

The Minimum Dropout Age and Student Victimization

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Abstract

Over the years, the minimum dropout age has been raised to 18 in 21 states. Although these policy changes are promoted for their educational benefits, they have been shown to reduce crimes committed by youths in the affected age groups. However, an unintended consequence of increasing the minimum dropout age could be the displacement of crime from the streets to schools. We use data from the Youth Risk Behavior Surveys to estimate the relationship between minimum dropout age laws and student victimization. Our results suggest that higher minimum dropout ages increase the likelihood that females and younger students report missing school for fear of their safety and younger students are more likely to report being threatened or injured with a weapon on school property. Our results also yield some evidence that students are more likely to report being victims of in-school theft when the minimum dropout age is higher.

Keywords: Minimum dropout age; Student victimization; Delinquency
JEL classification: H75; I20; I28; K42

1. Introduction

Over the last three decades, nearly half of all states have changed their policy to raise the minimum age at which high school students are allowed to drop out of school.¹ Since 2009, Alabama, Michigan, Missouri, New Hampshire, Rhode Island, South Dakota, and West Virginia have all raised their minimum dropout ages (Bush, 2010; Sanchez, 2012; Vessel, 2009).

Ostensibly, these policy changes are intended to increase the educational achievements of residents and thereby improve economic outcomes for the individuals and for the state. National Education Association President Dennis Van Roekel recently commented on minimum dropout age requirements by declaring, “Any young person without a high school diploma is at a severe disadvantage in our high-tech labor market with its accompanying demands for advanced education. We can’t prepare students for the 21st century who aren’t in school” (National Education Association, 2012).

In addition to the purported educational benefits, new research provides evidence that these policy changes have had the side effect of reducing crimes committed by youths in the affected age groups (Anderson, 2012). Specifically, Anderson (2012) found that increasing the minimum dropout age (hereafter MDA) to 18 was associated with large reductions in property and violent crime arrest rates among 16 to 18 year-old males.² Moreover, his results were consistent with an incapacitation effect; keeping teenagers in school decreases the time and opportunity available to commit crimes.³

¹ Currently, all states have a minimum dropout age of 16, 17, or 18.

² Anderson (2012) also found large effects for drug-related crimes, but these estimates were generally not statistically significant. He also found the crime-reducing effect to be much less pronounced among females.

³ Other research has found that stricter dropout laws have led to higher income (Oreopoulos, 2006; Oreopoulos, 2007), better health (Kemptner, Jorges, & Reinhold 2011; van Kippersluis, O’Donnell, & van Doorslaer, 2011), increased political involvement (Milligan, Moretti, & Oreopoulos, 2004), a lower incidence of teenage childbearing

However, an unintended consequence of keeping youths from dropping out could be the displacement of criminal activity and delinquency back into schools, to the detriment of the academic achievement and quality of life of other students.⁴ In fact, efforts to raise the minimum dropout age are often met with the argument that mandating the attendance of students who no longer want to be in school can be disruptive to their classmates and unfair to teachers (Lewin, 2012). This criticism is supported by Eckstein and Wolpin (1999) who found that youths who drop out of high school have different traits than those who graduate, including lower motivation and a lower consumption value of school attendance.⁵

Our study considers the contemporaneous relationship between education and crime from the perspective of the potential victims. Specifically, we rely on data from the national Youth Risk Behavior Survey (YRBS) to quantify the relationship between MDA laws and student victimization.⁶ The temporal and spatial variation in MDA laws allows us to obtain difference-in-difference estimates of the impact of keeping would-be dropouts in school.⁷ Our results indicate that younger students and females are more likely to report missing school for fear of their safety when the MDA is higher (three and four percentage points, respectively). Our results

(Black, Devereux, & Salvanes, 2008; Silles, 2011), and a lower likelihood of adult criminality (Lochner and Moretti, 2004).

⁴ Given that Anderson (2012) relied on county-level arrest data, his results do not capture possible increases of within-school crime that do not end in arrest. It is often documented that within-school crime is severely underreported to the police (Jeffrey, 2012; Trump, 2012).

⁵ Bjerck (2012) described important differences among high school dropouts.

⁶ Anderson (2012) was the first to study the issue of displaced delinquency due to MDA laws. He focused, however, on the asymmetric effects between males and females by analyzing the following outcomes: whether the respondent missed school for fear of safety during the past month, whether the respondent reported having had sexual intercourse during the past month, whether the respondent reported having ever been pregnant. Anderson's (2012) results for the "having missed school for fear of safety" outcome are consistent with our estimates reported below and, interestingly, he also found that females are more likely to report recent sexual intercourse when the MDA is higher. Pennig (2012) attempted to address the topic of displaced delinquency, but was limited by a too-short panel and little policy variation.

⁷ Appendix Table 1 illustrates each state's MDA for the period 1993-2009.

also indicate that younger students are roughly four percentage points more likely to report being threatened or injured with a weapon on school property when the MDA is higher. Lastly, we find some evidence to suggest a positive relationship between the likelihood of in-school theft and the MDA.

Our study fits within the broad literature on the determinants of student victimization and in-school crime. Research has established that student victimization is sensitive to individual-level characteristics such as age (Mühlenweg, 2010), gender (Khoury-Kassabri, 2010), race (Peguero, 2009), and sexual orientation (Kosciw, Diaz, & Greytak, 2008), and school-level factors such as school disorder, climate, and organization (Payne, Gottfredson, & Gottfredson, 2003; Randa and Wilcox, 2010), socio-economic status (Khoury-Kassabri, Benbenishty, Astor, & Zeira, 2004), and school size (Ferris and West, 2004; Leung and Ferris, 2008).

Perhaps most relevant to our research are studies that suggest policies affecting attendance also impact violence within schools. For instance, Jacob and Lefgren (2003) examined the relationship between teacher in-service days and juvenile crime using data from the National Incident-Based Reporting System. They found that property crime decreased during days when school was in session while violent crime increased. The violent crime results are likely explained by concentration effects; keeping adolescents in school increases the number of potentially volatile interactions among students. Luallen (2006) found similar effects when examining the relationship between teacher strike days and juvenile crime in Washington. Our paper differs from these studies in that it examines the impact of changing attendance for only a small margin of students – those affected by MDA laws. Students on the margin of dropping out are important from a policy and social perspective because they represent high risk offenders.

Furthermore, we define juvenile crime from the vantage point of the potential victims, so that our data could reflect incidents that would not be reported as crimes or result in arrests.

From an academic achievement perspective, it is vital to understand the factors that contribute to student victimization and school crime. Not surprisingly, student exposure to violence and delinquency is associated with increased absenteeism and decreased student performance. The National Center for Education Statistics (2006) reported that six percent of students avoided school or a school activity during the past six months because of fear of attack or harm.⁸ In a similar vein, Dake, Price, & Telljohann (2003) and Reid (1989) found that victims of bullying are at increased risk of absenteeism, while Grogger (1997) found that both minor and moderate levels of school violence led to lower high school graduation rates and decreased the likelihood of college attendance.⁹ The effects on academic outcomes are likely due, in part, to the fact that delinquent students disrupt the learning process for others and divert resources away from teaching (Bowen and Bowen, 1999).¹⁰

2. Data

This paper is based on pooled cross-sectional data from the national YRBS for the period 1993 through 2009.¹¹ The national YRBS is conducted every other year by the Centers for Disease Control and Prevention (CDC) and provides a nationally representative sample of U.S.

⁸ This estimate is in line with rates reported in the YRBS data.

⁹ Grogger (1997) used principal reports of student-student and student-teacher conflicts as his measure of violence. His findings were robust even when controlling for the individual's family background and own disruptive behavior.

¹⁰ Others have also found that negative social interactions at school increase the risk of depression and suicidality (Hansen and Lang, 2012; Klomek, Marrocco, Kleinman, Schonfeld, & Gould, 2007).

¹¹ The national YRBS was initially conducted in 1991. However, we omitted this survey wave from the analysis because it is based on relatively few schools.

high school students.¹² The YRBS data are suited to address a range of topics on youth behavior, and have been frequently employed to examine the impacts of state-level policies.¹³ The goal of the survey is to collect information on youth behaviors that impact health. Each wave, students are asked questions about eating and exercise habits, the use of alcohol, tobacco, and drugs, sexual activity, and other health behaviors that may adversely influence their physical and emotional wellbeing. In addition to health behaviors, students are also asked about victimization and violence within school. We use questions from this portion of the survey to gauge the extent to which crime and delinquency are displaced from the streets to schools when the minimum dropout age is higher.¹⁴ The data also provide information on standard student demographic characteristics, and we employ the restricted use state-identified versions of the national YRBS to link each student with their state of residence.

3. Empirical Strategy

Our empirical analysis is reduced-form, based on the approach taken by previous researchers interested in the effects of MDA laws.¹⁵ Implicit to the relationship between MDA

¹² Although intended to be nationally representative, not all 50 states are represented in any given year the survey has been conducted. For a description of the number of observations by state and year available in the national YRBS, see Anderson, Hansen, & Rees (2012).

¹³ For examples, see Anderson (2010) on the effect of an anti-methamphetamine campaign on teen meth use; Tremblay and Ling (2005) on the relationship between AIDS education and youth sexual behavior; Carpenter and Cook (2008) on the effect of cigarette taxes on youth smoking; Cawley, Meyerhoefer, & Newhouse (2007) on the impact of state physical education requirements on youth physical activity and obesity; Hansen, Rees, & Sabia (2012) on the social market for cigarettes in high school; Taber, Stevens, Evenson, Ward, Poole, Maciejewski et al. (2011) on the effectiveness of state policies targeting junk food in schools.

¹⁴ Studies such as Dukarm, Byrd, Auinger, & Weitzman (1996) have used the national YRBS to examine determinants of delinquent and violent behavior among high school students.

¹⁵ For examples of other research that has taken a reduced-form approach to analyze the effects of compulsory schooling, see Black, Devereux, & Salvanes (2008), Green and Paniagua (2012), Lleras-Muney (2002), Oreopoulos (2009), and Wenger (2002).

laws and student victimization is that these laws impact attendance rates. Indeed, a large body of research has confirmed that stricter dropout laws reduce dropout rates. For example, Angrist and Krueger (1991) found that 25 percent of potential dropouts in the United States stay in school because of compulsory schooling laws.¹⁶

To examine the relationship between MDA laws and within-school victimization, we exploit the temporal and spatial variation of these laws and estimate difference-in-difference-type models that control for both unobserved state-level heterogeneity and national trends. Specifically, our baseline equation is:

$$(1) \quad Y_{ist} = \beta_0 + \beta_1(MDA_{st} > 16) + X_{ist}\beta_2 + Z_{st}\beta_3 + v_s + w_t + \varepsilon_{ist},$$

where i indexes individuals, s indexes states, t indexes years, and v_s and w_t represent state fixed effects and year effects, respectively. The variable $MDA_{st} > 16$ is an indicator for whether the minimum dropout age is higher than 16 in state s and year t . The coefficient of interest, β_1 , represents the effect of a higher MDA. The dependent variable, Y_{ist} , represents one of the five following possible binary outcomes: whether the student was threatened or injured with a weapon on school property in the past 12 months; whether the student was in a physical fight on school property in the past 12 months; whether the student missed school for fear of his/her safety in the past 30 days; whether the student was offered, sold, or given an illegal drug on school property in the past 12 months; whether the student had property stolen or damaged on

¹⁶ Other research on the effectiveness of compulsory schooling is consistent with Angrist and Krueger (1991). For examples, see Li (2006), Lochner and Moretti (2004), Oreopoulos (2009), and Wenger (2002).

school property in the past 12 months.¹⁷ The descriptive statistics for these binary indicators are shown in Table 1.¹⁸ In our preferred specifications, we add a term to control for state-specific linear time trends to account for omitted factors that trend smoothly over time at the state level.

The vectors X_{ist} and Z_{st} are comprised of the individual-level and state-level controls listed in Table 1, respectively. In particular, we control for the student's gender, age, grade level, and race. In addition, we include the state-level unemployment rate and income per capita. The unemployment data come from the Bureau of Labor Statistics, while the income per capita data come from the Bureau of Economic Analysis. Previous studies have shown that youth criminal behavior is sensitive to economic conditions (Grogger, 1998; Hashimoto, 1987). All regressions are estimated as linear probability models and standard errors are corrected for clustering at the state level (Bertrand, Duflo, & Mullainathan, 2004).

Because our approach relies on the assumption that students in states with an MDA of 16 serve as an appropriate counterfactual for students in states with a higher MDA, Table 1 indicates whether independent variable means are statistically different between the control and treatment groups. While the majority of individual-level characteristics are not statistically different, the two state-level characteristics (real state income and the unemployment rate) are statistically different at the 0.05 level. Fortunately, because our identification strategy relies on variation in MDA laws within states over time, time-invariant differences across states are taken into account. However, time-varying characteristics that change systematically with MDA laws may lead to biased estimates. While the inclusion of state-specific linear time trends largely

¹⁷ Information on property crimes was not collected in the national YRBS in 2009. As a result, we analyze the period 1993 through 2007 for this outcome.

¹⁸ Table 1 shows that the mean rate of reports of stolen property is statistically higher for students in MDA > 16 states. However, it is important to note these are only simple means and they do not account for potentially important confounding variables. Because of this, it is also important to note that the outcome means that are not statistically different may be masking important sources of heterogeneity that bias the difference towards zero.

mitigates this concern, it is useful to consider a simple test of policy endogeneity (Anderson, Hansen, & Rees, 2012; Cawley, Meyerhoefer, & Newhouse, 2007; McClellan, McNeil, & Newhouse, 1994). Specifically, we regress our policy variable of interest, $MDA_{st} > 16$, on a set of state-level characteristics that could be related to a state's decision to increase their MDA.¹⁹ In doing so, we find that only one regressor is statistically significant at the 0.05 level.²⁰ While it is impossible to confirm that MDA laws are uncorrelated with unobserved determinants of student victimization, this exercise provides some confidence that policy endogeneity does not plague our study.²¹

4. Results

Table 2 presents results based on the full sample and shows the estimated impact of our variable of interest, $MDA_{st} > 16$, on the five outcome variables for each of three specifications. Estimates in column (1) are based on a specification that includes only state fixed effects and year effects; estimates in column (2) are based on a specification that also includes the covariates

¹⁹ In particular, we estimate the following state-level panel regression for the period 1980-2008:

$$MDA_{st} > 16 = \beta_0 + \mathbf{X}_{st}\beta_1 + v_s + w_t + \varepsilon_{st},$$

where s indexes the state and t indexes the year. The vector \mathbf{X}_{st} is comprised of the following state-level characteristics: male violent crime arrest rate for 16 to 18 year olds; male property crime arrest rate for 16 to 18 year olds; male drug possession arrest rate for 16 to 18 year olds; male drug sale arrest rate for 16 to 18 year olds; percent of the population that is 15 to 19 years old; percent of the population that is black; percent of the population that is male; real income per capita; unemployment rate; four dummies indicating the state's minimum legal drinking age. The vectors v_s and w_t represent state fixed effects and year effects, respectively. The regression is estimated as a linear probability model and standard errors are corrected for clustering at the state level (Bertrand et al. 2004). State populations are used as weights. The results from this regression are available from the authors upon request.

²⁰ The relationship between the percent of the state population that is black and the MDA law is statistically significant at the 0.05 level. However, the estimated effect is negative in sign. If the percent of the population that is black is positively associated with rates of student victimization, then we would expect this to bias the effect of $MDA_{st} > 16$ towards zero.

²¹ We also examined trends in the state-level characteristics described in footnote 19 to assess whether these variables varied systematically with MDA laws. We found no obvious patterns to suggest that states with higher MDAs differ over time relative to states with lower MDAs.

listed in Table 1; and estimates in column (3) are based on the preferred specification that adds state-specific linear time trends. The data are weighted by the YRBS sample weights.

As a whole, students report few changes in their school environment as a result of increasing the minimum dropout age. Violent behavior, as measured by threats/injuries with a weapon (Panel A) or fighting on school property (Panel B), appears to be unaffected by the MDA. In Panel C, point estimates indicate a modest increase of just over one percentage point in the incidence of students missing school for fear of safety, but this estimate is not precisely measured.²² The availability of drugs on school property (Panel D) also appears to be unaffected by the MDA. The single outcome that does show a response to changing MDA laws is the incidence of property crime; Panel E illustrates point estimates that imply a four to six percentage point increase in property crimes, with two of the estimates showing statistical significance at the 0.05 level. This effect is substantial, as the average incidence of property crime is just over 30 percent. This finding is consistent with the notion that property crimes are displaced from the streets to schools when the MDA is higher.

While the estimates from Table 2 are informative, they may mask important heterogeneous effects. Guided by predictions from routine activity theory, we explore whether the relationship between MDA laws and student victimization depends on gender or age.²³

Within this framework, the potential offenders are the would-be dropouts and the more

²² It is worth mentioning that we update the “miss school for fear of safety” results from Anderson (2012) by analyzing a longer time period.

²³ Appendix Tables 2 and 3 illustrate descriptive statistics for the dependent variables by gender and age, respectively. Appendix Table 4 illustrates descriptive statistics for the dependent variables relative to the timing of an increase in the MDA. These data are consistent with the notion that the risk of victimization is higher after the MDA is raised. We also experimented with assigning “placebo” MDA > 16 laws to states that always had a MDA = 16 during the 1993-2009 period. Assignment was based on random numbers drawn from the uniform distribution. When doing this, the mean rate of victimization, across all dependent variables and for all subsamples, was never statistically significantly greater after a “placebo” MDA > 16 law was passed. These results are available from the authors upon request.

vulnerable students (e.g. younger students or females) represent attractive targets for a range of delinquent and aggressive behaviors (Cohen and Felson, 1979).²⁴ The first two columns of Table 3 illustrate results separately for males and females. The estimates for males are never statistically distinguishable from zero and are positive in only two of the five regressions. The estimates for females, however, are always positive in sign. Moreover, the results indicate that the incidence of girls missing school for fear of safety (Panel C) nearly doubles when the MDA is higher. The estimated coefficient is 0.039 and the overall incidence of missing school for fear of safety is just over 0.05. This effect is also statistically significant at the 0.05 level.

The third and fourth columns of Table 3 compare estimates for students under the age of 16 with estimates for students 16 years of age or older.²⁵ A benefit of restricting the sample to students under the age of 16 is that this ensures our estimates do not incorporate information from students who are kept in school because of a higher MDA. In all states, students under the age of 16 are legally obligated to attend school. Panel A illustrates that younger students report over a four percentage point increase in the likelihood of being threatened or injured with a weapon on school property when the MDA is higher, and this effect is statistically significant at the 0.05 level. Columns (5) and (6) indicate that this effect is driven primarily by the young males in the sample.²⁶

Similarly, younger students also report a nearly three percentage point increase in the likelihood of missing school for fear of safety (Panel C) when the MDA is higher, and this

²⁴ Within routine activity theory, teachers, administrators, and other staff represent capable guardians who cannot always be present in school or at school events.

²⁵ Including students who are forced to stay in school longer because of the law change implies a sample selection bias. As a result, we view our estimates for the under-sixteen sample as the most credible estimates in the paper.

²⁶ These results are consistent with evidence showing that younger males are more likely to be victims of violent crime at school (Givens and Napolitano, 2010).

estimate is statistically significant at the 0.05 level. Columns (5) and (6) indicate that this effect is driven by the young females in the sample.²⁷

The estimates for students 16 years of age or older (Column (4)) do not show the same pattern; there are some positive point estimates, but these are never statistically significant. In fact, older students appear somewhat less likely to be threatened or injured with a weapon on school property when the MDA is higher, and this estimate is statistically significant at the 0.10 level.²⁸ Columns (7) and (8) indicate that this effect is driven by the older males in the sample.²⁹

In general, our results suggest that keeping potentially disruptive students in school has negative impacts on classmates. Importantly, we highlight specific mechanisms through which disruptive students may impact others when forced to stay in school. Namely, increases in violence, theft and the fear of one's own safety all have the potential to decrease student welfare. Our findings are consistent with recent research showing that high school classmate characteristics can influence a wide array of outcomes (Bifulco, Fletcher, & Ross, 2011). Certainly, schools most affected by increases in the MDA will experience systematic changes in the composition of their student body.

²⁷ These results are consistent with evidence showing that the perception of school safety among females is more sensitive to school experiences than it is for males (May and Dunaway, 2000).

²⁸ In alternative specifications, we assessed the sensitivity of our estimates to the inclusion of proxies for school environment. Our results were robust to the inclusion of these variables. For the sake of brevity, these estimates are not included, but are available from the authors upon request.

²⁹ A possible explanation for this negative finding may be due to the selection effect mentioned above. That is, the students induced to stay in school longer are more likely to pick on younger students. Therefore, in high MDA states, older males may be less likely to be victims of weapon-related crimes simply because they are even less likely to be a target. We are grateful to a referee for suggesting this explanation. This also corresponds to other research showing that younger students are disproportionately likely to report having been bullied or cyber bullied (Hansen and Lang, 2012).

5. Conclusion

This study examines a possible unintended consequence of changing minimum dropout age laws. Increasing the minimum dropout age could lead to more delinquents being kept in school, and these individuals may impose costs on other students due to their presence. Possible consequences include increased bullying, threats, and gang activity or simply a decrease in the perception of school safety. We quantify the relationship between state-level MDA laws and various measures of student victimization, using data from the national Youth Risk Behavior Surveys. Our results indicate modest impacts on students' experiences of property crime and stronger evidence that younger students and females experience increased violence and concerns about school safety. School administrators and policymakers should take these potential consequences into account and act to mitigate them when there are increases in the minimum dropout age.

Future research should extend our analysis to other outcomes that may be influenced by keeping possible delinquents in school longer. A growing literature suggests that exposure to negative peer effects in school not only impedes academic performance (Carrell and Hoekstra, 2010; Figlio, 2007; Robertson and Symons, 2003), but increases the likelihood of substance use (Gaviria and Raphael, 2001; Kawaguchi, 2004; Lundborg, 2006; Powell, Tauras, & Ross, 2005), misbehavior in the classroom (Carrell and Hoekstra, 2010), and cheating (Carrell, Malmstrom, & West, 2008). Lastly, because high schools in the United States differ widely in their dropout and completion rates, future research might also want to consider important heterogeneous effects. Despite the fact that dropout rates have not been measured uniformly across states, it could still be possible to study the broad differences in school outcomes as MDA laws have changed over the years.

References

- Anderson, D. M. (2010). Does Information Matter? The Effect of the Meth Project on Meth Use among Youths. *Journal of Health Economics* 29 (5), 732-742.
- Anderson, D. M. (2012). In School and Out of Trouble? The Minimum Dropout Age and Juvenile Crime. Forthcoming *Review of Economics and Statistics*.
- Anderson, D. M., Hansen, B., & Rees, D.I. (2012). Medical Marijuana Laws and Teen Marijuana Use. IZA Discussion Paper No. 6592.
- Anderson, D. M., Hansen, B., & Rees, D.I. (2012). Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption. Forthcoming *Journal of Law and Economics*.
- Angrist, J., & Krueger, A. (1991). Does Compulsory School Attendance Affect Schooling and Earnings? *Quarterly Journal of Economics* 106 (4), 979-1014.
- Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How Much Should We Trust Differences-in-Differences Estimates? *Quarterly Journal of Economics* 119 (1), 249-276.
- Bifulco, R., Fletcher, J., & Ross, S. (2011). The Effect of Classmate Characteristics on Post-Secondary Outcomes: Evidence from the Add Health. *American Economic Journal: Economic Policy* 3 (1), 25-53.
- Bjerk, D. (2012). Re-examining the Impact of Dropping Out on Criminal and Labor Outcomes in Early Adulthood. *Economics of Education Review* 31 (1), 110-122.
- Black, S., Devereux, P., & Salvanes, K. (2008). Staying in the Classroom and Out of the Maternity Ward? The Effect of Compulsory Schooling Laws on Teenage Births. *Economic Journal* 118 (530), 1025-1054.
- Bowen, N., & Bowen, G. (1999). Effects of Crime and Violence in Neighborhoods and Schools on the School Performance of Adolescents. *Journal of Adolescent Research* 14 (3), 319-342.
- Bush, M. (2010). Compulsory School Age Requirements. *Education Commission of the States*. Available at: <http://www.ecs.org/clearinghouse/86/62/8662.pdf>.
- Carpenter, C., & Cook, P. (2008). Cigarette Taxes and Youth Smoking: New Evidence from National, State, and Local Youth Risk Behavior Surveys. *Journal of Health Economics* 27 (2), 287-299.
- Carrell, S., & Hoekstra, M. (2010). Externalities in the Classroom: How Children Exposed to Domestic Violence Affect Everyone's Kids. *American Economic Journal: Applied Economics* 2 (1), 211-228.

- Carrell, S., Malmstrom, F., & West, J. (2008). Peer Effects in Academic Cheating. *Journal of Human Resources* 43 (1), 173-207.
- Cawley, J., Meyerhoefer, C., & Newhouse, D. (2007). The Impact of State Physical Education Requirements on Youth Physical Activity and Overweight. *Health Economics* 16 (12), 1287-1301.
- Cohen, L., & Felson, M. (1979). Social Change and Crime Rate Trends: A Routine Activity Approach. *American Sociological Review* 44 (4), 588-608.
- Dake, J., Price, J., & Telljohann, S. (2003). The Nature and Extent of Bullying at School. *Journal of School Health* 73(5), 173-180.
- Dukarm, C., Byrd, R., Auinger, P., & Weitzman, M. (1996). Illicit Substance Use, Gender, and the Risk of Violent Behavior Among Adolescents. *Archives Of Pediatrics and Adolescent Medicine* 150 (8), 797-801.
- Eckstein, Z., & Wolpin, K. (1999). Why Youths Drop Out of High School: The Impact of Preferences, Opportunities and Abilities. *Econometrica* 67 (6), 1295-1340.
- Ferris, J. S., & West, E. (2004). Economies of Scale, School Violence, and the Optimal Size of Schools. *Applied Economics* 36 (15), 1677-1684.
- Figlio, D. (2007). Boys Named Sue: Disruptive Children and their Peers. *Education Finance and Policy* 2 (4), 376-394.
- Gaviria, A., & Raphael, S. (2001). School-Based Peer Effects and Juvenile Behavior. *Review of Economics and Statistics* 83 (2), 257-268.
- Givens, J., & Napolitano, S.S. (2010). School Violence. Educational Psychology Papers and Publications. Department of Educational Psychology, University of Nebraska-Lincoln.
- Green, C., & Paniagua, M. (2012). Does Raising the School Leaving Age Reduce Teacher Effort? Evidence from a Policy Experiment. *Economic Inquiry* 50 (4), 1018-1030.
- Grogger, J. (1997). Local Violence and Educational Attainment. *Journal of Human Resources* 32 (4), 659-682.
- Grogger, J. (1998). Market Wages and Youth Crime. *Journal of Labor Economics* 16 (4), 756-791.
- Hansen, B., & Lang, M. (2012). Bullying and Youth Suicide. Working Paper, University of Oregon.

- Hansen, B., Rees, D.I., & Sabia, J. (2012). "Cigarette Taxes and How Youth Obtain Cigarettes." Forthcoming *National Tax Journal*.
- Hashimoto, M. (1987). The Minimum Wage and Youth Crimes: Time-Series Evidence. *Journal of Law and Economics* 30 (2), 443-464.
- Jacob, B., & Lefgren, L. (2003). Are Idle Hands the Devil's Workshop? Incapacitation, Concentration, and Juvenile Crime. *American Economic Review* 93 (5), 1560-1577.
- Jeffrey, T. (2012). 1,183,700 Violent Crimes Committed at Public Schools; Only 303,900 Reported to Police. *CNS News*. Available at: <http://cnsnews.com/news/article/1183700-violent-crimes-committed-public-schools-only-303900-reported-police>.
- Kawaguchi, D. (2004). Peer Effects on Substance Use among American Teenagers. *Journal of Population Economics* 17 (2), 351-367.
- Kemptner, D., Jürges, H., & Reinhold, S. (2011). Changes in Compulsory Schooling and the Causal Effect of Education on Health: Evidence from Germany. *Journal of Health Economics* 30 (2), 340-354.
- Khoury-Kassabri, M. (2010). Student Victimization by Peers in Elementary Schools: Individual, Teacher-Class, and School-Level Predictors. *Child Abuse & Neglect* 35 (4), 273-282.
- Khoury-Kassabri, M., Benbenishty, R., Astor, R. A., & Zeira, A. (2004). The Contributions of Community, Family, and School Variables to Student Victimization. *American Journal of Community Psychology* 34 (3/4), 187-204.
- Klomek, A., Marrocco, F., Kleinman, M., Schonfeld, I., & Gould, M. (2007). Bullying, Depression, and Suicidality in Adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry* 46 (1), 40-49.
- Kosciw, J., Diaz, E., & Greytak, E. (2008). The 2007 National School Climate Survey: The Experiences of Lesbian, Gay, Bisexual and Transgender Youth in our Nation's Schools. New York: Gay, Lesbian, and Straight Education Network.
- Leung, A., & Ferris, J.S. (2008). School Size and Youth Violence. *Journal of Economic Behavior and Organization* 65 (2), 318-333.
- Lewin, T. (2012). Obama Wades Into Issue of Raising Dropout Age. *New York Times*. Available at: <http://www.nytimes.com/2012/01/26/education/obama-wades-into-issue-of-raising-dropout-age.html>.
- Li, M. (2006). High School Completion and Future Youth Unemployment: New Evidence from High School and Beyond. *Journal of Applied Econometrics* 21 (1), 23-53.

- Lleras-Muney, A. (2002). Were Compulsory Attendance and Child Labor Laws Effective: An Analysis from 1915 to 1939. *Journal of Law and Economics* 45 (2), 401-435.
- Lochner, L., & Moretti, E. (2004). The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports. *American Economic Review* 94 (1), 155-189.
- Luallen, J. (2006). School's Out...Forever: A Study of Juvenile Crime, At-risk Youths and Teacher Strikes. *Journal of Urban Economics* 59 (1), 75-103.
- Lundborg, P. (2006). Having the Wrong Friends? Peer Effects in Adolescent Substance Use. *Journal of Health Economics* 25 (2), 214-233.
- May, D., & Dunaway, G. (2000). Predictors of Fear of Criminal Victimization at School among Adolescents. *Sociological Spectrum* 20 (2), 149-168.
- McClellan, M., McNeil, B., & Newhouse, J. (1994). Does More Intensive Treatment of Acute Myocardial Infarction in the Elderly Reduce Mortality? *Journal of the American Medical Association* 272 (11), 859-866.
- Milligan, K., Moretti, E., & Oreopoulos, P. (2004). Does Education Improve Citizenship? Evidence from the United States and the United Kingdom. *Journal of Public Economics* 88 (9-10), 1667-1695.
- Mühlenweg, A. (2010). Young and Innocent: International Evidence on Age Effects Within Grades on Victimization in Elementary School. *Economics Letters* 109 (3), 157-160.
- National Center for Education Statistics. (2006). *Indicators of School Crime and Safety: 2006*. Washington, D.C.: US Department of Education.
- National Education Association. (2012). Raising Compulsory School Age Requirements: A Dropout Fix? *National Education Association Policy Brief*. Available at: <http://www.nea.org/assets/docs/PB40raisingcompulsoryschoolage2012.pdf>.
- Oreopoulos, P. (2006). The Compelling Effects of Compulsory Schooling: Evidence from Canada. *Canadian Journal of Economics* 39 (1), 22-52.
- Oreopoulos, P. (2007). Do Dropouts Drop Out Too Soon? Wealth, Health and Happiness from Compulsory Schooling. *Journal of Public Economics* 91 (11-12), 2213-2229.
- Oreopoulos, P. (2009). Would More Compulsory Schooling Help Disadvantaged Youth? Evidence from Recent Changes to School-Leaving Laws. In J. Gruber, *The Problems of Disadvantaged Youth: An Economic Perspective*. Chicago, IL: University of Chicago Press.

- Payne, A., Gottfredson, D., & Gottfredson, G. (2003). Schools as Communities: The Relationships among Communal School Organization, Student Bonding, and School Disorder. *Criminology* 41 (3), 749-778.
- Pennig, L. (2012). Compulsory Schooling Laws and In-School Crime: Are Delinquents Incapacitated? Master's Thesis, Montana State University.
- Powell, L., Tauras, J., & Ross, H. (2005). The Importance of Peer Effects, Cigarette Prices, and Tobacco Control Policies for Youth Smoking Behavior. *Journal of Health Economics* 24 (5), 950-968.
- Peguero, A. (2009). Victimized Children of Immigrants: Latino and Asian American Student Victimization. *Youth & Society* 41 (2), 186-208.
- Randa, R., & Wilcox, P. (2010). School Disorder, Victimization, and General v. Place-Specific Student Avoidance. *Journal of Criminal Justice* 38 (5), 854-861.
- Reid, K. (1989). Bullying and Persistent School Absenteeism. In D.P. Tattum and D. A. Lane, *Bullying in Schools*. Stoke-on-Trent, England: Trentham Books.
- Robertson, D., & Symons, J. (2003). Do Peer Groups Matter? Peer Group versus Schooling Effects on Academic Attainment. *Economica* 70 (277), 31-53.
- Sanchez, C. (2012). Higher Dropout Age May Not Lead to More Diplomas. *National Public Radio*. Available at: <http://www.npr.org/2012/01/27/145984943/higher-drop-out-age-may-not-lead-to-more-diplomas>.
- Silles, M. (2011). The Effect of Schooling on Teenage Childbearing: Evidence Using Changes in Compulsory Education Laws. *Journal of Population Economics* 24 (2), 761-777.
- Taber, D., Stevens, J., Evenson, K., Ward, D., Poole, C., Maciejewski, M., Murray, D., & Brownson, R. (2011). State Policies Targeting Junk Food in Schools: Racial/Ethnic Differences in the Effect of Policy Change on Soda Consumption. *American Journal of Public Health* 101 (9), 1769-1775.
- Tremblay, C., & Ling, D. (2005). AIDS Education, Condom Demand, and the Sexual Activity of American Youth. *Health Economics* 14 (8), 851-867.
- Trump, K. (2012). School Crime Reporting and School Crime Underreporting. National School Safety and Security Services. Available at: http://www.schoolsecurity.org/trends/school_crime_reporting.html.
- Van Kippersluis, H., O'Donnell, O., & Van Doorslaer, E. (2011). Long-Run Returns to Education: Does Schooling Lead to an Extended Old Age? *Journal of Human Resources* 46 (4), 695-721.

Vessell, C. (2009). School Drop-Out Age Increase Impacts Opelika Schools. *WTVM News*.
Available at:
<http://www.wtvm.com/Global/story.asp?S=11404362>.

Wenger, J. (2002). Does the Dropout Age Matter? How Mandatory Schooling Laws Impact High School Completion and School Choice. *Public Finance and Management* 2 (4), 507-534.

Table 1. Descriptive Statistics for YRBS 1993-2009

	<i>MDA > 16</i>	<i>MDA = 16</i>
Dependent variables		
<i>Threatened or injured with a weapon on school property in past 12 months</i>	0.079	0.080
<i>In a fight on school property in past 12 months</i>	0.135	0.137
<i>Missed school for fear of safety in past 30 days</i>	0.052	0.050
<i>Offered an illegal drug on school property in past 12 months</i>	0.273	0.268
<i>Property stolen or damaged on school property in past 12 months^a</i>	0.322	0.301
Independent variables		
<i>Male</i>	0.518	0.510
<i>Age less than 15</i>	0.106	0.107
<i>Age = 15</i>	0.242	0.247
<i>Age = 16</i>	0.262	0.261
<i>Age = 17</i>	0.248	0.245
<i>Age 18 or older</i>	0.143	0.140
<i>Grade 9^a</i>	0.266	0.275
<i>Grade 10</i>	0.254	0.254
<i>Grade 11</i>	0.243	0.237
<i>Grade 12</i>	0.234	0.232
<i>Ungraded^a</i>	0.003	0.002
<i>Black^a</i>	0.119	0.152
<i>White</i>	0.541	0.602
<i>Other race^a</i>	0.340	0.246
<i>Unemployment rate^a</i>	6.08	5.45
<i>Real state income^a</i>	28,758	29,359
N	71,931	57,863

^a Statistically different at 5% level.

Notes: Based on weighted data from the national YRBS. The number of observations for the independent variables match the sample from Panel A in Table 2.

Table 2. Minimum Dropout Age Laws and Student Victimization

<i>Panel A: Threatened or injured with a weapon on school property in past 12 months</i>			
<i>MDA > 16</i>	0.009 (0.007)	0.006 (0.005)	0.005 (0.011)
N	129,794	129,794	129,794
<i>Panel B: In a fight on school property in past 12 months</i>			
<i>MDA > 16</i>	-0.004 (0.012)	-0.012 (0.009)	-0.001 (0.010)
N	127,922	127,922	127,922
<i>Panel C: Missed school for fear of safety in past 30 days</i>			
<i>MDA > 16</i>	0.017 (0.017)	0.013 (0.016)	0.013 (0.010)
N	129,769	129,769	129,769
<i>Panel D: Offered an illegal drug on school property in past 12 months</i>			
<i>MDA > 16</i>	-0.007 (0.020)	-0.009 (0.018)	0.032 (0.034)
N	128,683	128,683	128,683
<i>Panel E: Property stolen or damaged on school property in past 12 months</i>			
<i>MDA > 16</i>	0.047** (0.019)	0.057*** (0.021)	0.037 (0.051)
N	84,869	84,869	84,869
State Fixed Effects	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes
Covariates	No	Yes	Yes
State Trends	No	No	Yes

* Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: Each cell represents the results from a separate regression. The results in Panels A through D are based on YRBS data for the period 1993 through 2009. The results in Panel E are based on YRBS data for the period 1993 through 2007. The covariates are listed in Table 1. Standard errors, corrected for clustering at the state level, are in parentheses and regressions are weighted using the sample weights from the YRBS.

Table 3. Minimum Dropout Age Laws and Student Victimization by Gender and Age

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males	Females	Age < 16	Age ≥ 16	Males Age < 16	Females Age < 16	Males Age ≥ 16	Females Age ≥ 16
<i>Panel A: Threatened or injured with a weapon on school property in past 12 months</i>								
<i>MDA > 16</i>	-0.011 (0.014)	0.019 (0.019)	0.043** (0.016)	-0.016* (0.010)	0.065* (0.038)	0.023 (0.047)	-0.047** (0.020)	0.016 (0.013)
N	63,830	65,964	40,940	88,854	19,167	21,773	44,663	44,191
<i>Panel B: In a fight on school property in past 12 months</i>								
<i>MDA > 16</i>	-0.009 (0.044)	0.003 (0.036)	0.023 (0.025)	-0.015 (0.016)	0.069 (0.062)	-0.021 (0.059)	-0.044 (0.052)	0.012 (0.027)
N	62,693	65,229	40,250	87,672	18,771	21,479	43,922	43,750
<i>Panel C: Missed school for fear of safety in past 30 days</i>								
<i>MDA > 16</i>	-0.013 (0.016)	0.039** (0.015)	0.027** (0.013)	0.004 (0.012)	0.001 (0.012)	0.050** (0.022)	-0.018 (0.021)	0.030* (0.015)
N	63,819	65,950	40,936	88,833	19,164	21,772	44,655	44,178
<i>Panel D: Offered an illegal drug on school property in past 12 months</i>								
<i>MDA > 16</i>	0.011 (0.053)	0.044 (0.055)	0.015 (0.034)	0.040 (0.039)	-0.023 (0.059)	0.037 (0.051)	0.033 (0.052)	0.044 (0.064)
N	63,166	65,517	40,607	88,076	18,964	21,643	44,202	43,874
<i>Panel E: Property stolen or damaged on school property in past 12 months</i>								
<i>MDA > 16</i>	0.058 (0.063)	0.011 (0.042)	0.008 (0.044)	0.051 (0.065)	0.022 (0.057)	0.003 (0.036)	0.078 (0.086)	0.014 (0.050)
N	41,890	42,979	26,774	58,095	12,700	14,074	29,190	28,905

* Statistically significant at 10% level; ** at 5% level; *** at 1% level.

Notes: Each cell represents the results from a separate regression. The results in Panels A through D are based on YRBS data for the period 1993 through 2009. The results in Panel E are based on YRBS data for the period 1993 through 2007. All regressions control for state fixed effects, year effects, state-specific linear trends and the covariates listed in Table 1. Standard errors, corrected for clustering at the state level, are in parentheses and regressions are weighted using the sample weights from the YRBS.

Appendix Table 1. Minimum Dropout Age by State and Year

	1993	1995	1997	1999	2001	2003	2005	2007	2009
Alabama	16	16	16	16	16	16	16	16	16
Alaska	16	16	16	16	16	16	16	16	16
Arizona	16	16	16	16	16	16	16	16	16
Arkansas	17	17	17	17	17	17	17	17	17
California	18	18	18	18	18	18	18	18	18
Colorado	16	16	16	16	16	16	16	17	17
Connecticut	16	16	16	16	18	18	18	18	18
Delaware	16	16	16	16	16	16	16	16	16
D.C.	17	17	18	18	18	18	18	18	18
Florida	16	16	16	16	16	16	16	16	16
Georgia	16	16	16	16	16	16	16	16	16
Hawaii	18	18	18	18	18	18	18	18	18
Idaho	16	16	16	16	16	16	16	16	16
Illinois	16	16	16	16	16	16	17	17	17
Indiana	16	16	16	16	16	16	16	18	18
Iowa	16	16	16	16	16	16	16	16	16
Kansas	16	16	18	18	18	18	18	18	18
Kentucky	16	16	16	16	16	16	16	16	16
Louisiana	17	17	17	17	18	18	18	18	18
Maine	17	17	17	17	17	17	17	17	17
Maryland	16	16	16	16	16	16	16	16	16
Massachusetts	16	16	16	16	16	16	16	16	16
Michigan	16	16	16	16	16	16	16	16	16
Minnesota	16	16	16	16	16	16	16	16	16
Mississippi	16	16	17	17	17	17	17	17	17
Missouri	16	16	16	16	16	16	16	16	16
Montana	16	16	16	16	16	16	16	16	16
Nebraska	16	16	16	16	16	16	18	18	18
Nevada	17	17	17	17	17	17	17	18	18
New Hampshire	16	16	16	16	16	16	16	16	16
New Jersey	16	16	16	16	16	16	16	16	16
New Mexico	18	18	18	18	18	18	18	18	18
New York	16	16	16	16	16	16	16	16	16
North Carolina	16	16	16	16	16	16	16	16	16
North Dakota	16	16	16	16	16	16	16	16	16
Ohio	18	18	18	18	18	18	18	18	18
Oklahoma	18	18	18	18	18	18	18	18	18
Oregon	18	18	18	18	18	18	18	18	18
Pennsylvania	17	17	17	17	17	17	17	17	17
Rhode Island	16	16	16	16	16	16	16	16	16
South Carolina	17	17	17	17	17	17	17	17	17
South Dakota	16	16	16	16	16	16	16	16	16
Tennessee	17	17	17	17	17	17	17	17	17
Texas	17	17	18	18	18	18	18	18	18

Appendix Table 1. Minimum Dropout Age by State and Year (continued)

	1993	1995	1997	1999	2001	2003	2005	2007	2009
Utah	18	18	18	18	18	18	18	18	18
Vermont	16	16	16	16	16	16	16	16	16
Virginia	18	18	18	18	18	18	18	18	18
Washington	18	18	18	18	18	18	18	18	18
West Virginia	16	16	16	16	16	16	16	16	16
Wisconsin	18	18	18	18	18	18	18	18	18
Wyoming	16	16	16	16	16	16	16	16	16

Note: Data on state minimum dropout ages come from Oreopoulos (2009), the National Center for Education Statistics' *Digest of Education Statistics*, and various reports and policy briefs.

Appendix Table 2. Descriptive Statistics for Dependent Variables by Gender

	Males		Females	
	<i>MDA > 16</i>	<i>MDA = 16</i>	<i>MDA > 16</i>	<i>MDA = 16</i>
<i>Threatened or injured with a weapon on school property in past 12 months</i>	0.101	0.102	0.055	0.058
<i>In a fight on school property in past 12 months</i>	0.181	0.191	0.086	0.081
<i>Missed school for fear of safety in past 30 days</i>	0.049	0.049	0.054	0.052
<i>Offered an illegal drug on school property in past 12 months</i>	0.315	0.316	0.227	0.218
<i>Property stolen or damaged on school property in past 12 month^{a, b}</i>	0.356	0.340	0.285	0.260

^a Statistically different for males at 5% level; ^b Statistically different for females at 5% level.

Notes: Based on weighted data from the national YRBS.

Appendix Table 3. Descriptive Statistics for Dependent Variables by Age

	Age < 16		Age ≥ 16	
	<u>MDA > 16</u>	<u>MDA = 16</u>	<u>MDA > 16</u>	<u>MDA = 16</u>
<i>Threatened or injured with a weapon on school property in past 12 months</i>	0.091	0.099	0.072	0.070
<i>In a fight on school property in past 12 months</i>	0.163	0.169	0.120	0.119
<i>Missed school for fear of safety in past 30 days</i>	0.059	0.059	0.048	0.046
<i>Offered an illegal drug on school property in past 12 months</i>	0.261	0.267	0.279	0.269
<i>Property stolen or damaged on school property in past 12 month^{a, b}</i>	0.360	0.333	0.302	0.284

^a Statistically different for individuals under the age of 16 at 5% level; ^b Statistically different for individuals 16 years of age and older at 5% level.

Notes: Based on weighted data from the national YRBS.

Appendix Table 4. Descriptive Statistics for Dependent Variables Relative to MDA Change

	Full Sample		Males		Females		Age < 16		Age ≥ 16	
	Before MDA > 16	After MDA > 16								
<i>Threatened or injured with a weapon on school property in past 12 months</i>	0.083	0.086	0.109	0.115	0.058	0.055	0.089	0.086	0.081	0.086
<i>In a fight on school property in past 12 months</i> ^{a, c}	0.131	0.149	0.188	0.193	0.077	0.103	0.150	0.172	0.121	0.138
<i>Missed school for fear of safety in past 30 days</i> ^{a, b, c, d, e}	0.045	0.064	0.046	0.066	0.044	0.062	0.051	0.072	0.042	0.060
<i>Offered an illegal drug on school property in past 12 months</i> ^{a, b, c, d, e}	0.215	0.309	0.271	0.357	0.161	0.260	0.208	0.300	0.219	0.314
<i>Property stolen or damaged on school property in past 12 month</i> ^{a, b, c, d, e}	0.275	0.343	0.316	0.375	0.232	0.309	0.317	0.375	0.253	0.328

^a Statistically different for full sample at 5% level; ^b Statistically different for males at 5% level; ^c Statistically different for females at 5% level; ^d Statistically different for individuals under the age of 16 at 5% level; ^e Statistically different for individuals 16 years of age and older at 5% level.

Notes: Based on weighted data from the national YRBS. The means are calculated from the sample of students in states that raised their MDA from 16 to 17 or 18. The “Before MDA > 16” means are based on rates of victimization occurring 1 to 4 years before the MDA was raised. The “After MDA > 16” means are based on rates of victimization occurring 1 to 4 years after the MDA was raised.