s is associated with an increased tendency to carry guns among juveniles. Wintemute (2000) argues that the increase in violence in the mid-1980s is attributable to gun manufacturers' move to produce cheap medium- and high-caliber pistols and that the decline in youth violence in the 1990s is attributable to stricter gun control policies adopted during the same period. However, empirical evidence on the effect of gun ownership on crime is mixed. In an analysis of the effect of right-to-carry laws, Lott and Mustard (1997) report that counties with concealed-weapons laws have lower crime rates, while Duggan (2001) shows that changes in gun ownership are positively related to changes in homicide rates and that this relationship is driven almost entirely by the effect of gun ownership on homicides with firearms. Cook and Ludwig (2002) report the surprising finding that local gun ownership prevalence has a positive effect on residential burglary rates.[4] Marvell (2001) finds no evidence that juvenile handgun bans adopted by states had any effect on crime. Ludwig and Cook (2000) find no evidence that implementation of the Brady Act was associated with a reduction in homicide rates, and Lott and Whitley (2001) find no evidence that safe-storage gun laws reduce the number of juvenile accidental gun deaths or suicides and that the passage of such laws is associated with

[2] In 2002, juveniles comprised about 26 percent of arrestees for felony index crimes.

[3] For a more detailed discussion of various factors ranging from schools to gangs, see Wilson and Petersilia (1995).

[4] They interpret this finding as an indication that the existence of guns in homes may be a motivation for burglars because guns are valuable.

increased violent crime and more crimes occurring in people's homes. Mustard (2001) finds that enactment of right-to-carry laws does not increase police deaths and may actually help reduce their risk of being killed.

On the basis of these conflicting findings and the controversy surrounding them, some analysts suggest that gun control laws reduce social welfare and that they should be scrapped. They claim that this is because research reveals no clear effect of gun control on crime, while gun control is costly, as it interferes with individual choice and imposes monetary costs on police, prosecutors, courts, and prisons (Parker 2001).

The research on the gun/crime relationship cited above relies on aggregate (state- or county-level) data on crime rates. More specifically, analysts investigated the effect of the enactment of concealed-weapons laws or a measure of gun ownership on aggregate crime rates. The main shortcoming of this research is the measurement of gun ownership or gun availability. Gun ownership is approximated by various proxies, such as sales of *Guns and Ammo* magazine at the state or county level (Duggan 2001), the proportion of suicides that involve firearms (Cook and Ludwig 2002), and voter exit surveys (Lott 2000). In this paper, we use nationally representative individual-level data, in which information on the availability of guns at home as well as delinquent behavior is provided directly by each respondent.

Analyses of aggregate crime data reveal the net effect of gun ownership on crime rates. For example, assume that gun availability increases criminal tendencies and that gun availability also allows opportunities for self-defense, which deters potential perpetrators. The net effect of these factors on crime may be zero in the aggregate data. On the other hand, the net effect would again be zero if there was no effect of gun availability on crime from either the aggression or the protection points of view. It is difficult to isolate these factors using aggregate data. The individual-level data set we use allows us to directly test whether gun availability induces juveniles to commit more crime. In addition, using victimization information provided by the same individuals in the data set, we test whether gun availability has an effect on juveniles' crime victimization. Thus, our analysis provides a clearer picture regarding the pathways through which gun ownership affects crime.

This is the first paper to investigate the link between guns and juvenile crime using nationally representative individual-level data. As explained later in detail, the longitudinal nature of our data and an unusually large number of personal and family background variables allow us to examine the effect of the availability of guns at home on an individual's criminal activity.

We analyze four different crimes: robbery, burglary, property damage, and theft. The information on gun availability is obtained by asking juveniles whether guns are easily available to them at home. We address potential measurement error in gun availability. The identification of the effect of gun availability on crime is obtained from the change in gun availability between the survey years. We argue (and provide supporting evidence) that variation

in having access to guns is driven by parents' behavior. The results show that easy gun availability at home is positively related to the propensity to commit crime. Gun availability does not reduce the probability of being victimized, and it makes it more likely for a juvenile to be stabbed, witness someone be stabbed, or be jumped. We show that gun availability is unlikely to be a measure of undesirable home environment, because gun availability has no effect on grade point average or behaviors such as being expelled from school, drinking and fighting, and having sex.

Section II presents the analytical framework, Section III discusses the measurement error. Section IV describes the data, Section V displays the results, and Section VI concludes.

II. Analytical Framework

The crime supply equation with the addition of guns can be presented as

$$\mathrm{CR} = f\,(X,\ A,\ F,\ G), \tag{1}$$

where CR stands for a measure of the extent of the criminal activity of the individual. The term X represents the characteristics of the person such as age, race, and ethnicity, and religious beliefs; A stands for location-specific deterrence and economic variables that affect criminal involvement, such as crime-specific arrest rates, police presence, and the unemployment rate; F is a vector of parent and family characteristics; and G stands for the availability of guns to the individual.[5]

Empirical specification of the crime supply equation as a function of observable and unobservable personal characteristics (including biological attributes), deterrence measures, economic conditions, attributes of the family, and the availability of guns is presented by equation (2):

$$\mathrm{CR}_{it} = \alpha + \delta X_{it} + \gamma F_{it} + \varphi G_{it} + \zeta A_{st} + \mu_i + \lambda_{it} + \Omega_i^{\mathrm{F}} + \Psi_{it}^{\mathrm{F}} + \varepsilon_{it}, \tag{2}$$

where CR_{it} is the criminal activity measure of the ith individual at time t; X_{it} represents observable individual characteristics such as age, race, gender, and religiosity, weekly allowance of the child, and measures of risk aversion such as whether the child wears seatbelt while riding in a car; F_{it} stands for observable family attributes, including parent characteristics and measures of the extent of supervision at home;[6] G_{it} is the availability of guns at home; A_{st} stands for the deterrence measures faced by the individual, such as the arrest rates, the size of the police force, and local economic conditions in location s at time t where the child resides. The term μ_i captures individual-

[5] Empirical evidence from aggregate data on the effect on crime of deterrence, economic conditions, and drug use can be found in, among others, Corman and Mocan (2000, 2005), Levitt (1998b, 1999), and Raphael and Winter-Ebmer (2001).

[6] The complete list of these variables is given in Section IV.

specific time-invariant unobservables that include intellect, λ_{it} represents person-specific time-varying unobservables, Ω_i^F captures unobservable time-invariant family attributes, Ψ_{it}^F is unobservable time-varying family attributes, and ε_{it} is a standard error term.

Taking the first difference of equation (2) across time periods gives

$$\Delta \mathrm{CR}_{it} = \delta \Delta X_{it} + \gamma \Delta F_{it} + \varphi \Delta G_{it} + \zeta \Delta A_{st} + \Delta \lambda_{it} + \Delta \Psi_{it}^F + \Delta \varepsilon_{it}, \quad (3)$$

where Δ stands for time differencing. Equation (3) is a standard fixed-effects model in which time-invariant family and individual characteristics drop out but time-varying heterogeneity remains.

We estimate different formulations of equation (3) to investigate the link between gun availability at home (G) and a juvenile's criminal activity. Note that in equation (3), the change in an individual's criminal activity between the 2 years depends, among other factors, on the change in local deterrence and economics variables (A_{st}). The values of these variables are not collected beyond the first year of our data; therefore, ΔA_{st} cannot be calculated. However, following Currie and Moretti (2003) and Cook and Ludwig (2002), we include state or county dummies to control for such factors. That is, we estimate

$$\Delta \mathrm{CR}_{it} = \delta \Delta X_{it} + \gamma \Delta F_{it} + \varphi \Delta G_{it} + \kappa K_s + e_{it}, \quad (4)$$

where K_s stands for a set of state or county dummies that control for state-specific or county-specific time-varying local deterrence and economic factors and e is the error term.

As summarized in Duggan (2001), it is conceivable that a positive relationship between gun ownership and crime may indicate purchase of guns in response to expected future increases in crime. Although this argument has merit, especially in aggregate data, Duggan (2001) finds no support for such reverse causality from expected crime to gun ownership. In our case, reverse causality is even less likely. This is because our dependent variable is criminal activity of the juvenile, while our gun measure is the availability of guns at home. To the extent that this measure captures guns owned by parents, it is exogenous to future criminal involvement of the child. Put differently, the parent may purchase a gun because of protection or because he or she may be planning to commit a crime, but it seems unlikely that a parent would purchase a gun to facilitate his or her child's criminal activity. On the other hand, if parents' gun ownership is a proxy for their criminal propensity, and if this attribute is transmitted to the child, then gun availability at home is a proxy of bad home environment, which may be correlated with a juvenile's delinquent behavior. We show in Section IV that this hypothesis has no empirical support.

III. Measurement Error

As described in Section IV, data collection procedures were designed to minimize concern about confidentiality. For example, respondents were not provided with written questionnaires; rather, they listened to sensitive questions on delinquent behavior and gun availability through earphones and entered their answers directly on laptop computers. Nevertheless, it is still conceivable that gun availability is reported with error. Classical (symmetric) measurement error attenuates the estimated coefficient of gun availability (see note 8). In our particular case, the reporting error may not be symmetric in the classical sense, but it may be one-sided. To demonstrate the effect of nonrandom measurement error in gun availability in first-differenced data, consider equation (5):

$$\Delta \mathrm{CR}_{it} = \beta \Delta G_{it}^{*} + \Delta \varepsilon_{it}, \tag{5}$$

where i stands for the ith individual, t is the time period, and other covariates are dropped for ease of exposition. Let G_{it}^{*} be the actual gun availability at home and G_{it} stand for the reported gun availability. The reported gun availability at home is equal to the actual availability plus the measurement error; that is, $G_{it} = G_{it}^{*} + \nu_{it}$. Note that G equals one if the individual reports having access to a gun at home and G equals zero if he or she reports having no access. Similarly, G^{*} equals one if the actual gun availability is positive and G^{*} equals zero if actual gun availability is zero. Let the probability distribution of ν_{it} be $\mathrm{Prob}(G_{it} = 1, G_{it}^{*} = 1) = p_1$, $\mathrm{Prob}(G_{it} = 1, G_{it}^{*} = 0) = 0$, $\mathrm{Prob}(G_{it} = 0, G_{it}^{*} = 0) = p_2$, and $\mathrm{Prob}(G_{it} = 0, G_{it}^{*} = 1) = q$.

Following Ashenfelter and Zimmerman (1997), the probability limit of the estimated β can be substituted into equation (5) to obtain the expression for the measurement-error-corrected model (see Mocan and Tekin 2005).

In practice, the measurement error for gun availability at home seems negligible. This is because when we analyzed the subsample of siblings, we found nearly perfect agreement between siblings to the question on gun availability at home.[7] Therefore, we first report the results with no adjustment for measurement error in gun availability. However, we also report estimates with adjustment for nonrandom measurement error in gun availability.[8]

[7] This cannot be attributable to siblings lying in concert, because although in some cases the siblings took the survey on different days, in most cases they took it simultaneously.

[8] It is well known that classical measurement error in the explanatory variable attenuates its estimated coefficient, and the bias is exacerbated in first-differenced data (Levitt 1998b; Griliches and Hausman 1986). This can be seen by calculating the probability limit of φ in equation (4) when gun availability is measured with error. In the case of classical measurement error, one obtains

$$\operatorname{plim} \hat{\varphi} = \varphi\left[1 - \frac{\sigma_{\nu}^{2}}{(\sigma_{G^{*}}^{2} + \sigma_{\nu}^{2})(1-\rho)}\right] = \varphi\left[1 - \frac{\sigma_{\nu}^{2}}{\sigma_{G}^{2}(1-\rho)}\right] = \varphi\left[1 - \frac{1}{(\sigma_{G}^{2}/\sigma_{\nu}^{2})(1-\rho)}\right],$$

where ρ is the observed correlation of reported gun availability at home between time periods

IV. Data

The data used in the analyses are drawn from the two waves of the National Longitudinal Study of Adolescent Health (Add Health).[9] Add Health is a nationally representative data of adolescents in grades 7–12. Add Health is considered the largest and most comprehensive survey of adolescents ever undertaken. An in-school questionnaire was administered to every student who attended one of the sampled 132 U.S. schools on a particular day during the period September 1994–April 1995. A random sample of approximately 200 adolescents from each high school/feeder school pair was selected for in-home interviews, which were conducted during April 1995–December 1995.[10] The in-home interviews constituted the core sample and contained about 12,000 adolescents. In addition to the core sample, several special samples (for example, ethnic and genetic) were also drawn on the basis of in-school interviews. The core and the special samples provide a total number of 20,745 adolescents for wave 1. The adolescents are interviewed for the second time from April to August 1996 for wave 2. In wave 2, 14,738 adolescents were interviewed.[11] Data are gathered from adolescents, from their parents, siblings, friends, and fellow students, and from school administrators. The survey was designed to provide detailed information on teen behavior, including their criminal activity.

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1 and 2. In our case, where we entertain the possibility of one-sided measurement error due to differential propensities for telling the truth about gun availability at home, the bias depends on ρ and two additional parameters (for details, see Mocan and Tekin 2005).

[9] The Add Health project is a program project designed by J. Richard Udry (principal investigator) and Peter Bearman and funded by grant P01-HD31921 from the National Institute of Child Health and Human Development to the Carolina Population Center, University of North Carolina at Chapel Hill, with cooperative funding participation by the National Cancer Institute; the National Institute of Alcohol Abuse and Alcoholism; the National Institute on Deafness and Other Communication Disorders; the National Institute on Drug Abuse; the National Institute of General Medical Sciences; the National Institute of Mental Health; the National Institute of Nursing Research; the Office of AIDS Research, National Institutes of Health (NIH); the Office of Behavior and Social Science Research, NIH; the Office of the Director, NIH; the Office of Research on Women's Health, NIH; the Office of Population Affairs, Department of Health and Human Services (DHHS); the National Center for Health Statistics, Centers for Disease Control and Prevention, DHHS; the Office of Minority Health, Centers for Disease Control and Prevention, DHHS; the Office of Minority Health, Office of Public Health and Science, DHHS; the Office of the Assistant Secretary for Planning and Evaluation, DHHS; and the National Science Foundation. Persons interested in obtaining data files from the National Longitudinal Study of Adolescent Health should contact Add Health Project, Carolina Population Center, 123 West Franklin Street, Chapel Hill, NC 27516-2524 (e-mail: addhealth@unc.edu).

[10] Participating high schools were asked to identify junior high or middle schools that were expected to provide at least five students to the entering class of the high school. These are called feeder schools. Their probability of selection was proportional to the percentage of the high school's entering class that came from that feeder.

[11] The sample for the wave 2 in-home interview was composed of the respondents of the wave 1 in-home interview, with the following exceptions: a respondent who was in the twelfth grade in wave 1 and who was not part of the genetic sample was not interviewed in wave 2. Respondents who were only in wave 1's disabled sample were not reinterviewed.

The survey includes a number of detailed questions about delinquent behavior of adolescents. Specifically, respondents were asked whether they had committed any of the following acts in the 12 months prior to the interview date: robbery, burglary, property damage, and theft. Survey administrators took several steps to maintain data security and to minimize the potential for interviewer or parental influence. First, respondents were not provided with any printed questionnaires. Rather, all data were recorded on laptop computers. Second, for sensitive topics, such as delinquent behavior and gun availability, the adolescents listened to prerecorded questions through earphones and entered their answers directly on the laptops.[12]

Definitions of the variables used in empirical analyses and their descriptive statistics are reported in Table 1. Some personal and household characteristics, such as race, ethnicity, gender, and whether parents were born in the United States do not change between the waves. Therefore, these variables are not included in the analyses of the panel data. Note that because questions in wave 2 are worded as, "Since the last interview . . . ," the change in behavior between the two waves is easily identifiable. Contextual variables, such as local economic and social conditions, and deterrence measures are not available in both survey years. The change in these contextual variables between the two survey years is controlled for by state or county dummies.

Table 1 shows that about 23 percent of more than 15,000 juveniles indicate that guns were easily available to them at home. Cook and Ludwig (1996) and Smith (2000) report that in the 1990s, 35–40 percent of households had firearms. A Gallup poll in the summer of 1996 found that 38 percent of Americans reported having a gun in their homes (Carlson 2005). Given that the question posed to the juveniles pertains to "guns being easily available," the 23 percent availability rate appears reasonable. Our data set also matches well in other dimensions with similar surveys. For example, in our data set, about 10 percent of the juveniles responded in the affirmative to the question, "Have you ever carried a weapon at school?" This response rate is consistent with other youth surveys. In 1993, 8 percent of high school students had carried a gun in the prior 30 days (Kann et al. 1995). In our data set, 13 percent of the juveniles in urban areas and 32 percent of the juveniles in suburban and rural areas indicated having access to guns at home. This distribution matches well with the data from the General Social Survey (Davis, Smith, and Marsden 2005), which indicate that in 1996, 11 percent of the households that are in cities with more than 1 million people owned a gun. The rate of gun ownership was 31 percent among the households in cities, towns, or other incorporated areas with a population of 100,000–1 million people, and the rate was 46 percent for households in areas with fewer than 100,000 inhabitants.

[12] For less sensitive questions, the interviewer read the questions aloud and entered the respondent's answers.

V. RESULTS

In Table 2 we summarize the basic patterns of criminal activity and having easy access to guns at home in the two waves. The column headings indicate the responses for the first and second waves of the survey. A comparison of columns No-No and Yes-Yes reveals that children who had access to a gun at home in both periods have a higher propensity to commit crime than children who had no access to guns in either period. For both types, criminal propensity is lower in wave 2, which is consistent with the general decline in criminal activity in the United States during the 1990s. The decrease in the rate of involvement in crime is greater for children who stopped having easy access to a gun (column Yes-No). For example, their involvement in burglary was 8 percent in wave 1 when they had easy access to guns, and it went down to 5.4 percent when they had no easy access to guns in wave 2. The same is true for other crimes as well, where the participation rate in crime is reduced significantly after losing easy access to guns. In contrast, children who had no access to guns in wave 1 but gained access to guns in wave 2 (column No-Yes) have increased their criminal involvement in robbery, burglary, and property damage. Their propensity to steal remained the same. In summary, Table 2 displays notable raw differences in criminal involvement that are correlated with having access to guns.

Table 2 demonstrates that about 4.7 percent of the children lost access to guns at home between the periods. This change is consistent with national surveys that demonstrate that households' gun ownership rate declined by about 10 percentage points between the mid-1990s and early 2000. The proportion of households with guns was 44 percent in the mid-1990s, and it went down to 34 percent in 2000. Furthermore, around 1995–96, the decline was about 3–4 percentage points (Smith 2000). Similarly, Gallup polls show that the proportion of Americans who indicated that they had a gun in their home declined from about 50 percent in 1993 to 38 percent in 1996 (Carlson 2005). During the same time period, there was heightened awareness of a potential link between firearms and juvenile delinquency, and many cities were implementing aggressive policing strategies targeted at juvenile crime. In addition, the Brady Bill was enacted in 1993 and became effective in 1994. These events and trends are consistent with the proportion of the adolescents in the sample losing easy access to guns at home.

In Tables 3 and 4, we report the estimated coefficients of gun availability at home in four crime regressions using cross-sectional data from wave 1. The regressions include 33 control variables.

Table 3 shows that a number of variables exhibit interesting, albeit expected, correlations with criminal activity. For example, having a permanent tattoo is associated with higher propensity to commit crime, while wearing a seatbelt every time in a car (a measure of risk aversion) is correlated with a reduced criminal tendency. Those who "go with 'gut feeling' when making

TABLE 1

DESCRIPTIVE STATISTICS ($N = 15{,}089$)

VARIABLE	DEFINITION	WAVE 1 CROSS SECTION		FIRST DIFFERENCE: SD
		Mean	SD	
Damage	Dummy variable (=1) if deliberately damaged someone else's property that did not belong to you in the past 12 months, zero otherwise	.183	.387	.421
Burglary	Dummy variable (=1) if went into a house or building to steal something in the past 12 months, zero otherwise	.051	.220	.251
Theft	Dummy variable (=1) if took something from a store without paying for it, or took something worth more than 50 dollars in the last 12 months	.260	.439	.459
Robbery	Dummy variable (=1) if used or threatened to use a weapon to get something from someone in the past 12 months, zero otherwise	.042	.200	.229
Gun	Dummy variable (=1) if a gun is easily available at home, zero otherwise	.225	.418	.373
Male	Dummy variable (=1) if the respondent is male, zero otherwise	.503	.500	
Allowance	Allowance per week	6.867	10.386	11.807
Welfare	Dummy variable (=1) if any parent is on welfare, zero otherwise	.106	.308	.289
Seatbelt	Dummy variable (=1) if wears seatbelt every time in a car, zero otherwise	.885	.319	.342
Tattoo	Dummy variable (=1) if had a permanent tattoo, zero otherwise	.044	.206	.186
No chance to live until 35[a]	Dummy variable (=1) if the perceived chance of living until age 35 is less than 50 percent, zero otherwise	.034	.180	.229
Good chance to live until 35	Dummy variable (=1) if the perceived chance of living until age 35 is more than 50 percent, zero otherwise	.862	.345	.398
Gut feeling—yes[b]	Dummy variable (=1) if agrees with the statement "I usually go with 'gut feeling' when making decisions without thinking too much about the consequences," zero otherwise	.378	.485	.585

Gut feeling—neutral	Dummy variable (=1) if neither agrees nor disagrees with the statement "I usually go with 'gut feeling' when making decisions without thinking too much about the consequences," zero otherwise	.206	.404	.549
Perceived IQ—below average[c]	Dummy variable (=1) if in comparison to other people of the same age, the perceived intelligence is below average; zero otherwise	.058	.233	.282
Perceived IQ—average	Dummy variable (=1) if in comparison to other people of the same age, the perceived intelligence is about average; zero otherwise	.383	.486	.520
GPA	Average grade point average from math, science, history, and English classes	2.698	.863	.800
Chooses own friends	Dummy variable (=1) if parents allow the respondent to decide with whom to hang around, zero otherwise	.850	.358	.436
Decides TV time	Dummy variable (=1) if parents allow respondent to decide how much TV to watch, zero otherwise	.826	.379	.463
Decides own curfew on weekends	Dummy variable (=1) if parents allow the respondent to decide about the time to be at home on weekend nights, zero otherwise	.336	.472	.547
Decides own curfew on weeknights	Dummy variable (=1) if parents allow the respondent to decide about the time to be at home on weeknights, zero otherwise	.655	.475	.555
Height	Height in centimeters	168.392	10.452	4.587
Weight	Weight in kilograms	64.303	15.716	5.591
Hispanic	Dummy variable (=1) if the person is of Hispanic ethnicity, zero otherwise	.160	.367	
White[d]	Dummy variable (=1) if the person is white, zero otherwise	.649	.477	
Black	Dummy variable (=1) if the person if black, zero otherwise	.222	.416	
Age	Age in years	15.541	1.688	
No religion	Dummy variable (=1) if the person has no religion, zero otherwise	.119	.324	
Born Christian	Dummy variable (=1) if the person is a born-again Christian, zero otherwise	.272	.445	
Parent immigrant	Dummy variable (=1) if the person's parent is an immigrant, zero otherwise	.831	.375	
Parent married	Dummy variable (=1) if the person's parent is married, zero otherwise	.708	.455	
Alcohol available	Dummy variable (=1) if alcohol is available at home, zero otherwise	.289	.453	.607
Drugs available	Dummy variable (=1) if illegal drugs are easily available at home, zero otherwise	.029	.169	.202

TABLE 1 (*Continued*)

Variable	Definition	Wave 1 Cross Section		First Difference: SD
		Mean	SD	
Drinking and fighting	Dummy variable (=1) if ever got into fight because of drinking alcohol, zero otherwise	.063	.243	.261
Being expelled from school	Dummy variable (=1) if ever been expelled from school, zero otherwise	.042	.200	.190
Someone pulled a knife or gun on you	Dummy variable (=1) if someone ever pulled a knife or gun on the respondent, zero otherwise	.130	.336	.337
Someone shot you	Dummy variable (=1) if ever been shot, zero otherwise	.013	.113	.134
Someone cut you or stabbed you	Dummy variable (=1) if ever been cut or stabbed by someone, zero otherwise	.049	.216	.228
You were jumped	Dummy variable (=1) if ever been jumped by someone, zero otherwise	.113	.317	.314
You witnessed someone being stabbed	Dummy variable (=1) if ever witnessed someone being stabbed, zero otherwise	.122	.327	.334
Parent education less than high school		.168	.374	
Parent has high school education		.292	.455	
Parent has some college education		.298	.458	
Parent education is missing		.006	.082	

[a] The omitted category is Dummy variable (=1) if the perceived chance of living until age 35 is 50 percent, zero otherwise.
[b] The omitted category is Dummy variable (=1) if disagrees with the statement "I usually go with 'gut feeling' when making decisions without thinking too much about the consequences," zero otherwise
[c] The omitted category is Dummy variable (=1) if in comparison to other people of the same age, the perceived intelligence is above average; zero otherwise.
[d] The omitted category is Dummy variable (=1) if the person is of other race, zero otherwise.

TABLE 2

CHANGE IN CRIME AND ACCESS TO GUNS

	No-No	Yes-Yes	Yes-No	No-Yes
Robbery:				
Wave 1	.038	.058	.071	.061
	(.190)	(.233)	(.257)	(.239)
N	10,748	1,661	1,459	674
Wave 2	.029	.047	.053	.087
	(.167)	(.221)	(.223)	(.282)
N	10,745	1,663	1,463	676
Burglary:				
Wave 1	.046	.070	.080	.064
	(.210)	(.255)	(.271)	(.245)
N	10,747	1,662	1,459	674
Wave 2	.034	.049	.054	.084
	(.181)	(.215)	(.226)	(.278)
N	10,744	1,662	1,461	677
Damage:				
Wave 1	.166	.246	.240	.185
	(.372)	(.431)	(.427)	(.389)
N	10,743	1,661	1,459	675
Wave 2	.119	.209	.136	.188
	(.324)	(.407)	(.343)	(.391)
N	10,738	1,662	1,460	674
Theft:				
Wave 1	.250	.291	.315	.264
	(.433)	(.454)	(.464)	(.441)
N	10,732	1,662	1,454	675
Wave 2	.191	.225	.199	.264
	(.393)	(.418)	(.400)	(.441)
N	10,733	1,663	1,460	674

NOTE.—No-No indicates having no access to a gun in either wave. Yes-Yes stands for having access to a gun in both waves. Yes-No is having access to a gun in wave 1, but not in wave 2. No-Yes is having no access to a gun in wave 1 but having access in wave 2. The cells are the participation rates for the corresponding crimes. Numbers in parentheses are standard deviations.

decisions without thinking too much about the consequences" and those with a perceived below-average IQ have a higher propensity to commit crime. Table 3 shows that having easy access to guns at home is associated with a propensity to commit crime that is 2–4 percentage points higher. The regressions in Table 4 are based on the same specifications, but they include state fixed effects. The results are very similar, and the coefficient of the gun variable ranges from .02 to .05 in these specifications. Although the results in Tables 3 and 4 are benchmark cases, they are questionable, as none of the heterogeneity is eliminated that may be correlated with easy gun access.

In Table 5, we report the regression results, based on first-differenced data. That is, we estimate specifications displayed in equation (4). As was argued earlier, the extent of measurement error seems negligible in these data. If that is indeed the case, the coefficients in columns 1–3 are credible. If there is measurement error, and if it is symmetric, the coefficients in columns 1–3

TABLE 3

EFFECT OF GUN AVAILABILITY AT HOME ON CRIME: ORDINARY LEAST SQUARES CROSS-SECTIONAL REGRESSIONS

	Damage	Burglary	Robbery	Theft
Hispanic	.017^{+}	.004	.013*	.039**
	(.010)	(.006)	(.006)	(.012)
White	.0003	−.012*	−.010^{+}	−.024*
	(.010)	(.006)	(.006)	(.012)
Black	−.057**	−.016*	.010	−.030*
	(.012)	(.007)	(.007)	(.014)
Seatbelt	−.059**	−.024**	−.027**	−.060**
	(.010)	(.007)	(.007)	(.012)
Male	.101**	.031**	.021**	.055**
	(.007)	(.004)	(.004)	(.008)
Age	.105**	.054**	.030^{+}	.184**
	(.029)	(.017)	(.016)	(.034)
Age^2	−.004**	−.002**	−.001*	−.006**
	(.001)	(.001)	(.001)	(.001)
Height	.002**	.0004	.0002	.0002
	(.0004)	(.0004)	(.0002)	(.0004)
Weight	−.0004^{+}	−.0001	.000007	.00003
	(.0003)	(.0001)	(.0001)	(.00004)
Perceived IQ—below average	.004	.032**	.026**	.043**
	(.014)	(.010)	(.009)	(.016)
Perceived IQ—average	−.014*	.003	.005	.014^{+}
	(.006)	(.004)	(.004)	(.007)
Parent education less than high school	−.057**	−.009	−.010	−.014
	(.011)	(.006)	(.006)	(.012)
Parent has high school education	−.048**	−.010*	−.006	−.006
	(.009)	(.005)	(.004)	(.010)
Parent has some college education	−.017^{+}	.002	−.008*	.021*
	(.009)	(.005)	(.004)	(.010)
Parent education is missing	−.063^{+}	.013	−.029^{+}	−.018
	(.034)	(.024)	(.016)	(.040)
Welfare	.012	.015*	.008	.008
	(.010)	(.007)	(.006)	(.012)
Alcohol available	.073**	.020**	.013**	.084**
	(.007)	(.004)	(.004)	(.008)
Drugs available	.119**	.088**	.105**	.180**
	(.022)	(.017)	(.017)	(.023)
No religion	.008	.022**	.012*	.053**
	(.010)	(.007)	(.006)	(.012)
Born Christian	−.029**	−.002	−.006^{+}	−.034**
	(.007)	(.004)	(.004)	(.008)
Allowance	.0004	.0002	.00001	.001
	(.0003)	(.0002)	(.000)	(.0003)
Tattoo	.078**	.043**	.068**	.112**
	(.016)	(.011)	(.012)	(.018)
No chance to live until 35	.055**	.016	.018	.014
	(.021)	(.015)	(.015)	(.022)
Good chance to live until 35	−.034**	−.030**	−.036**	−.027*
	(.010)	(.007)	(.007)	(.012)
Decides own curfew on weekends	.003	.005	.012**	−.010
	(.007)	(.004)	(.004)	(.008)

TABLE 3 (*Continued*)

	Damage	Burglary	Robbery	Theft
Chooses own friends	.011	.0007	−.005	.001
	(.009)	(.005)	(.005)	(.010)
Decides TV time	.003	.008+	−.001	.003
	(.008)	(.005)	(.004)	(.009)
Decides own curfew on weeknights	.032**	.005**	.0003	.010
	(.007)	(.004)	(.004)	(.008)
Gut feeling—yes	.053**	.020*	.021**	.073**
	(.007)	(.004)	(.004)	(.008)
Gut feeling—neutral	.020**	.010	.010**	.035**
	(.008)	(.005)	(.004)	(.009)
Parent immigrant	.028**	.007	.015**	−.015
	(.010)	(.006)	(.005)	(.012)
Parent married	−.024**	−.012**	−.012**	−.045**
	(.007)	(.004)	(.004)	(.008)
Gun	.044**	.019**	.023**	.036**
	(.008)	(.005)	(.005)	(.009)
Constant	−.745**	−.374**	−.185	−1.122**
	(.223)	(.126)	(.126)	(.255)
N	15,674	15,679	15,681	15,665
R^2	.073	.035	.047	.053

NOTE.—All regressions exclude state dummy variables.
+ Statistically significant at the <10% level.
* Statistically significant at the <5% level.
** Statistically significant at the <1% level.

are underestimates of the true effect. If there is asymmetric measurement error as was discussed in Section III, the coefficients in columns 4–6 are the correct ones. Given the fact that the coefficients with asymmetric measurement error correction (in columns 4–6) are smaller than the ones obtained from no adjustment, these estimates can be considered as conservative.

In columns 2 and 5 of Table 5, the change in local deterrence and economic conditions between the two years is controlled for by a set of state dummies. Columns 3 and 6 present the results of the models that include county dummies, under the assumption that time variation in deterrence and economic conditions where the juvenile resides has an effect on his or her behavior.

It can be argued that a parent would be more likely to make a gun available as the child gets older. Also, the child may have higher criminal propensity over time independent of whether parents make a gun available. To control for this potential confounding, all regressions include age dummies.[13] Dropping the age dummies did not change the results.

The coefficient of easy gun availability at home is always significant in all specifications. The magnitudes indicate that having guns easily available at home increases the probability of robbery, burglary, theft, and property

[13] This is admittedly an ad hoc specification, as age drops out from the first-differenced models. However, one can think of this as an attempt to control for the initial stock of criminal propensity.

TABLE 4

EFFECT OF GUN AVAILABILITY AT HOME ON CRIME: ORDINARY LEAST SQUARES CROSS-SECTIONAL REGRESSIONS WITH STATE FIXED EFFECTS

	Damage	Burglary	Robbery	Theft
Hispanic	.026*	.005	.015*	.026*
	(.011)	(.007)	(.006)	(.013)
White	.003	−.009	−.009	−.014
	(.011)	(.006)	(.006)	(.013)
Black	−.046**	−.010	.009	−.003
	(.012)	(.008)	(.007)	(.015)
Seatbelt	−.057**	−.026**	−.026**	−.067**
	(.011)	(.007)	(.007)	(.012)
Male	.099**	.030**	.021**	.053**
	(.007)	(.004)	(.004)	(.008)
Age	.101**	.053**	.033*	.174**
	(.029)	(.017)	(.016)	(.034)
Age^2	−.004**	−.002**	−.001*	−.006**
	(.001)	(.001)	(.001)	(.001)
Height	.002**	.0003	.0002	.0004
	(.0004)	(.0003)	(.0002)	(.0005)
Weight	−.0003^{+}	−.0001	−.00002	.00006
	(.0002)	(.0001)	(.0001)	(.0003)
Perceived IQ—below average	.004	.031**	.026**	.041**
	(.014)	(.010)	(.009)	(.016)
Perceived IQ—average	−.014*	.003	.006	.014^{+}
	(.006)	(.004)	(.004)	(.007)
Parent education less than high school	−.056**	−.008	−.010^{+}	−.007
	(.011)	(.006)	(.006)	(.012)
Parent has high school education	−.048**	−.009^{+}	−.005	−.004
	(.009)	(.005)	(.005)	(.010)
Parent has some college education	−.019*	.0002	−.008^{+}	.017^{+}
	(.009)	(.005)	(.004)	(.01)
Parent education is missing	−.051	.017	−.026^{+}	−.004
	(.033)	(.024)	(.016)	(.040)
Welfare	.014	.016*	.008	.011
	(.010)	(.007)	(.006)	(.012)
Alcohol available	.069**	.019**	.013**	.079**
	(.007)	(.004)	(.004)	(.008)
Drugs available	.116**	.086**	.102**	.172**
	(.022)	(.017)	(.017)	(.023)
No religion	.006	.021**	.011^{+}	.049**
	(.010)	(.007)	(.006)	(.012)
Born Christian	−.020**	.003	−.004	−.018*
	(.007)	(.004)	(.004)	(.008)
Allowance	.001*	.0005	.00003	.001^{+}
	(.0003)	(.0002)	(.0002)	(.0003)
Tattoo	.078**	.042**	.070**	.115**
	(.016)	(.011)	(.012)	(.019)
No chance to live until 35	.053^{+}	.015	.020	.009
	(.021)	(.015)	(.015)	(.022)
Good chance to live until 35	−.039**	−.032**	−.036**	−.033**
	(.010)	(.007)	(.007)	(.012)
Decides own curfew on weekends	.003	.005	.012**	−.013^{+}
	(.007)	(.004)	(.004)	(.008)

TABLE 4 (*Continued*)

	Damage	Burglary	Robbery	Theft
Chooses own friends	.008	−.001	−.005	−.004
	(.009)	(.005)	(.005)	(.010)
Decides TV time	.004	.008+	−.002	.004
	(.008)	(.005)	(.004)	(.009)
Decides own curfew on weeknights	.032**	.004	.000	.009
	(.007)	(.004)	(.004)	(.008)
Gut feeling—yes	.051**	.019**	.021**	.070**
	(.007)	(.004)	(.004)	(.008)
Gut feeling—neutral	.018*	.009+	.011**	.031**
	(.008)	(.005)	(.004)	(.009)
Parent immigrant	.021*	.006	.011*	−.007
	(.010)	(.006)	(.006)	(.012)
Parent married	−.024**	−.013**	−.012**	−.045**
	(.007)	(.004)	(.004)	(.008)
Gun	.053**	.023**	.025**	.052**
	(.008)	(.005)	(.005)	(.009)
Constant	−.979**	−.439**	−.274*	−1.217**
	(.232)	(.130)	(.129)	(.256)
N	15,603	15,607	15,609	15,593
R^2	.081	.041	.050	.065

NOTE.—All regressions include state dummy variables.
+ Statistically significant at the <10% level.
* Statistically significant at the <5% level.
** Statistically significant at the <1% level.

damage by 1.2–4.8 percentage points after adjusting for the measurement error. [14]

It should be noted that the models include all explanatory variables of Tables 3 and 4 as long as they exhibit time variation. For example, they include four parental supervision variables (decides TV time, decides own curfew on weekends, decides own curfew on weeknights, and chooses own friends) as well as a variable that measures whether alcohol is available to the juvenile at home and another variable that measures whether drugs are available at home. Although not reported, the coefficients of these variables are consistent with those in Tables 3 and 4. Thus, controlling for these family environment and supervision effects, we find that gun availability has a separate, positive effect on delinquent behavior.

In Table 6 we report the same regressions as in Table 5, but we omit all explanatory variables. The estimated coefficients are similar to those reported

[14] If current criminal activity of the juvenile depends positively on past criminal behavior, and if current gun availability at home is negatively correlated with the juvenile's past criminal behavior, the results may be biased downward. In that case, the results reported in Tables 5 and 6 are underestimates of the true effect of gun availability. Specifically, if an increase in criminal behavior between time periods $t-2$ and $t-1$ (ΔCR_{t-1}) motivates parents to eliminate guns at home ($\Delta G_t < 0$), and if (ΔCR_{t-1}) is positively correlated with the dependent variable ΔCR_t, the estimated effect of guns will be biased downward. We thank John Donohue for this insight.

TABLE 5

EFFECT OF GUN AVAILABILITY AT HOME ON CRIME: FIRST-DIFFERENCED DATA
(Coefficient of Gun Availability)

	WITHOUT MEASUREMENT ERROR CORRECTION			WITH MEASUREMENT ERROR CORRECTION		
	(1)	(2)	(3)	(4)	(5)	(6)
Damage	.058**	.058**	.058**	.048**	.048**	.048**
	(.011)	(.011)	(.011)	(.009)	(.009)	(.009)
Burglary	.016*	.016*	.015*	.013*	.013*	.012*
	(.007)	(.007)	(.007)	(.006)	(.006)	(.006)
Robbery	.014*	.014*	.014*	.012*	.012*	.012*
	(.007)	(.007)	(.007)	(.006)	(.006)	(.006)
Theft	.049**	.048**	.049**	.041**	.040**	.041**
	(.011)	(.012)	(.012)	(.009)	(.010)	(.010)
State dummies	No	Yes	No	No	Yes	No
County dummies	No	No	Yes	No	No	Yes

NOTE.—The entries are the coefficients of gun availability at home. Robust standard errors are in parentheses. Sample sizes: damage: 12,671–844; burglary: 12,674–847; robbery: 12,676–850; theft: 12,657–831. All regressions include 19 control variables plus a series of age dummy variables.

* Statistically significant at the <5% level.

** Statistically significant at the <1% level.

in Table 5, which indicates that adding control variables does not influence the results significantly. This suggests that the effect of unobserved heterogeneity is not significant.

Whose Gun Is It? Omitted Variable?

To the extent that easy access to guns is controlled by parents, it is exogenous to the behavior of children. However, assume that those children who plan to commit crime acquire a gun. Under this scenario, if one sibling is more crime prone than the other, he would obtain a gun on his own, commit a crime, and answer the question "Is a gun is easily available to you in your home?" affirmatively, while the other sibling would answer "no." Here, we would expect more variation in the response to "Is a gun easily available to you in your home?" for siblings who have different criminal activities than siblings with similar criminal activities. We investigated the data on siblings who live in the same household and found that this was not the case.

Furthermore, national surveys indicate that only 6 percent of juveniles and about 10 percent of ninth- and tenth-grade boys own guns (Teret, Wintermute, and Beilenson 1992; Lizotte and Sheppard 2001). This means that the 23 percent rate for having easy access to guns at home displayed in our data set cannot be attributable in a meaningful way to gun ownership by juveniles.

If availability of guns at home is interpreted as a sign of undesirable home environment, and if such an environment affects the juvenile's criminal be-

TABLE 6

EFFECT OF GUN AVAILABILITY AT HOME ON CRIME: FIRST-DIFFERENCED DATA, NO CONTROL VARIABLES (Coefficient of Gun Availability)

	WITHOUT MEASUREMENT ERROR CORRECTION			WITH MEASUREMENT ERROR CORRECTION		
	(1)	(2)	(3)	(4)	(5)	(6)
Damage	.056**	.056**	.057**	.047**	.047**	.047**
	(.010)	(.010)	(.010)	(.008)	(.008)	(.008)
Burglary	.020**	.018**	.018**	.017**	.015**	.015**
	(.007)	(.007)	(.007)	(.006)	(.006)	(.006)
Robbery	.018**	.017**	.017**	.015**	.014**	.014**
	(.007)	(.007)	(.007)	(.006)	(.007)	(.007)
Theft	.058**	.057**	.058**	.048**	.047**	.048**
	(.011)	(.011)	(.011)	(.009)	(.009)	(.009)
State dummies	No	Yes	No	No	Yes	No
County dummies	No	No	Yes	No	No	Yes

NOTE.—The entries are the coefficients of gun availability at home. Robust standard errors are in parentheses. Sample sizes: damage: 14,268–511; burglary: 14,282–527; robbery: 14,284–527; theft: 14,251–493.

** Statistically significant at the <1% level.

havior, then the relationship between guns and crime is not causal, but it is a reflection of the influence of harmful home environment. For example, if most parents who allow their children to have access to guns at home have criminal tendencies themselves, and if such criminal human capital is transmitted to the child, then having access to guns is a proxy for a tendency for criminal behavior. We have no information on the criminal records of the parents, but it should be emphasized that taking first differences of the data eliminates parent-specific as well as child-specific heterogeneity, such as unobserved tendency for criminal delinquency.

Parent-specific time-varying heterogeneity may be correlated with both gun availability at home and children's criminal activity. For example, imagine a parent who loses his sanity between the two waves of the survey, starts abusing the family, and decides to purchase a gun. If the child is affected by this change in the home environment and starts acting up and committing crimes as a result, we would detect a correlation between the change in having access to guns and crime, but this would be an artifact of the change in the home environment. To test whether gun availability at home is merely a measure of unobserved time-varying parent characteristics that also affect child behavior, we investigated whether the change in gun availability has an effect on the change in grade point average or behavior of the child such as being expelled from school, drinking and fighting, and having sex.[15] If

[15] In wave 1 the questions for these behaviors are "Have you ever being expelled from school?" "Did you get into a physical fight because you had been drinking in the last 12 months?" and "Have you ever had sexual intercourse?" In wave 2, the same questions were asked as "Since the last interview, have you . . . "

TABLE 7

EFFECT OF GUN AVAILABILITY AT HOME ON OTHER BEHAVIOR: FIRST-DIFFERENCED DATA (Coefficient of Gun Availability)

	WITHOUT MEASUREMENT ERROR CORRECTION			WITH MEASUREMENT ERROR CORRECTION		
	(1)	(2)	(3)	(4)	(5)	(6)
Drinking and fighting	.010	.009	.009	.006	.005	.005
	(.008)	(.008)	(.008)	(.005)	(.005)	(.005)
Being expelled	.001	.002	.002	.0006	.0012	.0012
	(.006)	(.006)	(.006)	(.003)	(.003)	(.003)
Having sex	−.001	−.003	−.001	−.0006	−.002	−.0006
	(.010)	(.010)	(.010)	(.006)	(.006)	(.006)
Grade point average	.010	.013	.011	.006	.008	.006
	(.019)	(.020)	(.020)	(.011)	(.012)	(.012)
State dummies	No	Yes	No	No	Yes	No
County dummies	No	No	Yes	No	No	Yes

NOTE.—The entries are the coefficients of gun availability at home. Robust standard errors are in parentheses. Sample sizes: fighting: 12,684–858; being expelled: 12,687–861; having sex: 12,596–769; grade point average: 11,477–621. All regressions include 19 control variables plus a series of age dummy variables.

having guns available at home is a proxy of the home environment, then it should have an effect on these factors as well. The results, presented in Table 7, show that change over time in easy access to guns at home has no statistically significant effect on the change in grade point average or drinking and fighting, being expelled from school, or having sex. The point estimates were small, negative in some cases, and never statistically significant. This suggests that the estimated effect of guns on crime is not likely to be driven by omitted variables.

Victimization

One main argument in favor of concealed-weapons laws is that they allow law-abiding citizens to protect themselves from potential perpetrators. As a result, carrying a firearm is expected to decrease criminal victimization. We provide a test of this hypothesis. The data set contains five questions that measure criminal victimization of the juvenile. They are "whether during the past 12 months someone pulled a knife or gun on you," "whether during the past 12 months someone shot you," "whether during the past 12 months someone cut you or stabbed you," "whether during the past 12 months you were jumped," and "whether you witnessed someone being stabbed." Using the same set of explanatory variables, we estimated the probability of victimization on the basis of these questions. The results, which are reported in Table 8, reveal that having easy access to guns does not decrease the probability of victimization for juveniles. In fact, gun availability increases the probability of being cut or stabbed, being jumped, or witnessing a stabbing by about 2 percentage points. The increase in the probability of victimization

TABLE 8

EFFECT OF GUN AVAILABILITY ON VICTIMIZATION: FIRST-DIFFERENCED DATA
(Coefficient of Gun Availability)

	WITHOUT MEASUREMENT ERROR CORRECTION			WITH MEASUREMENT ERROR CORRECTION		
	(1)	(2)	(3)	(4)	(5)	(6)
Someone pulled a knife or gun on you	.012	.011	.011	.010	.009	.009
	(.009)	(.009)	(.009)	(.007)	(.007)	(.007)
Someone shot you	.004	.004	.003	.003	.003	.002
	(.004)	(.004)	(.004)	(.003)	(.003)	(.003)
Someone cut you or stabbed you	.018**	.018**	.017**	.015**	.015**	.014**
	(.006)	(.006)	(.006)	(.005)	(.005)	(.005)
You were jumped	.021*	.021*	.023*	.017*	.017*	.019*
	(.009)	(.009)	(.009)	(.007)	(.007)	(.007)
You witnessed someone being stabbed	.024**	.023*	.025**	.020**	.019*	.021**
	(.009)	(.009)	(.009)	(.007)	(.007)	(.007)
State dummies	No	Yes	No	No	Yes	No
County dummies	No	No	Yes	No	No	Yes

NOTE.—The entries are the coefficients of gun availability at home. Robust standard errors are in parentheses. Sample sizes: "someone pulled a knife or gun on you" and "someone cut you or stabbed you": 12,682–856; "someone shot you": 12,684–858; "you were jumped": 12,678–852; "you witnessed someone being stabbed": 12,673–847. All regressions include 19 control variables plus a series of age dummy variables.

* Statistically significant at the <5% level.

** Statistically significant at the <1% level.

might be because juveniles may become overconfident because of guns being available to them. As a result, they may engage in situations with less certain outcomes. This point has been demonstrated theoretically by Donohue and Levitt (1998).

VI. CONCLUSION

The analysis of the determinants of juvenile risky behavior in general and juvenile crime in particular has become an important research question (Gruber 2001; Levitt 1998a; Mocan and Rees 2005). In addition to sanctions, economic variables, and social factors, access to guns is a potentially important determinant of criminal activity. Existing inference on the gun/crime relationship relies on research that employed aggregate (state- or county-level) data. In addition, it has been difficult to find data sets with measures of gun availability. Therefore, researchers explained crime rates with some proxies of gun ownership, such as sales of gun magazines or suicides involving firearms. Alternatively, they analyzed the effect of gun laws on state or county crime rates.

In this paper we employ the Add Health data, a nationally representative

panel data set of high school students. In addition to an unusually large number of interesting variables that aim to gauge personal characteristics, family background, and family supervision, the data set includes a direct question on whether a gun is easily available to the juvenile at home. The crimes we analyze are robberies, burglaries, thefts, and property damage committed by juveniles.

The effect of gun availability on crime is analyzed using first-differenced data, in which time-invariant individual-specific and family-specific heterogeneity is eliminated. The results reveal that easy gun availability at home increases the propensity to commit robbery, burglary, theft, and property damage from 1 to 4 percentage points for juveniles, depending on the crime.

We report evidence to indicate that the variation in easy access to guns at home observed in these data mirrors the changes in national household-level gun ownership rates. Both the level and the change in our gun measure between the two survey years demonstrate that it is unlikely that the variation is driven by the behaviors of the juveniles.

It is unlikely that gun availability is merely a measure of the unobserved home environment either. This is because other measures of home environment, such as various parent supervision variables and variables that indicate the availability of alcohol or drugs at home, have no similar systematic effects on crime. Furthermore, gun availability at home has no effect on grade point average or behavior such as being expelled from school, drinking and fighting, and having sex.

We also investigate whether gun availability decreases the probability of being a crime victim. We find no support for this hypothesis; in fact, the results show that having easy access to guns at home increases the probability of being jumped, cut, or stabbed by someone and witnessing someone being stabbed. These results, taken together, suggest that having easy access to a gun at home has an effect on juvenile criminal behavior.

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