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Abstract*

This paper uses a natural policy experiment to estimate how changes in the costs of engaging in criminal activity may influence adolescents' decisions in crime participation and school attendance. The study finds that, after an exogenous decrease in the severity of judicial punishment imposed on Colombian adolescents, crime rates in Colombian municipalities increased. This effect appears to be larger in municipalities with a higher proportion of adolescents between 14 and 15 years of age. The study provides suggestive evidence that one possible transmission channel for this effect is a decrease in the effort of the police force to capture teenage suspects. The study also finds that the probability that boys of this same age group attend school decreased following the change in the juvenile justice system. This effect is stronger for boys from homes where the heads of household are less educated.

JEL classifications: D19, I25, K14

Keywords: Crime, School attendance, Adolescents, Colombia

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1. Introduction

In the 1990s, juvenile crime rates rose almost everywhere in the world (United Nations, 2004, 2007). In Western Europe, the number of teenagers convicted or given warnings by the police almost doubled from the 1980s to the late 1990s. In Colombia, Brazil, El Salvador, and Venezuela, the main cause of death of people between the ages of 15 and 24 is homicide. Similarly, in the United States, the juvenile homicide arrest rate had more than doubled by the early 1990s. In many countries, juvenile crime has increased faster than adult crime, as has the degree of violence.¹

Understanding these trends and how to reverse them is crucial for several reasons. First, criminal behavior begins early in life (Greenwood, 1995), peaking in the middle teen years and decreasing thereafter. Almost all of the most violent adult criminals committed their first crime as adolescents. Finally, young people who attempt to return to legitimate activities often face limited job opportunities (Grogger, 1995).

There is currently no consensus in the fields of criminology, economics, or public policy on the best way to hold adolescents accountable for criminal behavior. A variety of theories of justice are applied to teenagers in different countries. A protectionist view holds that teens are considered not legally responsible for their acts due to their inability to make ethical judgments. They are considered victims of poverty who lack supervision and appropriate upbringing and who therefore require protection from the State. The criminal justice systems in Germany, Spain, and France are informed by this view. At the other extreme is the penal view, which holds teens responsible for their acts and treats them accordingly in juvenile courts. Countries such as the United States, China, the Netherlands, Canada, and Chile follow such a system. England, Australia, New Zealand, Belgium, and Colombia have been moving toward a restorative justice system, which can be thought of as a middle ground. Under this system, two objectives are pursued. First, victims are effectively compensated for the harm done to them. Second, the system seeks to ensure that teens who commit crimes receive appropriate rehabilitation (*Oportunidad Estratégica*, 2012).

There is little rigorous empirical evidence on how teenagers respond to the interventions employed by juvenile justice systems. Economists do not even know whether the different

¹ A recent example in Colombia is the case of “Piloto,” a minor who placed the bomb to assassinate the ex-Minister Fernando Londoño in Bogota in May 2012.

approaches influence criminal behavior. In principle, based on Becker's (1968) seminal paper, adolescents who engage in criminal activity should ponder the costs and benefits of doing so. Theoretically, all other things being equal, laws that impose harsher sentences on juveniles should deter crime. Empirically, however, this relationship is not evident. While criminologists have studied this issue and found that harsher punishments tend to increase recidivism, most of these studies suffer from selection bias (Fagan, 2008). In the economics literature, the few serious empirical studies on the subject show conflicting results. Levitt (1998), Hjalmarsson (2009), and Entorf (2011) find that when teens face harsher sentences, their involvement in criminal activities is significantly reduced. Lee and McCrary (2009), however, find that the elasticity of juvenile crime with respect to the harshness of the judicial system is positive but very low.

Regarding the cost of crime, participation in criminal activity has been found to reduce educational attainment and future job opportunities. Two main negative impacts of crime on education have been found. First, the immediate and high returns of criminal activity induce some adolescents to drop out of school or reduce the amount of time they devote to school activities (Freeman, 1996). Second, if teens are caught and convicted, their education may be affected in several ways: i) the low quality of schooling while incarcerated reduces the chances of returning or completing school; ii) education is interrupted during the period of incarceration; iii) punishment may stigmatize adolescents, pushing them to remain on a path of deviant behavior; and iv) incarceration may expose them to conflict-prone peers (Hjalmarsson, 2008; Bernburg, Krohn, and Rivera, 2006; Matsueda, 1992).

Nonetheless, empirical evidence of the negative impact of engagement in criminal behavior on education is scarce. Since unobservable characteristics that influence criminal activity may also be related to low educational attainment, most studies fail to establish a causal link. Criminology studies find that official interventions (i.e., police or judicial) are positively correlated with lower educational attainment and fewer job opportunities, which in turn pushes teenagers further into deviant behavior (Bernburg, Krohn, and Rivera, 2006; Bernburg and Krohn, 2003; Matsueda, 1992). Two recent studies identify a causal relationship between crime participation and reduced educational attainment. Using a bivariate probit to account for common unobservables, Hjalmarsson (2008) finds that the likelihood of high school completion is lower for teenagers who have been arrested or incarcerated. Merlo and Wolpin (2009) estimate

a structural model and show that teens who commit a crime by age 13 are less likely to graduate from high school. Finally, Aizer and Doyle (2011) find that juvenile incarceration increases the likelihood of adult recidivism. The authors suggest that one of the possible channels that drive this result is lower educational attainment caused by the interruption in their education while incarcerated.

This paper contributes to the debate by answering two different but related questions. How do changes in the judicial system, which changes the costs of committing crimes, influence adolescents' involvement in criminal activity? How changes in the judicial system can also affect schooling decisions of children and adolescents?

To answer these two questions, we use a natural policy experiment that exogenously decreased the costs of crime faced by Colombian teenagers through the enactment of Law 1098 in 2006. Specifically, we use the introduction of the new Criminal Justice System for Adolescents (*Sistema de Responsabilidad Criminal de Adolescentes*—SRPA) which aligned Colombian legislation with international treaties and agreements in order to implement a system of restorative justice for juveniles who commit crimes. Rather than sending juvenile offenders to correctional facilities, SRPA aims to use other strategies, such as rules of conduct, community service, and partial confinement, as its main means of rehabilitation. The new penal system increases the age of imprisonment from 12 to 14 and reduces the severity of punishment received by all teenagers under 18. Moreover, pursuant to Law 1098, teenagers 14 to 16 years of age can only be sent to jail for homicide, kidnapping, and extortion.

The gradual and exogenous implementation of SRPA across the country enables its effects on juvenile involvement in crimes and schooling decisions to be empirically estimated using a difference-in-difference (DID) approach. Using a rich municipal panel data set of crime rates and other municipal characteristics for the period between 2003 and 2010, we first show that the assumptions of exogeneity in the implementation of the new system are valid. Through a duration model, we are able to establish that the introduction of SRPA across the country was exogenous to time-varying municipality characteristics and hence not related to crime rates themselves or to characteristics that may help explain them.

Secondly, we present evidence showing that crime rates did in fact increase after the implementation of SRPA for all Colombian municipalities. This increase was larger for municipalities with a higher proportion of juveniles. Specifically, we find that the elasticity of

theft affecting business, vehicles, and residences to the proportion of the population under 14 years of age is positive and significant for all Colombian cities. In contrast, we find no significant effect of SRPA and the proportion of teenagers in a given municipality on homicides. These results are consistent with what the theory suggests, as SRPA reduced the costs of thefts carried out by teenagers, but not of homicides.

We present suggestive evidence that the incentives of the police force to apprehend juveniles changed after SRPA was implemented. We interpret this result as one possible reason why juvenile crime may have increased. Capture rates of adolescents for most crimes decreased after the new juvenile penal system was implemented. The magnitude of this effect varies between 0.05 and 6.3 percentage points. The fact that the capture rates for other age groups increased and that the homicide capture rate for all age groups, including adolescents, remained the same suggests that there was indeed a change in the incentive structure of the police force to capture juveniles and not a mere decrease in police efficiency. This implies that SRPA lowered the costs of crime not only by lessening the severity of penalties but also by decreasing the probability of juvenile imprisonment.

Finally, we present evidence to show how these exogenous changes in legislation and its effect on crime rates may have affected young people's decisions about schooling. Using a pooled cross-section of household surveys, we find evidence that after the implementation of SRPA the probability of school attendance of children under 14 decreased by nearly 1 percent. We argue that this is an important impact, since our estimate shows the average impact of the implementation of SRPA on all Colombian students, not all of whom commit crimes. Specifically, we find this effect only for adolescents belonging to households in which the head of household is less educated.

The remainder of the paper is organized as follows. Section 2 presents a literature review on the effects of deterrence mechanisms on juvenile crime rates and schooling decisions. Section 3 describes the implementation of the new SRPA in Colombia. Section 4 explains the empirical strategy implemented in the study, and Section 5 describes the data. Section 6 presents the main results, and Section 7 concludes.

2. Literature Review

2.1 Deterrence and Juvenile Crime

Since Becker's 1968 paper on crime and punishment, the economic literature on the subject has continuously examined both the causes and the consequences of crime.² Regarding the former, Becker's basic premise is that individuals decide whether or not to participate in criminal activities based on a cost-benefit analysis. The costs of criminal activities are related to institutional rules, such as law enforcement and the punishment that criminals would face if caught. The model shows that the level of crime in a society is negatively related to the probability of a criminal being caught and convicted, and to the severity of the punishment.

From a theoretical standpoint, numerous papers have extended the initial model, reaching similar conclusions. For example, Fender (1999) extends Becker's model and finds a negative relationship between the severity and the probability of punishment and criminal activity. Additional extensions of Becker's model reach similar conclusions. Ehrlich (1996) incorporates the idea of a market for offenses, where the equilibrium of crime is jointly determined by the supply of crime and the demand for offenses, implicitly defined by the demand for public and private protection. Andvig and Moene (1990), Sah (1991), Schrag and Scotchmer (1994), and Freeman (1996) examine conflict in a dynamic framework.

Empirically, economists have found causal evidence that the probability of apprehension and the severity of punishment deter adult crime by increasing the costs to criminals.³ Regarding the probability of apprehension, Levitt (1998) and Di Tella and Schargrotsky (2004) causally link the increase in the size of the police force in a city with a decrease in its crime rate. With respect to the severity of punishment, based on natural policy experiments of collective pardons, Maurin and Ouss (2009) and Drago, Galbiati, and Vertova (2009) find that longer prison sentences reduce recidivism. Similarly, Helland and Tabarrok (2007) find that California's three-strikes legislation significantly reduces felony arrest rates of those with two strikes by some 19 percent. Iyengar (2008) finds similar effects, but also establishes an increase in more violent crimes and some displacement to neighboring states.

The evidence on prison conditions is mixed. Katz et al. (2003) find that harsher prison conditions have a deterrent effect given their negative correlation with crime rates. On the other

² For an excellent review of the criminology evidence on the subject, see Fagan (2008).

³ For a recent survey on the subject, see Entorf (2011).

hand, Drago, Galbiati, and Vertova (2009) and Chen and Shapiro (2007) find that harsher prison conditions increase adult recidivism. Related with these last findings, in a study on Latin America, Di Tella and Schargrotsky (2009) find that individuals subjected to electronic monitoring have lower recidivism rates than individuals sent to prison.

There are even fewer studies in the economic literature on the causes and consequence of juvenile crime. The initial studies on the subject analyzed the correlations between socioeconomic characteristics and the probability that young people would engage in crime. Using information from the NLSY97, Bjerk (2004) finds a strong negative correlation between the probability of engaging in serious criminal activities and household wealth. According to the author, adolescents from lower-income households receive less investment in their upbringing, have lower expectations for their future, and live in neighborhoods where they are exposed to higher crime rates. Similarly, Mocan and Rees (2005), using a national representative sample of U.S. high school children, find that family poverty and neighborhood unemployment increase the probability of juvenile criminal behavior.

Regarding efficient deterrents for juvenile crime, few studies provide causal links on the effectiveness of the judicial system. A notable exception is Levitt (1998), who uses state-level panel data for 1978 to 1993 and finds that harsher punishments for juveniles, proxied by the fraction of juveniles in custody, decrease the number of juvenile offenses. Moreover, he finds that this reduction is driven by the deterrent effect of the judicial system. He examines the changes in the number of crimes committed by juveniles around the age when they are considered adults by the judicial system and finds that in states where adults are punished more harshly than minors, violent crimes and crimes against property committed the year after reaching adulthood decrease by 20 and 10 percent, respectively.

The evidence on the effect of harsh punishment on juvenile recidivism is mixed. Entorf (2011) corroborates the hypothesis that harsher criminal laws decrease the probability of expected recidivism of adolescents. In his research, he uses the fact that turning 18 does not necessarily lead to the application of adult criminal law in Germany. In Germany, individuals between 18 and 21 years of age may be treated as minors in the penal system. Based on a survey conducted on 159 juveniles, and taking into account possible endogeneity problems of the punishment finally imposed by the judge, he finds that young inmates convicted as adults are less likely to re-offend. Similarly, Hjalmarsson (2009) finds that juveniles in Washington state

sentenced to state incarceration have a 37 percent lower daily hazard rate of recidivism compared to adolescents sentenced to a local facility. To address probable endogeneity problems, she uses an RD design that takes advantage of the pseudo-random variation present in Washington's juvenile justice system. In contrast to these two studies, Lee and McCrary (2009), using longitudinal administrative data for Florida, find a low elasticity of juvenile crime with respect to length of sentence. Specifically, using the discontinuity of the probability of receiving harsher sentences at age 18, the authors find that the decrease in criminal activity is merely 2 percent compared to the increase in the harshness of punishments by 230 percent.

Two recent papers provide some evidence of the channels through which harsher and more efficient judicial systems may deter juvenile crime. Visser, Harbaugh, and Mocan (2006) designed an experiment with high school and college students where the rewards and penalties of petty larceny were exogenously modified. They find evidence that the decision whether to commit a crime is in fact responsive to the tradeoffs first expressed by Becker (1968). Similarly, Hjalmarsson (2008b) uses data from the NLSY97 to assess whether adolescents update their beliefs about the cost of crime according to changes in the judicial system. Using longitudinal data, she finds that young people's expectations of going to jail increase by 4-6 percent when they reach adulthood and can be tried as adults.

There are few studies of juvenile crime in Latin America. A notable exception is Romero (2012), who analyzes how prison sentences for Colombian teenagers affects recidivism rates. Using data collected after the implementation of SRPA, the author finds that adolescents sent to serve their punishment in prison have recidivism rates 11-17 percent higher than the rate of similar juveniles sentenced to non-prison punishments.

2.2 Crime and Schooling Decisions

Schooling decisions and crime have a negative and simultaneous relationship. Higher investment in human capital reduces the likelihood that adolescents or adults will engage in criminal activities (Hjalmarsson and Lochner, 2012; Berthelon and Kruger, 2011; Merlo and Wolpin, 2009; Fella and Gallipoli, 2008; Lochner and Moretti, 2004; Cullen, Jacob, and Levitt, 2003).⁴ On the other hand, participation in criminal activities affects schooling decisions and future

⁴ Hjalmarsson and Lochner (2012) provide a detailed literature review on the impacts of education on crime.

participation in legal labor markets (Hjalmarsson, 2008; Bernburg and Krohn, 2003; Bernburg, Krohn, and Rivera, 2006; Western and Beckett, 1999; Freeman, 1996; Matsueda, 1992). Most theoretical and empirical studies center on the impacts of education on crime, while few studies assess how crime affects education.

Education reduces participation in criminal activity in several ways. Education discourages participation in crime by increasing returns on legitimate work in the future and raising the opportunity costs of criminal behavior (Lochner and Moretti, 2004). Education alters preferences by increasing risk aversion or making individuals more patient, thus reducing the financial or psychic returns on participating in criminal activities (Hjalmarsson and Lochner, 2012; Lochner and Moretti, 2004). Because school interactions favor relationships with more educated people who are less likely to commit crimes, attending school decreases the likelihood of engaging in crime (Hjalmarsson and Lochner, 2012).

Several empirical studies confirm the negative correlation between education and crime. Establishing causality is difficult because the unobservable characteristics that determine schooling decisions may also influence the decisions to engage in crime. Most studies exploit exogenous changes in schooling regulations to identify the impact of education on crime. For example, Lochner and Moretti (2004) use the exogenous change in state compulsory schooling attendance laws to instrument for school attendance. They find that increased schooling reduces incarceration rates, particularly for vulnerable populations (e.g., black students), as well as arrests for violent and property crimes. The effects are sizeable: each additional year of education reduces arrests at the state level by 11 percent. Using data from the NLSY, they find that the effect is mostly driven by increasing the opportunity costs of participating in legitimate labor markets.

Extending school hours also contributes to a reduction in juvenile crime rates. Berthelon and Kruger (2011) study the effects of a school reform in Chile that extended the length of the school day on juvenile crime. They found that longer school days reduce juvenile crime rates at the municipal level such that a 20 percent increase in the length of the school day in the municipality reduces juvenile crime by between 11 and 24 percent.

Besides school attendance and longer school days, school quality may reduce juvenile crime. Cullen, Jacob, and Levitt (2003) examine the effect of school quality on crime using random assignments through lotteries to high-quality schools in Chicago. The results show that

attending high-quality schools do not improve traditional academic outcomes, yet the incidence of disciplinary events and the arrest rates for adolescents assigned to these schools are lower.

Few studies examine contemporaneous decisions regarding schooling and crime participation. Merlo and Wolpin (2009) develop a structural model to explain the relationships between schooling, juvenile employment, and juvenile crime. They estimate the model for black males using data from the NLSY1997. Results show that attending school at 16 years of age reduces involvement in crime between the ages of 19 and 22: crimes and arrest rates decline by 12.2 and 15.5 percent, respectively. Initial conditions play an important role in determining subsequent participation in criminal activities and lower graduation rates. However, teens that engage in crime at 14 years of age due to a transitory shock are also more inclined to commit crimes as adults (between 19 and 22 years of age).

Juvenile crime may reduce human capital investment. Reductions arise from two channels. First, teens may drop out of school or reduce the amount of time spent on academic activities, since they may be attracted by the higher returns on criminal activity (Freeman, 1996). Second, arrest or incarceration of teenagers potentially affects school attendance. If the quality of schooling while incarcerated is poor, returning and completing school is less likely (Hjalmarsson, 2008). Incarceration may overlap with the school period, causing a disruption in school attendance (Hjalmarsson, 2008). The stigma caused by legal punishment may push adolescents to persist in a pattern of criminal behavior (Hjalmarsson, 2008; Bernburg, Krohn, and Rivera, 2006). Since jails are schools of crime and human capital accumulation decreases while incarcerated, the potential benefits derived from criminal activities are increased.

Few economic studies assess the impact of crime on schooling decisions. Hjalmarsson (2008) examines the negative effect of interaction with the criminal justice system on schooling decisions. Using the NLSY1997, she finds that arrested and incarcerated adolescents are 11 and 11.2 percent less likely to complete high school. After accounting for unobservables that affect schooling and crime participation decisions, the negative impact of incarceration persists. The study finds some weak evidence on the potential channels that lead to dropping out of school. The effects of incarceration are higher when it overlaps with the school year and in states in which the judicial system is required to inform the school about the incarceration (the stigma effect). Similarly, Merlo and Wolpin (2009) find that young people who commit a crime by age 13 have a lower chance of graduating from high school.

Criminology studies show similar findings, although they fail to account for unobservables that determine the decision to attend school and participate in criminal activities. Bernburg, Krohn, and Rivera (2006) use panel data that follow males from 13 to 22 years of age. Results show that juvenile intervention is positively correlated to unemployment spells in adulthood, which are mediated mostly through educational attainment. Bernburg and Krohn (2003) find similar results: police and judicial interventions with adolescents reduce educational attainment and job opportunities, increasing the likelihood that they will engage in crime. These negative effects of official interventions may promote deviant behavior or bring adolescents into contact with conflictive peers (Matsueda, 1992).

3. Law 1098 of 2006: Criminal Justice System for Adolescents in Colombia

In November 2006, the Colombian Congress approved the Code for Childhood and Adolescence. One of its main objectives was to align Colombian legislation with international treaties and agreements. Specifically, Colombia sought to incorporate the declaration on the International Convention on the Rights of the Child of 1989 into its judicial system (Benavides, 2012). The Code prompted the implementation of a restorative justice system for juvenile crime, called the Criminal Justice System for Adolescents (SRPA), with the aim of establishing the rights of children who had committed crimes while recognizing their responsibilities (Benavides, 2012).

Since 1989, Colombia has had separate justice systems for crimes committed by adults and minors. Before the enactment of Law 1098, the juvenile justice system, which was for adolescents between 12 and 18 years age, had special judges, and juvenile punishments were more lenient than those reserved for adults. Juveniles were sent to correctional facilities. In addition to punishment, these facilities sought to rehabilitate juvenile offenders and provide formal education. When adolescents older than age 16 committed a serious offense, the case was sent to an adult court. Children under 12 were not held legally responsible for crimes. They were handled by social workers, who were responsible for providing support and investigating social conditions in their homes. When they reached age 18, individuals were tried as adults.⁵

Law 1098 of 2006 is similar in many respects to the legislation described above. For the purpose of this paper, two differences are worth mentioning. Law 1098 aims to put in place a

⁵ See Decree 2737 de 1989.

restorative juvenile justice system that puts less emphasis on punitive strategies. The new system seeks to provide redress to victims and rehabilitate and reintegrate offenders. Rather than sending juvenile offenders to correctional facilities, the systems aims to use other strategies such as abiding by rules of conduct, performing community service, and being partially confined. This system does not apply to those who have committed homicides, kidnapping, or extortion; in such cases, juveniles are sent to correctional facilities. Second, the new code raises the age at which young people enter the juvenile justice system. After 2006, children under 14 years old are not held legally responsible for crimes, except in the case of murder, kidnapping, or extortion. When children of these ages are caught for these crimes, they are placed in the care of the Colombian Institute of Family Welfare (*Instituto Colombiano de Bienestar Familiar—ICBF*)⁶ which protects them and ensures that they are enrolled in school. Such children are neither confined nor punished.

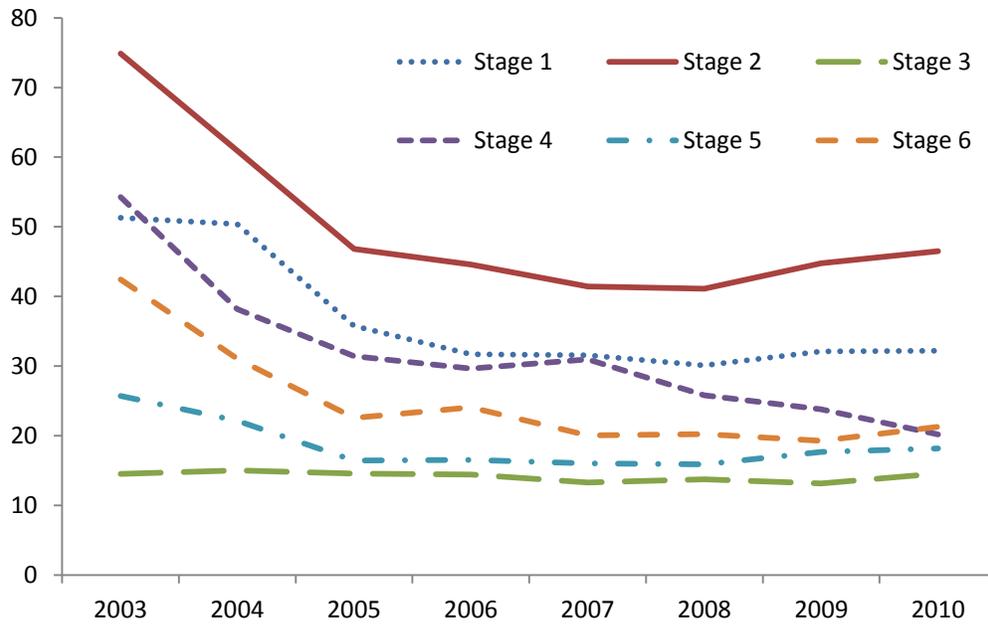
The new system was implemented gradually to ensure that the judicial districts were adequately trained. The central government created six groups within Colombian judicial districts,⁷ and adoption began in March 2007 and ended in December 2009. Local governments did not participate in the decision-making process, and the exact date of implementations was changed at least three times through decrees issued by the national government. Hence, in principle we argue that implementation was exogenous. Preliminary evidence, presented in Figure 1, shows the average trend of homicides and total thefts for the six groups. As can be observed, even though the average rates are different for each judicial district, there is no apparent trend according to the order of implementation. For example, the average homicide rate is similar for the first and fourth implementation groups. In the case of thefts, all judicial districts, except for the first group, follow similar patterns but none is related to the order of implementation.

⁶ Government institution responsible for children's programs.

⁷ The six groups were the following: i) Stage I: Bogotá and Cali; ii) Stage II: Armenia, Manizales, Pereira, Buga and Medellín; iii) Stage III: Tunja, Santa Rosa de Viterbo and Popayán; iv) Stage IV: Cucutá, Pamplona, Bucaramanga and San Gil; v) State IV: Antioquia, Cundinamarca, Ibagué, Neiva, Barranquilla, Santa Marta, Cartagena, Riohacha, Sincelejo, Mintería and Valledupar; and vi) Stage VI: San Andrés, Villavicencio, Pasto, Quibdó, Yopal, Florencia and Arauca

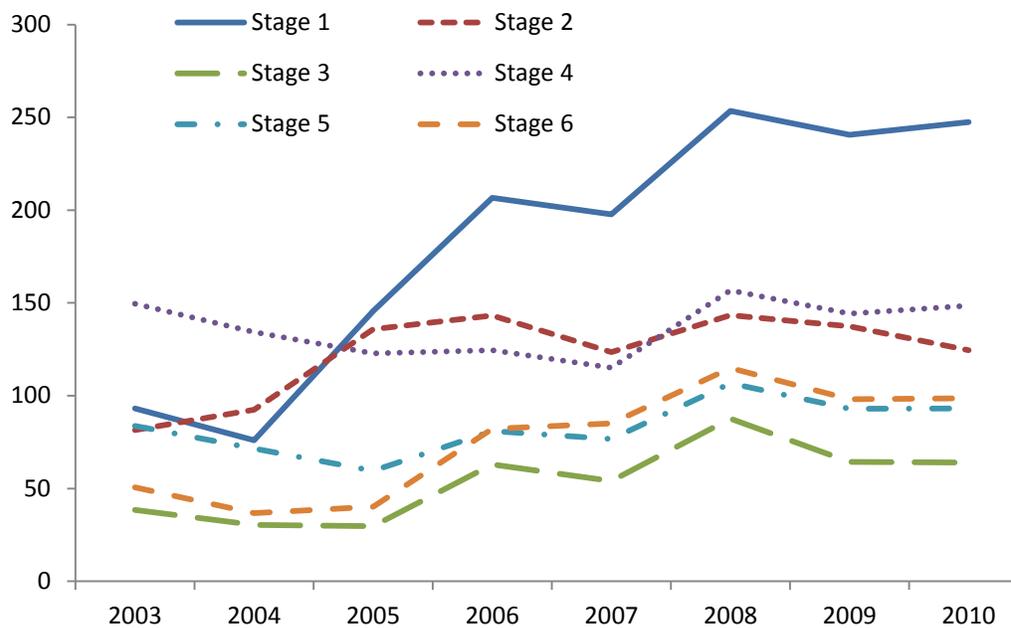
Figure 1. Selected Crime Rates by Judicial District, 2003 and 2010

Homicide Rates by Judicial District, 2003 and 2010



Source: Authors' calculations based on Ministry of Defense.

Theft Rates by Judicial District, 2003 and 2010



Source: Authors' calculations based on Ministry of Defense

Compared with the previous Code, Law 1098 of 2006 reduces the cost of crime, increasing the incentives for children to participate in minor crimes. Because punishment of children under 14 was eliminated, criminal organizations have recruited them to perform illegal activities.

During the period 2007-2010, SRPA reported 57,000 cases of juvenile crime. Around 28.1 percent of adolescents entering SRPA were found guilty. Despite explicitly favoring restoration measures, punishments consisted of partial or total seclusion. The harshness of punishment varied greatly from one judicial district to another. The crimes these children engaged in were mostly thefts, drug trafficking, or illegal possession of firearms. Overall, recidivism rates for SRPA are 19 percent. Recidivism is higher for juveniles that are confined to correctional facilities (30 percent) or who participated in theft (27 percent). Educational attainment for these adolescents in SRPA is low. For teens 14 years of age, 81 percent were below their grade, and for 17 year-olds, 95 percent were below their grade (Oportunidad Estratégica, 2012).

Adoption of SRPA has been slow and has several weaknesses. First, implementation of the system is heterogeneous across judicial districts. Second, judges and social workers responsible for the system have little knowledge of restorative justice, favoring traditional approaches and seclusion of adolescents. Third, correctional facilities are overcrowded and do not offer school programs, as mandated by Law 1098. Fourth, children under 14 who commit crimes are not participating in prevention programs. Instead, these children are usually immediately released (Oportunidad Estratégica, 2012).

The public perception that crimes committed by children under 14 have increased sharply since the law came into force and has prompted efforts to reform the law. Law 1098 has apparently set the groundwork for children to engage in crime earlier. In fact, large criminal groups are modifying their strategies and recruiting children. “They (children under 14) are being used by adults,” declared Elvira Forero, director of the Colombian Institute on Child Welfare.⁸ Therefore, the risk that children will be drawn into illegal activities has presumably increased after the law was passed.

⁸ *No es un juego de niños*, in *El Espectador*.

4. Empirical Strategy

The purpose of this paper is to identify whether adolescents respond to reductions in the cost of engaging in criminal activities in their crime and schooling decisions. Following the Becker model, we argue that lower costs of crime, which include more lenient punishments, will increase juvenile crime participation and decrease their involvement in legal activities, specifically, school attendance. To identify this effect, we use the exogenous variation through time and regions created in the implementation of Law 1098 in Colombia. We argue that SRPA may have changed the incentives to participate in criminal activities and attend school through three channels. First, more lenient criminal laws reduce the cost of engaging in criminal activities. The law eliminates (for children under 14) or reduces (for adolescents between 14 and 16) punishment for certain crimes. Second, the probability of being caught and convicted after committing a crime decreases after the enactment of Law 1098. Because children under 14 cannot be convicted, the police force may have lower incentives to apprehend them. This could further reduce the cost of engaging in criminal activities. Third, criminal networks may recruit younger children to commit crimes on their behalf. This is particularly true of crimes based on strong and dense networks, such as the drug trade.

As with many empirical evaluations, estimates of the average effect of SRPA on crime rates by Colombian adolescents suffer from a lack of data. We follow the common notation in the literature and let D be a zero-one indicator variable that equals one if municipality i introduced the new SRPA, $Y_{i,t,0}$ the dependent variable of interest (which may be crime or school attendance rate) if municipality i applies the previous juvenile criminal code in period t , and $Y_{i,t,1}$ the variable of interest in municipality i if it implements SRPA in period t . Then, the outcome observed for municipality i in period t will be given by $Y_{i,t} = DY_{i,t,1} + (1-D)Y_{i,t,0}$ and the average change in crime rates from the enactment of Law 1098 of 2006 that have characteristics $X_{i,t}$ will be given by:

$$E(Y_{i,t,1} - Y_{i,t,0} \mid D = 1, X_{i,t}) = E(\Delta \mid D = 1, X) \quad (1)$$

Given that $Y_{i,t,0}$ is not observed for municipalities that introduced SRPA, we use an appropriate methodology to estimate its effects. In this paper, we implement a difference-in-difference approach. Specifically, we take advantage of the fact that SRPA was introduced gradually across the country, providing variation across both space and time in order to estimate its effects.

Under this strategy, it is important to confirm that indeed the gradual application of SRPA across the country was exogenous and hence provides an adequate scenario to estimate the impacts of the law on juvenile criminal activity and school attendance. As explained in the previous section, at the national level, the introduction of the new Code for Childhood and Adolescence followed international trends on the matter and was established to bring Colombia into compliance with the 1989 United Nations Convention on the Rights of the Child. Hence, its introduction is not related to any particular crime or school attendance trend in the country. Within its borders, the gradual timing of its implementation was also exogenous to regional trends in crime, school attendance, or other time-varying characteristics. In fact, the central government, not the regional offices, decided and designed the six phases of implementation. Moreover, the dates of implementation were changed at least three times through exogenous decrees issued by the central government.

In order to prove this exogeneity in a more formal way, we follow Galiani, Gertler, and Schargrodsky (2005) and analyze the determinants of the gradual implementation of SRPA in the country. Thus, we estimate a duration model in which the probability that a given region implemented SRPA is a function of both constant and time-varying characteristics. We pay particular attention to the effect of time-varying observables, which may be related to crime or school attendance rates, on such probability.

If indeed there is an exogenous implementation of Law 1098 across Colombian municipalities, a difference-in-difference strategy to estimate its effects can be used. Specifically, under such a scenario, in order to estimate the impact of SRPA on crime rates actually perpetrated by adolescents, we use the total crime rate directly as our dependent variable of interest. We estimate two different reduced form equations. The first one is equation (2)

$$\text{Log}(\text{Crime Rate}_{i,t}^s) = \delta_0 \text{SRPA}_{i,t} + \beta \text{Log}(X_{i,t}) + \alpha_t + \mu_i + \varepsilon_{i,t} \quad (2)$$

where the dependent variable, $\text{Log}(\text{Crime Rate}_{i,t}^s)$, is the natural logarithm of crime rate of type s in the municipality i , at time t . We have data on homicides and theft against people, commercial establishments, residences, and vehicles. We let $\text{SRPA}_{i,t}$ be a dummy variable that takes the value of 1 after the enactment of the Law 1098 in municipality i and time t , and 0 otherwise. Given the gradual exogenous implementation of SRPA, this dummy has variation both across time and space, allowing us to causally estimate its effect on our variables of interest.

The specification also includes a vector of controls $X_{i,t}$. Specifically, we include controls for economic performance (trade and industry tax revenues as a proxy for municipal GDP), supply of educational services (investment in education per capita), institutional conditions (land inequality and fiscal performance), and conflict dynamics (number of forcefully displaced). The estimations include year*month (α_t), and municipality (μ_i) fixed effects in order to control for national trends in crime rates and unobservable municipality characteristics that are time invariant, respectively. Finally, even though controls include the presence and magnitude of conflict attacks, in order to take into account possible confounding effects between conflict and crime, we estimate specification (2) for four different groups of municipalities: state capitals and the 13 largest cities where the conflict should not be significant, all other municipalities, and finally the whole country.⁹

Under specification (2) the coefficient of interest is δ , which will estimate the average impact that the gradual implementation of SRPA had on the municipalities' crime rates. In order to understand if these effects vary according to the structure of the population in a given region we estimate the following reduced form equation:

$$\begin{aligned} \text{Log}(CrimeRate_{i,t}^s) = \\ \delta_0 SRPA_{i,t} + \sum_{c=1}^3 \delta_c \text{Log}(PropCohort_{c,i,t}) SRPA_{i,t} + \beta \text{Log}(X_{i,t}) + \alpha_t + \mu_i + \varepsilon_{i,t} \end{aligned} \quad (3)$$

As can be observed, the main difference with specification (2) is the interaction of $SRPA_{i,t}$ with $\text{Log}(PropCohort_{c,i,t})$ which represents the logarithm of the proportion of certain cohort c of adolescents residing in each municipality i at time t . The specific groups of cohorts c chosen are based on the new SRPA. As previously explained, the enactment of Law 1098 changed the incentives for adolescents to commit crimes to different degrees according to their ages. Thus, we use these changes in incentives to create three excluding cohorts of interest: under 14, between 14 and below 18, and between 18 and 25 years of age.

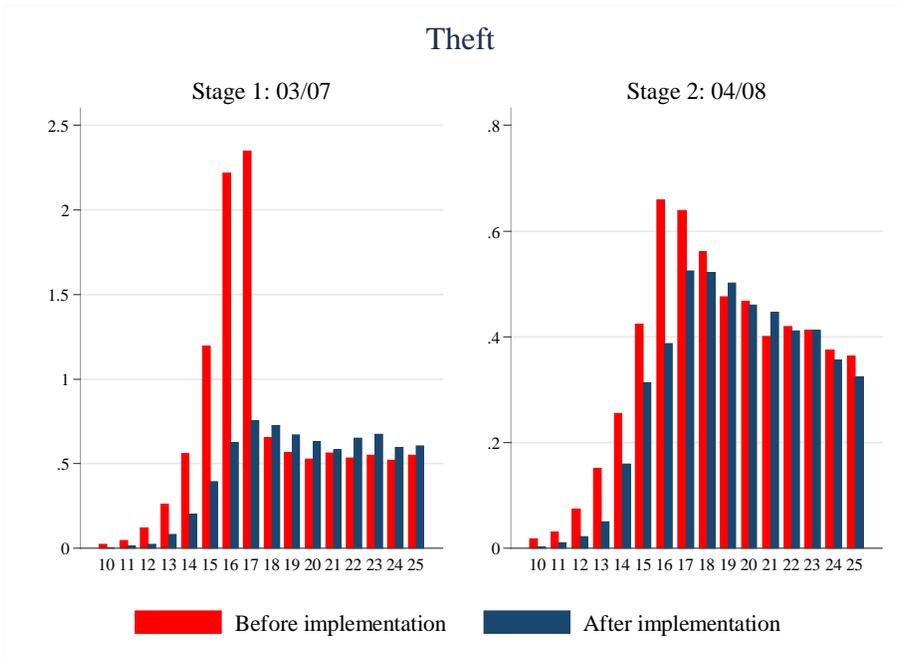
Under this strategy, δ_c will estimate the elasticity of crime to Law 1098 on municipality i at time t according to the proportion of the population from a specific age cohort. If our hypothesis is true, it is expected that these coefficients will be positive and significant, implying that crime rates increased by a higher proportion in municipalities where a larger fraction of the population belongs to such age groups.

⁹ All regressions are estimated using robust standard errors.

It is difficult to provide evidence on the possible channels that may drive any results on the estimations described above. Some of these may be a change in young people's perceptions of the costs of crime. As explained in the literature review, recent studies show that youth do update their beliefs about the costs of involvement in crime. Unfortunately, for Colombia there is no data set that can allow us to test this channel. However, this is not the only channel that may explain the impact of the change in SRPA on crime rates. Anecdotal evidence suggests that the change in the legislation caused a decrease in the effort that the police force invested in the arrest of young suspects. The police force knows that such arrests, given the application of Law 1098, will probably end with no punitive measure; hence, they simply may have reduced their effort to apprehend them.

Figure 2 shows this trend clearly for the capture rates of four different crimes one year prior and one year after the implementation of SRPA in the first two phases of SRPA. Two facts are important to mention from these figures. First, as previously established in the criminology literature, criminal careers start early in life and reach their peak at ages 16 and 17. Thereafter, there is a sharp reduction in the arrest rate of juveniles, probably due to the deterrence effect that reaching adulthood and being subject to adult penal law may have on criminal behavior. Second, this preliminary evidence suggests that just one year after the implementation of Law 1098, the capture rates of adolescents younger than 18 years of age decreased sharply. On the contrary, if anything, the capture rate of older individuals appeared to increase in the same period.

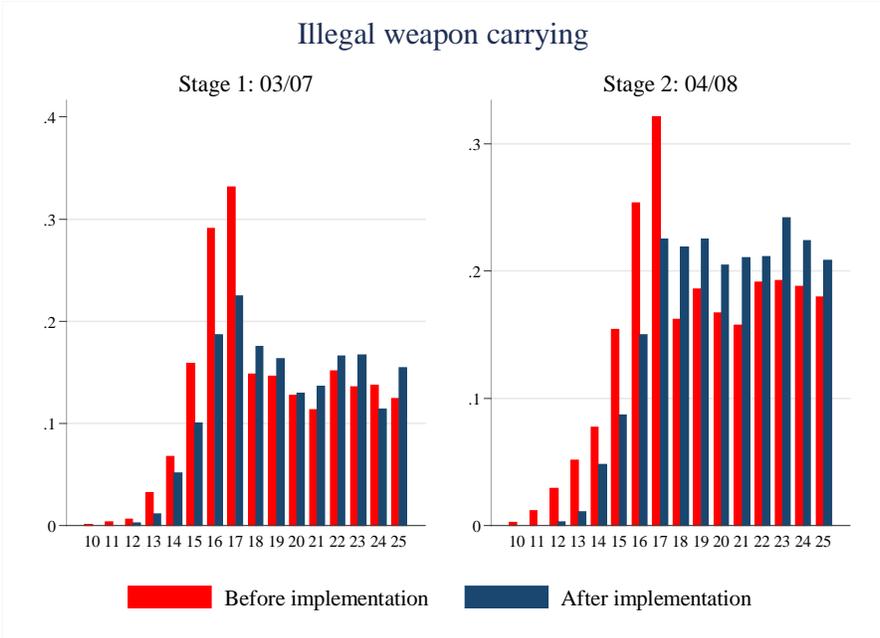
Figure 2. Arrest Rates by Age and Crime Type, One Year Before and After the Adoption of SRPA



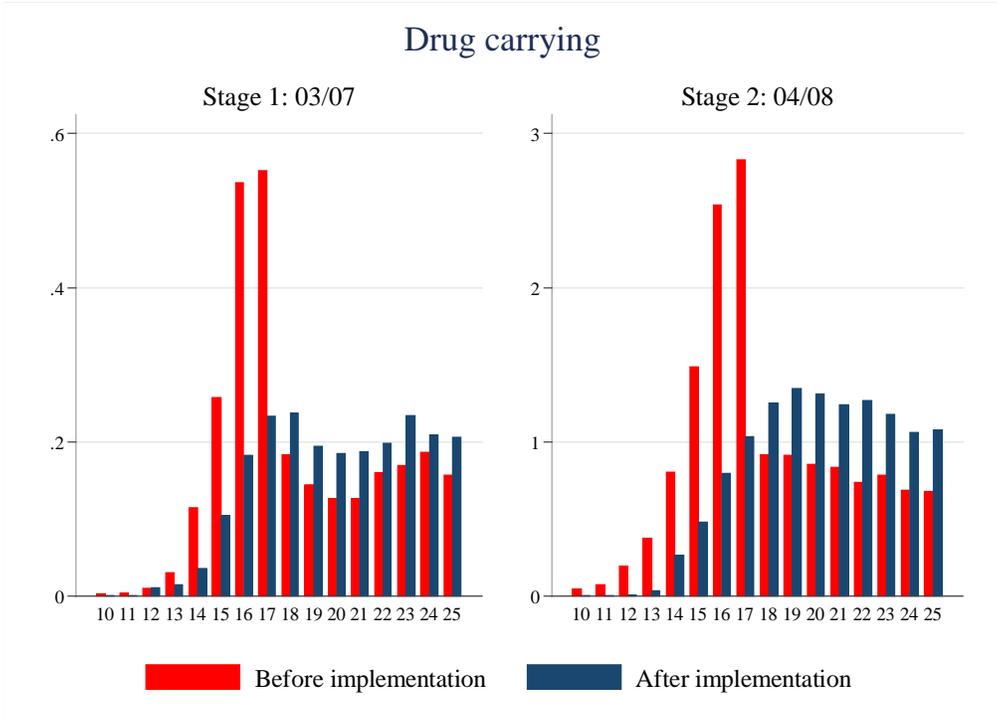
Source: Authors' calculations based on Ministry of Defense.



Source: Authors' calculations based on Ministry of Defense.



Source: Authors' calculations based on Ministry of Defense.



Source: Authors' calculations based on Ministry of Defense.

In order to formally assess this effect on the incentives of the police force after the implementation of SRPA, we estimate a reduced form equation in which the dependent variable is the rate of arrest for different age groups in each municipality and time. Specifically, we estimate the following regression:

$$ArrestRate_{i,t}^{c,s} = \delta SRPA_{i,t} + \gamma CrimeRate_{i,t}^s + \beta X_{i,t} + \alpha_t + \mu_i + \varepsilon_{i,t} \quad (4)$$

where the dependent variable, $ArrestRate_{i,t}^{c,s}$ is the capture rate per 100,000 inhabitants of cohort c in municipality i , at time t for crime s such as homicides, theft against people, commercial establishments, residences, vehicles, motorcycles, illegal possession of firearms, and drug trafficking. The specific groups of cohorts chosen are the same ones as those used in specification (3). The difference, however, is that, given that information on arrest rates is available according to age, no interaction of cohort proportions with the SRPA dummy is needed. What is done in this case is that separate regressions are estimated for each cohort.

As in the previous specifications, $D_{i,t}$ is a dummy variable that takes the value of 1 on the precise month and year in which the new SRPA started to be applied in municipality i and zero otherwise. We further include the crime rate in municipality i at time t ($CrimeRate_{i,t}$) in order to control for possible trends of crime in the municipality that may explain arrest rates. The main problem with the use of this last control is that it may create endogeneity problems that could bias our coefficient of interest. Nonetheless, controlling for the crime rate in the municipality is also important for obvious reasons. Hence, we run several specifications with different lags of this variable as well as without it at all. Finally, we include a vector $X_{i,t}$ of time varying municipality's characteristics as in specification (1) and (2).

Under this specification, the coefficient of interest is δ , which, if significant, will imply that the implementation of Law 1098 may have changed the incentives of the police force to capture at a different rate each of these age cohorts.¹⁰

In order to assess the impact of SRPA on schooling decisions, we take a similar approach. Specifically, we estimate a linear probability model of school attendance of child a , residing in municipality i in year t . We follow the economics of education literature and control

¹⁰ The significance of the coefficient could also imply a change in adolescent behavior in which they may become more adept at committing crimes or become harder to arrest. Although we are not able to test which of these two possibilities is actually occurring, anecdotal evidence suggests that the change in police incentives is at play.

for child, family, and municipality characteristics in matrix Z . We further include a dummy for whether SRPA was implemented in their municipality of residence ($SRPA_{i,t}$) and its interaction with a dummy of the students' own age cohort ($Cohort_{a,i,t}$) which is different from the one in specification (3). The main specification is as follows:

$$SchoolAtt_{a,i,t} = \delta_0 SRPA_{i,t} + \sum_{c=1}^3 \delta_c Cohort_{a,i,t} SRPA_{i,t} + \beta Z_{a,i,t} + \alpha_t + \mu_i + \varepsilon_{a,i,t} \quad (5)$$

where $SchoolAtt_{a,i,t}$ is a dummy variable equal to one if child a , residing in municipality i in year t is attending school and zero otherwise. As in the previous regressions, our coefficients of interest are δ_0 and all δ_c , which estimate the impact of the implementation of SRPA on school attendance in general and for particular students depending on their age. If these coefficients are negative and significant, it will imply that, after the implementation of SRPA in Colombia, school attendance decreased. As reviewed in the literature, there are two main channels through which SRPA may have influenced schooling decisions of young people. First, adolescents may view a criminal career as now more beneficial given the exogenous reductions in crime costs, and may opt to quit their legal activity (school) and devote themselves to the illegal one. Second, adolescents may try to pursue both activities but, when apprehended and sent to prison, they are forced to quit school and abandon their studies. Finally, if indeed police force incentives changed after the implementation of SRPA, it could be that this last channel may not be occurring. If so, adolescents may be committing more crime without leaving school. Hence, the final impact of the new legislation is ambiguous and can only be resolved empirically.

5. Data

In this paper, we use four sources of data. The first is data on incidence of crimes from the Ministry of Defense. This data provides information on each crime incident that occurred for the period ranging from 2003 to 2010. For each crime incident, the data provide information on type of crime (homicides, theft against people, commercial establishments, residences, and vehicles), the date of the incident (month and year), and the municipality.

The second is data on arrests from the Ministry of Defense for the period 2003-2010. Police record detailed information for each arrest: type of crime committed, age of the offender, date (month and year), and municipality. This information covers a broad range of crimes, such as homicides, theft against people, commercial establishments, residences, vehicles, motorcycles,

illegal possession of firearms, and drug trafficking. Before 2006, the police did not always classify theft by type. Unclassified thefts were labeled as other theft. Since 2006, theft types are correctly classified and this category disappears.

The third data source is a pooled cross-section of the *Encuesta de Calidad de Vida* (ECV) for 2003, 2008, and 2010. This is a national representative survey that follows the same methodology used in the World Bank’s LSMS survey. Conducted by the Colombian Bureau of Statistics (*Departamento Administrativo Nacional de Estadística*—DANE), the survey’s objective is to measure Colombian socioeconomic conditions, poverty, and access to social programs. The three cross-sections allow us to have information before SRPA was implemented (2003), in the period during its gradual implementation (2008), and after it was in place throughout the country (2010). In order to evaluate the effect of SRPA on schooling decisions, we use information for individuals between 6 and 18 years of age who, in accordance with the Colombian educational system, should be enrolled in school. The fourth source of data is the CEDE panel. This panel collects yearly information on a wide range of municipal characteristics starting in the 1980s. We use trade and industry revenues, investment in education per capita, land Gini, an index for fiscal performance, the number of forcefully displaced persons, and the number of hectares under aerial fumigation.

Table 1 presents descriptive statistics for monthly municipal crime rates. The mean monthly homicide rate per 100,000 inhabitants is 1.2 for all municipalities. Even though state capitals and the 13 largest cities have higher homicide rates, divergence among municipalities is not large. Thefts are much higher in state capitals and the 13 largest cities. For example, thefts against people in the 13 largest cities are 8.9 times higher than in the other municipalities.

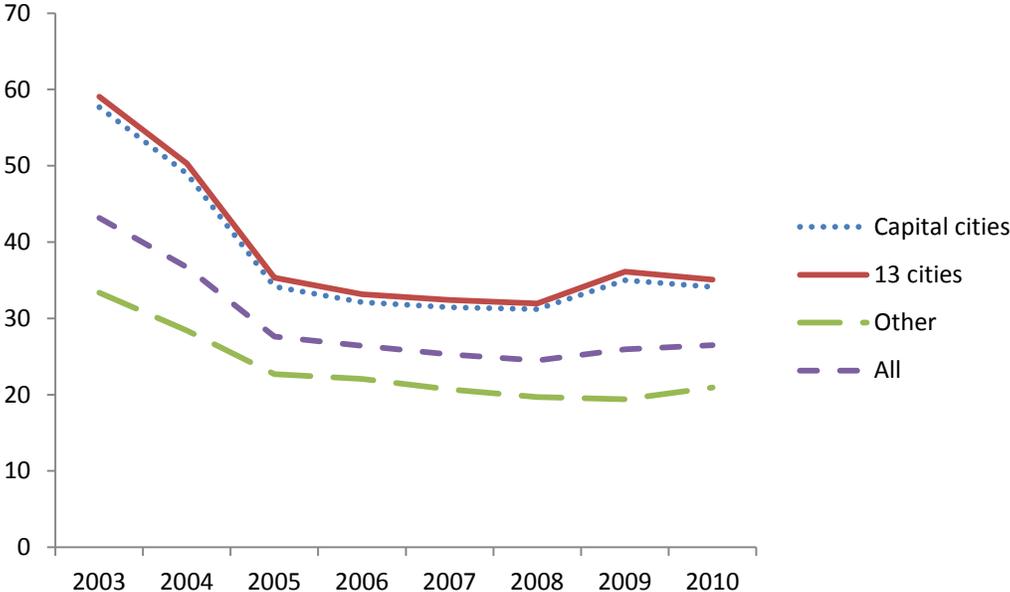
Table 1. Monthly Municipal Crime Rates: All Municipalities, State Capitals, 13 Largest Cities and Other Municipalities

Variable	Capital cities		13 cities		Other		All cities	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Homicides	2.9	2.7	3.5	2.3	1.2	4.0	1.2	4.0
Theft: people	15.4	13.0	19.4	13.9	2.4	8.1	2.6	8.4
Theft: business	4.2	3.5	4.9	3.1	0.8	3.0	0.8	3.1
Theft: residence	7.3	7.6	6.0	4.3	1.1	4.1	1.2	4.1
Theft: cars	4.8	4.6	6.8	4.9	0.5	2.4	0.6	2.6
Observations	2,592		1,248		86,016		87,264	

Source: Authors’ calculations based on Ministry of Defense.

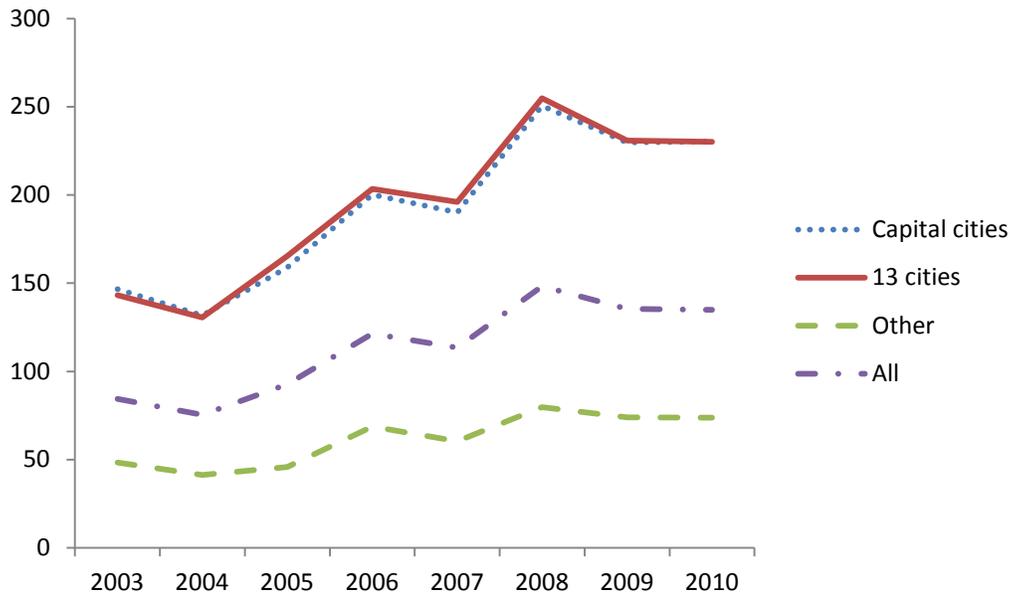
Trends of crime incidence differ for homicides and thefts. Figures 3 and 4 illustrate yearly homicide and theft rates between 2003 and 2010. Since 2003, Colombia has experienced a significant overall reduction in homicide rates. Although reductions are widespread, homicide rates are still high compared to international standards. By contrast, theft rates have increased slightly since 2003. As distinct from homicide rates, theft rates are concentrated in state capitals and the 13 largest Colombian cities. This is intuitive, as these areas are more urban.

Figure 3. Annual Homicide Rates: All Municipalities, State Capitals, 13 Largest Cities and Other Municipalities



Source: Authors' calculations based on Ministry of Defense.

Figure 4. Annual Theft Rates: All Municipalities, State Capitals, 13 Largest Cities and Other Municipalities



Source: Authors' calculations based on Ministry of Defense.

Total yearly arrests by crime type are reported in Table 2. In 2003, just over 163,149 people were apprehended in Colombia, of which 18.9 percent were juvenile offenders (under the age of 18). Participation of juvenile offenders in arrest rates reached its peak, 22 percent, in 2005. By 2011, total arrests fell to 146,073, and the percentage of juvenile offenders also fell to 13.1 percent. Most of the reduction in the percentage of apprehensions for those under 18 arises from lower arrests of children under 14. In 2003, children under 14 comprised 1.1 percent of arrests. This figure fell to 0.1 percent in 2011. The bulk of the decline occurred from 2009 onward, when Law 1098 was fully adopted. Presumably, the provisions of Law 1098 that prohibited confinement for children under 14 years of age lowered the incentive for police forces to arrest these children.

Table 2. Total Arrests by Type of Crime

	2003	2004	2005	2006	2007	2008	2009	2010
Homicides	6,833	7,207	7,391	6,522	5,821	4,611	5,076	5,120
Under 14	12	19	11	16	12	4	4	0
Between 14 and 18	336	432	385	361	261	287	301	303
Weapons carrying	15,080	17,708	17,964	15,752	14,758	14,706	16,450	16,468
Under 14	67	81	93	116	107	75	31	24
Between 14 and 18	1,541	2,095	2,233	2,058	1,806	1,870	1,997	2,137
Drug carrying	46,215	61,047	73,276	55,118	52,911	49,014	54,777	73,309
Under 14	346	389	415	790	887	478	87	71
Between 14 and 18	5,230	7,076	11,625	12,786	11,533	10,586	6,275	7,607
Total theft	85,311	93,744	70,711	54,144	44,332	41,379	42,921	44,532
Under 14	1,207	1,267	1,305	1,285	847	512	177	88
Between 14 and 18	9,437	10,552	15,401	13,516	7,772	8,008	6,844	7,325

Source: Authors' calculations based on Ministry of Defense.

Table 3 shows the main descriptive statistics of the pooled cross-section of ECV and the CEDE panel. In total, we have information for 44,000 students who have an attendance rate of almost 89 percent, 83 percent of whom attend public schools. The average number of years of schooling of the head of household is six, and the vast majority of them come from low-income households (strata 1 through 3). Nearly 29 percent belong to single heads of households.

Table 3. Descriptive Statistics, ECV

Variable	Obs.	Mean	Std. Dev.	Min	Max
School attendance	44,310	0.89	0.31	0.00	1.00
Under 14	44,310	0.67	0.47	0.00	1.00
Between 14 and 16	44,310	0.17	0.37	0.00	1.00
Between 16 and 18	44,310	0.16	0.37	0.00	1.00
Gender	44,310	0.51	0.50	0.00	1.00
Socio-economic level (stratum)	44,310	1.88	0.93	0.00	6.00
Years of education	44,310	0.55	1.92	0.00	14.00
Years of education of head of household	44,310	6.24	4.66	0.00	21.00
Years of education of spouse	44,310	4.49	4.78	0.00	21.00
Single-parent household	44,310	0.30	0.46	0.00	1.00
Gender of head of household	44,310	0.69	0.46	0.00	1.00
Income per capita (\$COP)	44,310	2,462,143	4,362,640	0	169,900,000
Household size	44,310	5.23	2.04	1.00	20.00
Floor material (=1 if polished wood, rug, marble)	44,310	0.43	0.50	0.00	1.00
Rural	44,310	0.20	0.40	0.00	1.00
Municipal theft against people (rate per 100.000 people)	44,310	106.22	107.94	0.00	617.32
Municipal homicide rate (rate per 100.000 people)	44,310	30.98	26.70	0.00	193.61
Municipal theft against business (rate per 100.000 people)	44,310	37.23	35.25	0.00	214.11
Municipal theft of vehicles (rate per 100.000 people)	44,310	55.48	59.67	0.00	314.53
Municipal theft of residences (rate per 100.000 people)	44,310	51.03	55.26	0.00	364.72

Source: Authors' calculations based on ECV and CEDE municipal panel.

6. Results

6.1 Exogenous Implementation of Law 1098

As previously explained, this paper seeks to understand whether the enactment of Law 1098 changed the costs to adolescents of engaging in criminal behavior and hence their involvement in criminal activities, and to determine whether changes in the costs of crime may also affect decisions regarding licit activities, such as schooling. We take advantage of the natural policy experiment created by the Colombian central government: the gradual rollout of the new SRPA law across the country. However, the first step is to prove that this implementation was in fact exogenous and hence can be used in a DID approach to answer our questions of interest.

To do so, we follow Galiani, Gertler, and Schargrodsy (2005) and estimate a duration model in which the probability of implementing SRPA in municipality i at time t depends on both time-varying shocks and constant characteristics that may be related to crime rates. We include as time-varying characteristics each municipality's current income levels and investment in education and health. As controls, we also use shocks to different crime rates in the previous month in order to test whether they are related to the phase in which each municipality began implementing Law 1098. We further control for the average values of these same measures and finally for municipalities' characteristics in 2003 prior to the enactment of the law. Finally, all models control for duration dependence linearly.

As can be observed in Table 4, the results show that the gradual implementation of SRPA can be treated as an exogenous policy experiment. None of the shocks, especially those related to crime rates in each municipality, help explain the timing of the start of each implementation phase. The only exceptions to this rule are shocks such as the rate of vehicle theft, which appear significant at 6 percent and suggest that implementation was faster in places where a reduction in this crime rate occurred. As for the constant control variables, the only significant one suggests that municipalities with higher mean homicide rates implemented SRPA earlier. However, given that we control in our specification of interest for constant municipalities' fixed effects, this finding poses no inconvenience for the implementation of the DID strategy.

Table 4. Duration Model - Probability of Implementing SRPA

Variables	OLS	Panel
Duration dependence	0.00103*** (1.88e-05)	0.00223*** (2.57e-05)
Δ investment in education	1.57E-11 (1.77e-10)	1.57e-10 (1.67e-10)
Δ municipality income	-4E-12 (2.66e-11)	-0 (0)
Δ municipality royalties	-4.61e-10 (3.35e-10)	-0 (5.12e-11)
Δ theft rate to people	-2.05e-05 (6.05e-05)	-5.30e-05 (5.69e-05)
Δ homicide rate	6.87e-05 (8.18e-05)	3.55e-05 (7.64e-05)
Δ theft rate against business	6.22e-07 (0.000109)	9.15e-06 (0.000102)
Δ theft rate against residence	-7.41e-05 (8.35e-05)	-9.30e-05 (7.78e-05)
Δ theft rate of vehicles	-0.000178 (0.000157)	-0.000207 (0.000146)
Constant	-0.0159** (0.00794)	-0.00401** (0.00177)
Observations	75,603	79,408
R-squared	0.038	0.143
Municipality FE		Yes
Time FE		Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on Ministry of Defense and CEDE municipal panel

6.2 SRPA and Crime Rates

Tables 5 and 6 present the general effect of the implementation of SRPA on crime rates in the country. Specifically, we present the results for five different crimes: theft against people, commercial establishments, residences, vehicles, and homicides. For each one, the specification is done for the 13 largest Colombian cities, all state capitals, other municipalities, and the country as a whole with month-year and municipalities fixed effects. In order to separate crime from armed conflict in Colombia, we use only information on urban crime. Although not shown, all regressions include controls for industry and trade revenue per capita, investment in education, Gini coefficient, number of coca hectares grown in the municipality, forcefully displaced population, and the unemployment rate for the 13 largest cities. Each table has two distinct panels corresponding to different specifications. In the first panel, the results from specification (2) are presented, while the other panel presents the results from specification (3). As can be observed, the coefficient associated with the implementation of SRPA in each municipality is positive and significant for thefts against people and residences, implying that they in fact increased in each municipality after the change in the judicial system for adolescents. This, however, is not true for other thefts and homicides where the coefficient associated with SRPA is zero. The results on homicide are expected given that, as previously explained, SRPA decreased the costs of committing crimes such as thefts for juveniles but did not change the costs for crimes such as homicides, kidnapping, or extortion.

Table 5. Dependent Variable: Logarithm of Crime Rates in Municipality i and Time t

VARIABLES	Theft against people				Theft against business				Theft of residence			
	Capital cities	13 cities	Other cities	All cities	Capital cities	13 cities	Other cities	All cities	Capital cities	13 cities	Other cities	All cities
<i>Panel A</i>												
SRPA	0.212 [0.136]	0.192 [0.137]	0.0940*** [0.0228]	0.0977*** [0.0231]	0.0941 [0.108]	0.194 [0.117]	0.0156 [0.0179]	0.0185 [0.0181]	0.200 [0.128]	0.347*** [0.0969]	0.0320 [0.0202]	0.0365* [0.0201]
<i>Panel B</i>												
SRPA	-2.391* [1.229]	3.334 [3.134]	0.181 [0.151]	0.196 [0.154]	-2.495*** [0.807]	-0.587 [1.905]	-0.194** [0.0885]	-0.220** [0.0899]	-1.845 [1.271]	0.840 [2.277]	-0.230* [0.119]	-0.252** [0.119]
SRPA*Log (% of people 8-13)	17.65** [7.506]	2.310 [12.39]	0.619 [1.445]	0.540 [1.429]	-2.993 [4.149]	-5.442 [4.962]	1.675** [0.832]	1.802** [0.834]	13.20* [6.614]	0.571 [4.793]	1.714 [1.150]	1.921* [1.125]
SRPA*Log (% of people 14-17)	-37.76*** [10.00]	-79.43* [38.95]	-6.925** [2.748]	-7.091*** [2.735]	10.70 [6.927]	9.758 [27.99]	-1.617 [1.680]	-1.187 [1.667]	-27.15** [11.36]	-28.30 [30.77]	-2.766 [2.248]	-2.757 [2.224]
SRPA*Log (% of people 18-25)	28.83*** [7.917]	20.66 [20.01]	3.467*** [1.188]	3.559*** [1.182]	17.28** [6.283]	5.347 [16.90]	1.144* [0.657]	0.952 [0.658]	21.73** [8.899]	12.69 [13.74]	2.404*** [0.843]	2.397*** [0.823]
Observations	2,592	1,248	86,016	87,264	2,592	1,248	86,016	87,264	2,592	1,248	86,016	87,264
R-squared	0.221	0.306	0.015	0.016	0.132	0.240	0.008	0.008	0.114	0.243	0.011	0.011
Number of municipalities	27	13	896	909	27	13	896	909	27	13	896	909
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Controls: Per capita Industry and Business tax collection, per capita investment in education, fiscal performance, density of population, rural index, displaced population arrival, unemployment (for 13 cities).

Robust Standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on Ministry of Defense and CEDE municipal panel.

Table 6. Dependent Variable: Logarithm of Crime Rates in Municipality i and Time t

VARIABLES	Theft of vehicles				Homicide			
	Capital cities	13 cities	Other cities	All cities	Capital cities	13 cities	Other cities	All cities
<i>Panel A</i>								
SRPA	-0.00157 [0.0637]	-0.0716 [0.0529]	0.00554 [0.0131]	0.000915 [0.0131]	0.0645 [0.0588]	-0.0272 [0.0446]	-0.0143 [0.0158]	-0.0157 [0.0154]
<i>Panel B</i>								
SRPA	-1.588 [1.182]	-0.549 [1.604]	-0.193** [0.0749]	-0.249*** [0.0759]	0.251 [0.851]	1.235 [1.296]	-0.289*** [0.112]	-0.291*** [0.111]
SRPA*Log (% of people 8-13)	16.88** [7.236]	9.455** [4.141]	1.495** [0.607]	1.987*** [0.643]	-7.621 [7.358]	-7.936* [4.364]	1.029 [0.980]	0.985 [0.965]
SRPA*Log (% of people 14-17)	-28.29** [12.45]	-12.81 [18.14]	-2.205 [1.352]	-2.173 [1.361]	23.28* [13.53]	9.071 [12.38]	1.696 [1.810]	1.803 [1.791]
SRPA*Log (% of people 18-25)	15.14 [9.021]	3.488 [10.34]	1.701*** [0.525]	1.580*** [0.514]	-9.251 [5.467]	-8.915 [5.115]	0.0940 [0.626]	0.0794 [0.618]
Observations	2,592	1,248	86,016	87,264	2,592	1,248	86,016	87,264
R-squared	0.120	0.403	0.005	0.006	0.182	0.343	0.009	0.010
Number of municipalities	27	13	896	909	27	13	896	909
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Controls: Per capita Industry and Business tax collection, per capita investment in education, fiscal performance, density of population, rural index, displaced population arrival, unemployment (for 13 cities).

Robust Standard errors in brackets, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' calculations based on Ministry of Defense and CEDE municipal panel.

The second panel presents the results of estimating specification (2) with the interactions of the proportion of the population between 8 and 14, 15 and 17, and 18 and 25 for each of the different types of crimes and in the four groups of municipalities. It is interesting to note that the average impact of the implementation of SRPA change under this new methodology. In fact, on average the implementation of SRPA reduced theft and homicide rates in municipalities with a higher proportion of adult population. Moreover, based on the interaction of SRPA with the different cohorts, all results appear to be driven by the largest municipalities, in the first two groups that include the 13 largest cities and all states' capitals. For state capitals, the effect of SRPA is more pronounced the higher the proportion of teens under 14 for all crimes, except for the case of theft against business and homicides. The elasticity for the variable of interest ranges from 1.3 to 15, where the smallest effect is for thefts of vehicles in non-capital cities and the largest is for thefts against people in capital cities.

There appears to be a substitution effect between teens under and over 14 after the implementation of SRPA. For almost all thefts, except for thefts against business, the coefficient associated with the proportion of youths between 14 and 17 years old in the 13 largest cities is negative and significant. With respect to the proportion of adults between 18 and 25, the coefficient for all crimes is positive and significant, suggesting that in Colombia this age group is particularly prone to commit crimes. In the case of homicides, neither the dummy variable nor its interaction is significant for the largest cities, suggesting that once we control for the structure of the population, the effect of the implementation of SRPA is zero. For smaller municipalities, the elasticity is actually negative and significant. Again, we expected this result, as Law 1098 mandates that teens who commit homicides and other serious crimes receive the same punishment as in adult courts. Thus, implementation of SRPA increased crime overall and redistributed participation in crime across age groups, prompting children under 14 to engage more in criminal activities.

6.3 A Change in Police Incentives?

In this paper, we present evidence of one of the possible mechanisms that may be occurring: a change in police incentives. The results in Tables 7 through 9 confirm what was evident in Figure 2. The implementation of Law 1098 may have changed police incentives, and a general decrease in juvenile arrest rates did in fact occur for most crimes. The table shows the coefficient

of interest, δ , obtained from regressing each capture rate per 100,000 inhabitants for each crime and cohort, as explained in Section 4. For each type of crime, the table shows the results of the estimation using only state capitals, non-capitals, and all municipalities, respectively.

Two important results must be highlighted. First, in the case of thefts against people, drug trafficking, and possession of illegal weapons, the capture rate of adolescents under 14 and between 14 and 18 decreased after the implementation of SRPA. The economic impact of these effects is important for adolescents under 18, but less so for those over 18. For example, with respect to theft against people, after the implementation of SRPA the reduction in arrest rates of children below 14 years of age was approximately of 0.05 percentage points for the whole country. For those cohorts 18 or older, the capture rate per 100,000 inhabitants actually increased. The magnitude of these changes is 0.6 and 0.1 percentage points, respectively, in the case of thefts against people. These differences suggest that the efficiency of the police force did not decrease after the implementation of SRPA; rather, the police force's incentive to capture adolescents after SRPA changed. Second, for homicide arrest rates, the coefficient of interest is never significant at any standard confidence level. This suggests that the gradual implementation of SRPA did not change any incentives that might have affected homicide arrest rates for any cohort. This result is expected given that the punishment of juveniles older than 14 for homicide remained the same. Although not shown, as mentioned in the empirical strategy we either excluded the crime rate in each municipality from the regressions on arrest rates or included different lag times in order to analyze whether any endogeneity problem may have been present that could bias the results. Although not shown, the results remain almost identical and are available upon request.

Taken together, the evidence presented in Tables 5 through 8 suggests that the introduction of SRPA decreased the cost of crime to juveniles through two different channels. First, it significantly reduced the harshness of the penalties, except for homicide, kidnapping, and extortion. Second, it reduced the probability of apprehension.

Table 7. Dependent Variable: Arrest Rate for Each Cohort c and for Each Crime s in Municipality i and Time t

VARIABLES	Theft against people				Theft against business				Theft to residence			
	Capital cities	13 cities	Other	All cities	Capital cities	13 cities	Other	All cities	Capital cities	13 cities	Other	All cities
SRPA (under 14)	-0.0500 [0.0499]	-0.0848 [0.0505]	-0.0517*** [0.0137]	-0.0527*** [0.0135]	-0.0280* [0.0157]	-0.0160 [0.0212]	-0.00342 [0.0120]	-0.00405 [0.0118]	0.00696 [0.0221]	0.0152 [0.0128]	0.00711 [0.00607]	0.00733 [0.00593]
SRPA (14-17)	-1.459*** [0.369]	-1.579*** [0.416]	-0.160*** [0.0350]	-0.194*** [0.0380]	-0.0730 [0.0720]	-0.0769 [0.0609]	-0.0422* [0.0217]	-0.0436** [0.0213]	-0.169 [0.111]	-0.0557* [0.0279]	0.00161 [0.0135]	0.000926 [0.0133]
SRPA (18-25)	0.678*** [0.238]	0.382 [0.367]	0.127*** [0.0401]	0.127*** [0.0399]	0.0924 [0.111]	0.202 [0.149]	0.0286 [0.0235]	0.0314 [0.0231]	0.0655 [0.160]	0.00597 [0.0673]	0.0790*** [0.0212]	0.0778*** [0.0208]
SRPA (over 25)	0.476 [0.312]	-0.202 [0.447]	0.225*** [0.0604]	0.211*** [0.0596]	0.243 [0.213]	0.421 [0.334]	0.0497* [0.0301]	0.0547* [0.0299]	-0.232 [0.204]	0.155 [0.0991]	0.0420 [0.0327]	0.0442 [0.0319]
Observations	1620	780	53760	54540	1620	780	53760	54540	1620	780	53760	54540
Number of municipalities	27	13	896	909	27	13	896	909	27	13	896	909
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Controls: Per capita Industry and Business tax collection, per capita investment in education, fiscal performance, density of population, rural index, displaced population arrival, unemployment (for 13 cities).

Robust standard errors in brackets, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' calculations based on Ministry of Defense and CEDE municipal panel.

Table 8. Dependent Variable: Arrest Rate for Each Cohort c and for Each Crime s in Municipality i and Time t

VARIABLES	Theft to cars				Theft to motorcycles				Total theft			
	Capital cities	13 cities	Other	All cities	Capital cities	13 cities	Other	All cities	Capital cities	13 cities	Other	All cities
Dummy (under 14)	0.000210 [0.000354]	-0.000477 [0.000364]	0.000531 [0.000520]	0.000518 [0.000513]	-0.00317 [0.00210]	-0.00240 [0.00152]	-0.000627 [0.000468]	-0.000638 [0.000457]	-0.100 [0.103]	-0.117 [0.0828]	-0.0176 [0.0193]	-0.0203 [0.0190]
Dummy (14-17)	0.000533 [0.00499]	0.000533 [0.00702]	0.000928 [0.00112]	0.000870 [0.00111]	-0.00992 [0.0521]	-0.00710 [0.0122]	0.00837* [0.00461]	0.00809* [0.00452]	-2.313*** [0.568]	-2.255*** [0.497]	-0.180*** [0.0504]	-0.233*** [0.0549]
Dummy (18-25)	0.00772 [0.0110]	0.0281* [0.0140]	-0.0128*** [0.00486]	-0.0120** [0.00479]	0.0449 [0.0292]	0.0131 [0.0280]	0.0239** [0.0106]	0.0233** [0.0104]	0.237 [0.461]	0.286 [0.633]	0.188*** [0.0675]	0.168** [0.0680]
Dummy (over 25)	-0.00959 [0.0317]	0.0277 [0.0254]	0.00121 [0.0111]	0.00127 [0.0109]	0.0834*** [0.0290]	-0.0101 [0.0337]	0.0273*** [0.00907]	0.0265*** [0.00889]	0.0348 [0.545]	0.155 [0.666]	0.176 [0.114]	0.147 [0.113]
Observations	1620	780	53760	54540	1620	780	53760	54540	2430	1170	80640	81810
Number of municipalities	27	13	896	909	27	13	896	909	27	13	896	909
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Controls: Per capita Industry and Business tax collection, per capita investment in education, fiscal performance, density of population, rural index, displaced population arrival, unemployment (for 13 cities).

Robust standard errors in brackets, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' calculations based on Ministry of Defense and CEDE municipal panel .

Table 9. Dependent Variable: Arrest Rate for Each Cohort c and for Each Crime s in Municipality i and Time t

VARIABLES	Weapon carrying				Drug carrying				Homicide			
	Capital cities	13 cities	Other	All cities	Capital cities	13 cities	Other	All cities	Capital cities	13 cities	Other	All cities
Dummy (under 14)	-0.0287** [0.0113]	-0.0354* [0.0188]	0.000577 [0.00500]	-0.000295 [0.00490]	-0.269** [0.126]	-0.311 [0.203]	-0.0739*** [0.0165]	-0.0772*** [0.0164]	-0.00244 [0.00180]	-0.00405 [0.00322]	-0.000273 [0.000271]	-0.000316 [0.000272]
Dummy (14-17)	-0.214* [0.108]	-0.367** [0.163]	-0.0363* [0.0210]	-0.0426** [0.0209]	-4.854*** [1.666]	-5.996** [2.403]	-1.001*** [0.194]	-1.077*** [0.193]	-0.00404 [0.0153]	0.00553 [0.0159]	-0.00788 [0.00610]	-0.00792 [0.00596]
Dummy (18-25)	0.134 [0.104]	0.214* [0.117]	-0.0150 [0.0422]	-0.0115 [0.0414]	1.325 [1.235]	3.759** [1.412]	0.691*** [0.204]	0.718*** [0.200]	-0.0993 [0.0727]	-0.0531 [0.0620]	0.00894 [0.0198]	0.00719 [0.0194]
Dummy (over 25)	0.384* [0.190]	0.0800 [0.185]	-0.0292 [0.0831]	-0.0238 [0.0814]	3.564 [2.464]	7.182*** [2.307]	1.945*** [0.437]	2.001*** [0.430]	0.0589 [0.169]	-0.0388 [0.111]	0.116** [0.0492]	0.110** [0.0482]
Observations	2430	1170	80640	81810	2430	1170	80640	81810	2430	1170	80640	81810
Number of municipalities	27	13	896	909	27	13	896	909	27	13	896	909
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Controls: Per capita Industry and Business tax collection, per capita investment in education, fiscal performance, density of population, rural index, displaced population arrival, unemployment (for 13 cities).

Source: Authors' calculations based on Ministry of Defense and CEDE municipal panel.

6.4 SRPA and School Attendance Decisions

Table 10 shows the effect of the implementation of SRPA on school attendance decisions. The table is divided into three panels, depending on whether information is used for the whole sample, boys only, or girls only. The three panels present the effect of the law on school attendance for each sample and for adolescents, divided by level of education of the head of the household, in order to study the presence of heterogeneous impacts on school attendance decision making. Finally, given the structure of the law, we interact in all specifications a SRPA dummy with two age cohorts: younger than 14 and between 14 and 16.

As the first four columns show, implementation of SRPA appears to have no effect on school attendance decisions of Colombian adolescents. Even though the coefficients in the first two columns are negative, none of them is significant at any standard significance level. This suggests that, on average, the lower cost of committing crimes is not creating a tradeoff for students between legal and illegal activities.

However, the difference between boys and girls is striking. Law 1098 had no impact on girls' schooling decisions. The opposite is true for boys. The coefficients in Table 10 suggest that SRPA only affected males under age 14 from households with low levels of education. This result is in line with three facts. First, boys are more likely to engage in criminal activity than girls. Second, previous economic literature has established that adolescents belonging to poorer and more fragile households are more likely to commit crimes. Finally, the biggest reduction in the cost of crime following implementation of SRPA affected boys under 14. After the new law passed, school attendance for this group fell by 3.84 percentage points. This is a large effect, given that what we present is the average impact of the law on all Colombian children, which of course should not be all affected by it.

Table 10. Dependent Variable: School Attendance for Each child a in Municipality i and Time t

	Whole sample				Boys				Girls			
	All individuals	Houshold Head's Education			All Boys	Houshold Head's Education			All Girls	Houshold Head's Education		
		Primary	Secondary	College or More		Primary	Secondary	College or More		Primary	Secondary	College or More
SRPA * Under 14	-0.0116 (0.0171)	-0.0267 (0.0179)	0.00569 (0.00925)	0.00307 (0.00516)	-0.0183 (0.0218)	-0.0384* (0.0223)	0.00913 (0.0130)	0.00565 (0.00605)	-0.00468 (0.0138)	-0.0139 (0.0168)	0.00172 (0.00999)	-0.00619 (0.00807)
SRPA * Between 14-16	0.00552 (0.0105)	-0.00347 (0.0132)	0.00938 (0.00864)	0.0144** (0.00632)	0.00382 (0.0134)	-0.00436 (0.0168)	0.00969 (0.0131)	0.00664 (0.00705)	0.00669 (0.0104)	-0.00302 (0.0143)	0.00796 (0.0100)	0.0168* (0.00976)
Observations	44310	25295	13991	5024	22496	12958	7031	2507	21814	12337	6960	2517
R-squared	0.703	0.685	0.773	0.841	0.685	0.668	0.757	0.864	0.727	0.709	0.791	0.825
Number of municipalities*years	351	347	339	294	351	345	333	266	351	346	333	257
Municipality*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Controls: Gender, years of education, years of education of head of household, single-parent household, gender of head of household, per capita income, size of household, floor quality, rural/urban, stratum, role inside household, homicide rate, theft rates (people, business, vehicles, residence)

Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on Ministry of Defense and CEDE municipal panel.

7. Conclusions

The exogenous implementation of the change in the juvenile justice system in Colombia allows us to estimate its effect on juvenile crime. Following international trends in theories of justice affecting adolescents, SRPA reduced the harshness of punishments, which yielded two important results. The first is its effects on crime rates. After SRPA was implemented, theft increased in urban areas, more so in municipalities with a higher proportion of adolescents. There was no correlation between homicide rates and SRPA. Moreover, the results seem to suggest a tradeoff between teens older than and younger than 14 following implementation of SRPA. Theft in municipalities with a higher proportion of teens under 14 increased but it decreased in municipalities with a higher proportion of teenagers between 14 and 17. The second result is the apparent reduction in the arrest rates of juveniles in Colombia. These results are probably unintended effects of the new judicial system, which reduced the costs to adolescents of engaging in criminal activities.

The rising trend of juvenile crime creates incentives for children to drop out of school. School attendance decreased for boys under 14 after SRPA went into effect. Lower school attendance is most marked among male children from less educated households. This result contributes to the emerging evidence on the impacts of crime on school attendance.

The results are in line with previous studies that show that the mechanisms present in the judicial system influence young people's decisions whether to participate in illegal activities. More importantly, the results also show that policy makers must be prepared to counteract the negative unintended consequences of changes in legislation, such as the one implemented in Colombia. . In this case, without complementary policies being implemented, the negative consequences might persist or even increase over time. Anecdotal evidence as well as the studies cited in this paper on the implementation of SRPA suggest that much work needs to be done to coordinate the work of the police, the judicial system, and social services in this area. Moreover, special programs need to be implemented for at-risk youth belonging to poor, low-educated, fragile households.

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