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**Abstract**

Using census data for Argentine prisons for the period 2002-2005, this paper presents evidence of the positive effect that prisoner education programs (primary and some part of secondary schooling) have on in prison conflictivity measured as sanctions or violent behavior of the prisoner. In order to overcome the problems of endogeneity that education decisions generate we use an instrumental variables approach. Our results show a decrease in participation in violent conflicts and bad behavior which can be partially attributed to education.

JEL code: I21, O54
Keywords: prison based education, violent behavior.

# 1 Introduction

> *"Now in prisons like Stateville, purposes are unclear, education is largely a token, idleness takes the place of work and industry, and keeping peace and safety between prisoner and prisoner is the prevailing aim" Prisoner 12345, F House, cell 304, Stateville Prison*[1]

Even though prisons have existed since ancient times, before the late eighteenth century, they were not commonly used by justice systems around the world for punishing criminal behavior. Morris and Rothman (1995) describe that among the most frequent punishing tools employed in England during the early eighteen hundreds one finds whipping, military recruitment, transfer to the colonies and the much feared gallows. Imprisonment was very rarely imposed and if it occurred, it was the punishment given to petty offenders.[2] In modern days the situation is quite the opposite and most serious felonies are often punished with prison. The International Centre for Prison Studies estimated that more than nine million people were held in penal institutions around the world in 2006. However, Walmsley (2006) specifies that female prison population rates today vary significantly across countries. According to the author, the highest prison population rate is found in the USA (738 per 100,000 inhabitants) and almost half of all prisoners are held in only three countries: United States, Russia and China. While the average prison population rate in southern European countries is 90, in Southern African countries it reaches 267. Variation in America is also important, while the average rates in South American countries is close to 166, in Caribbean countries it reaches 324.

Despite such variations, it is evident that in modern days one of the most common punishments for criminal behavior is prison. Cavadino and Dignan (2002) suggest that institutions such as prisons are legitimate only if they are perceived as morally justified. Two of the most cited justifications for such punishment in modern society are reductivism and retributivisim. The former is a forward looking theory associated with the idea that through deterrence, incapacitation and reform of prisoners, future violent and criminal behavior can be reduced. The latter on the contrary, is a backward looking theory based on the idea that criminals should be punished because they deserve it. Although early

[1] Quoted from Morris and Rothman (1995).

[2] For an extensive review of the history of prisons please refer to Morris and Rothman (1995).

thoughts of this justification were based on the commonly known saying "an eye for an eye", more modern views relate it to a theory of "social contract" in which punishment is a mean through which equality is restored.

It can be stated that economic literature has largely studied and justified punishment under the reductivism channel, especially through its effect on deterrence. In his classical paper Becker (1968) concluded that through an appropriate choice of policy variables such as expenditure on police and courts, the expected returns of crime to potential felons will decrease and hence reduce its incidence. Since then, several theoretical and empirical studies have tried to confirm this.[3] However, much less focus has been given to the effect of the penal system on the "reformation" of prisoners. It is difficult to understand how prisons can attain this objective, that is how can inmates be trained to behave rightfully in a free society when all of the time they are inside four walls under probably deplorable physical and moral conditions.

Among the few programs established in modern societies to try to reform convicts are education programs. On this matter, the economics of crime literature has acknowledged several channels through which education may affect criminal participation. In particular, education by increasing potential wage rates can reduce the probability of engaging in criminal activities since it increases the opportunity costs of illicit behavior as well as the cost of time spent in prison. Moreover, schooling may affect directly the financial or psychic reward of crime since it can affect behavioral attitudes, time preferences or risk aversion indirectly influencing the decision to engage in crime. Finally, education could affect crime through the fact that past conviction can hurt subsequent labor opportunities of the more educated due to stigma.

Studies from criminologists such as Phipps et al. (1999), Wilson et al. (2000) and Steurer and Smith (2003) have obtained evidence in favor of the positive effects that prison based education may have on recidivism rates. However, based on the methodology employed, it is hard to disentangle the channels through which education affects the criminal behavior of ex-convicts. For instance, recent evidence obtained by Tyler and Kling (2006) suggests that part of this effect may be coming from an increase in the opportunity cost of crime given that prisoners who received general education obtain

[3]Recent empirical evidence on the effect that deterrence variables have on crime are Levitt (1997) and Di Tella and Schargrodsky (2004).

higher wages than peers who did not. Hence, the question of whether education can indeed "reform" convicts is still unanswered.

Using census data for Argentine prisons this paper is a first attempt to estimate the direct impact that prisoners education programs have on violent behavior within prisons. Specifically, we evaluate whether participation in basic education programs reduces the probability of in-prison conflicts. To handle the possible endogeneity of schooling decisions two approaches are explored: an instrumental variables approach and a panel fixed effects approach. We find that primary and secondary education participation lowers the probability of in-prison conflict for different measures of in-prison violence.

Within prisons little is known about the effects that education programs have on violent behavior of convicted criminals. This paper represents a contribution supporting the idea of reductivism, where prisons's objective should be to reform inmates. Furthermore, evidence provided suggests that fostering in-prison education could have a positive effect in reducing conflictivity. The remainder of the paper is organized as follow: section two presents the literature review on prison based education programs; section three and four describe the empirical strategy and main results; finally section five concludes.

# 2 Literature Review

In his seminal paper, Becker (1968) describes the supply of offenses ($O_j$) as a function that depends on three distinct groups of variables:

$$O_j = O(p_j, f_j, \mu_j)$$

where $p_j$ captures the probability of conviction after a crime is committed, $f_j$captures the punishment per offenses and finally $\mu_j$ captures other variables that could influence such supply such as the income earned from legal activities and a measure of law abidingness of the potential criminal. Economic and criminologist literature has traditionally focused its attention on the first two groups of variables, studying how expenditure in police, courts and hardness of punishment can reduce the incidence on crime. After years of research, it is now generally accepted that while higher measures of $p_j$ will deter crime, the effect of changes in $f_j$ is more ambiguous. According to Cavadino and Dignan (2002) such differences may emerge due to the fact that people's acts are more influenced by their

moral principles, the social norms and the probability of capture than by the harshness of punishment itself.

Much less attention has been given to the variables captured by the third parameter; specifically there is little evidence on how education can decrease criminal statistics. Under Beckers´ framework education could indeed reduce the supply of offenses by either increasing the opportunity cost of committing a crime (opportunity cost channel) or through an increase in the "law abidingness" of citizens (behavioral channel). Empirical evidence on the subject however is scarce. Several problems exist in order to estimate the effect of schooling on crime. Among them, two of the most serious ones are the endogeneity of schooling decisions and the fact that crime is not perfectly observed. Moreover, all of the studies present in the literature evaluate the effect of education on behavior outside prisons.

Nonetheless, findings for the United States suggest that education has a negative effect on crime participation once these endogeneity problems are accounted for. In the criminologist literature, the first evaluations on the subject concluded that education programs were a promising tool in the reduction of recidivism rates. However, most of these studies had serious methodological problems given that they ignored problems arising from self-selection of prisoners into programs, the availability of information on adequate control groups and a sufficient follow up of prisoners.[4] Recently, Steuter and Smith (2003) fill this gap by conducting a three state recidivism study. Taking into account the previous concerns, the authors compare the impact of educational programs in the recidivism rates of prisoners in Maryland, Minnesota and Ohio. The main findings, robust to different estimation methodologies, supports the hypothesis that education programs for prisoners are indeed an effective tool for the reduction in re-arrest, re-conviction and re-incarceration of ex-prisoners.

In the economics literature, Lochner-Moretti (2004), using census and FBI data and controlling for endogeneity problems, find that more education reduces the probability of incarceration and arrest. For a population of convicted offenders in Florida and using panel fixed effects methodology, Tyler-Kling (2006) find that ex-convicted offenders from minorities (non white individuals) that participated in education programs in prison had

[4]For complete reviews of previous studies in the criminologist literature please refer to Sherman et al (1997), Phipps et al. (1999) and Wilson et al. (2000).

a significant increase in post release income compared to similar ex-convicted offenders that did not.

This paper is a first attempt to estimate the effect of prison based education programs on the behavior of prisoners. Moreover, assuming that the opportunity cost of bad behavior for all prisoners is the same we could also in principle obtain evidence in favor of the hypothesis that the "behavioral" channel indeed exists.

# 3 The Argentine Penal Legislation

In 1996 the Argentine Congress passed a law that regulates the punishment that deprives personal freedom for convicted individuals. This law repeals the previous one dating back to 1958. The goal of this new law is to make inmates acquire the capacity to understand and respect the law, endeavoring their proper reintegration to society. The law states that the mandatory treatment of the inmates must be programmed and individually monitored with respect to the norms that regulate life, discipline and work. Moreover, the penitentiary regime is based on the notion of *progressiveness* that limits the time that inmates stay in closed prisons as well as promoting, conditioned on a positive evaluation of the inmates conduct, whenever possible that the inmate should be incorporated in less restrictive prisons.[5] The progressiveness of the penitentiary regime applied to convicts is characterized four periods:

1. *Observational period:* during this period, the inmate is evaluated in several dimensions. She has medical, psychological and social evaluations, together with a criminological profile. All this information must be properly filed and updated.

2. *Treatment period:* during this period and according to prison facilities, the prisoner goes through different phases in order to gradually attenuate the restrictions imposed by the sentence. This may include changes within each prison department or even prison transfers.

3. *Test period:* this period comprises the gradual incorporation of the inmate to less restrictive activities, including the incorporation to the regime of semi-liberty.

[5] Cfr. Argetine Law 24.660, articles 1-6

4. *Parole period:* the inmates leaves the prison for periods up to seventy two hours in order to carry out different activities: studying, participation in training programs, family visits, etc.

In turn, the treatment period is divided into 3 stages:

a. Socialization

b. Consolidation

c. Trust

In order to go through these periods and stages inmates are evaluated in two dimensions: conduct and concept. On the one hand, *conduct* refers to the observance of norms and rules that enforce order, discipline and life inside the prison. On the other hand, *concept* refers to the inmates personal evolution from which the possibilities of reentry into society are appraised. This in turn is used for the application of the regime of progressiveness. Moreover, the inmates conduct is used to determine the frequency of visits and the possibility to participate in recreative activities, among others.

Each time an inmate enters a prison, he must be examined by a doctor, who certificates the inmates physical and mental health in order to give a proper treatment. The doctor must also look for injuries or any trace of alcohol, drugs or other toxic substances that produce any physical or psychological dependency. Also, some basic information about the inmate[6] is gathered in his personal file. Once the entry proceedings are finished, and in order to avoid possible conflicts among prisoners, inmates are gathered into homogeneous groups taking into account the offenders sex, age, physical and mental health, schooling attainment, criminal record and the nature of the offence committed.

The Argentinean law states that remanded prisoners must be separated and kept away from sentenced prisoners. Nevertheless, due to prison overcrowding remanded prisoners are frequently held in shared accommodations with sentenced prisoners.

The penal system is designed to encourage good behavior of the prisoners by means of rewarding positive actions and punishing negative ones. In particular, the inmates

[6]Marital and legal status, educational level, etc.

right to acquire education must guaranteed from the moment they enter the prison. The education acquired is oriented so as to make inmates acknowledge her obligations and the norms that govern life in society. Basic primary and secondary schooling is mandatory to all illiterate prisoners and to those who have not achieved the minimum level of education set by the law. Moreover, in every prison the law requires that there should be a library for all inmates.

The *Federal* Penitentiary Service (SPF, for its Spanish abbreviation) is in charge of all federal prisons in Argentina while each *Provincial* Penitentiary Service is in charge of the prisons in each province except for those that are federal. All offenders to the federal system are put away in federal prisons, i.e. tax evasion, drug traffic, smuggling, counterfeiting, money laundering, among other felonies, as well as all offences committed in the National Capital City (CABA[7]).

When a sentenced prisoner is sent to a prison, criteria is that it has to be the closer available to the place where the crime was committed. Contrary to what happens with sentenced prisoners, remanded prisoners are allocated to the prisons according to space available in them.

The National Statistical System about the Observance of Punishment (SNEEP[8], for its Spanish abbreviation) has the objective of periodically gathering statistical information about all sentenced and remanded prisoners in the whole country. Annually, the system collects the data from both federal and provincial prisons. The information is gathered through a specific questionnaire which includes census data of prison population and specifies what happened during that year. In the first part of the questionnaire there are questions about the inmates age, sex, nationality, marital status, educational level, working status and training level, place of residence before incarceration, judicial jurisdiction, legal status, where the inmate comes from (direct entry or transferred from another prison) and type of the offence committed. In the second part of the questionnaire there is information about what the inmate did over the past year. There are also questions about the prisoners activities (work in prison, training attainment, participation in educational programs, sports and recreational activities) and if they received medical attention and visits. There is also a record about the inmates conduct, discipli-

[7] Ciudad Autónoma de Buenos Aires

[8] Sistema Nacional de Estadísticas sobre Ejecución de la Pena (SNEEP)

nary sanctions, attempts to escape, security measures[9] and their status on the progressive system.

# 4 Educational Requirements for Inmates

The educational system[10] in Argentina is gradual and progressive. It is divided into 5 periods[11]:

1. Initial education (kindergarten): for children between 3 and 5 years of age.
2. General education (grade school, EGB or Educación General Básica): it is mandatory, lasts for 9 years and starts at the age of 6. Up to 2006, compulsory education in Argentina consisted of the EGB. In order to compare it with the US system, EGB is the sum of elementary education plus two years of high school.[12]
3. "Polimodal" education (high school): lasts for 3 years. This level is equivalent to the last three years of high school. The student can opt for different specializations (humanities, sciences, etc) during this cycle.
4. Superior education (tertiary and university studies).
5. Graduate education

Law 24.660 states that prisons must guarantee schooling for inmates whose educational attainment is below the compulsory nine years. Hence, any inmate failing to provide the necessary documentation that proves that she/he has at least nine years of education must attend school while in prison. Furthermore, prisons must guarantee the necessary educational supply for inmates. For other educational levels (polimodal and superior education), prisons may or may not offer such education. In general, prisons only offer general education, though in some centers there is polimodal and even in some

[9] Cfr. Penal Code, art 52

[10] This is based on the Law 24.195. It is worth mentioning that this law has been modified by Law 26.206 of December 2006. However, our paper is based on the educational requirements mandated by the previous law which applies in the period studied.

[11] Cfr. Law 24.195, Title III - Chapter I

[12] In 2006 the period of compulsory education was increased from 9 to 12 years.

of them, like in Buenos Aires, some university degrees[13] can be obtained. Using data from the SNEEP, we observe that 31,5% of the inmates should be receiving compulsory education, because they do not fulfill with the basic education requirements mandated by the law. Participation varies widely across provinces, as it can be appraised in Table 1, which shows how many prisoners who should be participating in formal education are indeed participating. While there are some provinces where participation in education is high like in Chubut and Santa Cruz provinces, where participation amounts to 88% of individuals, others have very low participation, like the case of San Luis and Catamarca. Non participation comes from different reasons, as we will see below.

In theory, the fact that education is compulsory for some prisoners, implies that variation in educational participation could be considered "exogenous" and so the effect of education on in prison conflictivity could be analyzed. However, there are several data and other limitations which makes it impossible to ensure the exogeneity of treatment.

The system regulating education in Argentina was decentralized in the early nineteen nineties, where the Argentine Congress transferred most primary and secondary schools to provincial governments. In-prison education is supervised by the Ministry of Justice, a national authority, but as a result of school decentralization, this federal entity has to make individual agreements with each Ministry of Education at the provincial level. Given the profile of inmates, where all of them are adult population, in-prison education falls within the category of "adult education". While all the in-prison education is coordinated at the national level, it has to be supplied by provincial authorities. In this vein, each provincial government must guarantee a functioning school in each prison. However, there are severe administrative limitations to fulfill this mandate. There is a chronic shortage of teachers for adult population in general, and this shortage is worse for prisons, specially since there are no extra incentives to teachers in prison.[14] So, in practice, education is not available for all the inmates that should be attending school while in prison. Moreover, even though the states that have both remanded and sentenced prisoners should guarantee in-prison education if they do not have the minimum mandatory years of education, the Ministry of Justice does not enforce this requirement

[13]The Centro Universitario de Devoto has over 200 university students who are inmmates. Several degrees can be obtained there.

[14]There is no wage differential for teaching in jail.

for the remanded prisoners. One of the main reasons is due to this short supply of teachers so they are first assigned to sentenced prisoners. Secondly, there is a lot of mobility of remanded prisoners among different prisons. Educational programs vary across provinces after decentralization, which is troublesome for prisoners who may change their locations several times before they are sentenced. So these are two of the main reasons of why this educational requirement is not enforced for remanded prisoners. Another reason which prevents inmates from receiving education, even when education is available for them is the lack of proper inmate identification. Around 60%[15] of total inmate population do not have ID cards (Documento Nacional de Identidad or DNI). According to the educational law, in order to receive education the person must have a valid ID.

# 5 Descriptive Statistics

There are some interesting statistics which can be drawn from the SNEEP. In 2005 there were 55,423 incarcerated individuals in Argentina (i.e. 19.7% more than in 2002), this means that the incarceration rate ascended from 123 in 2002 to 143 in 2005, implying an annual growth rate of 5.2%. Though both prisoner population and incarceration rates raised between 2002–2005, there was a fall in prison overcrowding. While in 2002 overcrowding was 17.7% of the prisons, this rate went down to 6.3% in 2005.

Various relevant characteristics of the inmates and of the prison system can be observed from the different annual censuses.[16] The first one is that most incarcerated people are not sentenced: on average 58% of the population were in that situation for the whole period of analysis. It is found that 94.8% of the inmates were male (94.8%), 70.1% were younger than 34 years of age (30.4% were younger than 24 years of age and 39.7% were between the ages of 25 and 34). Furthermore, 68.3% of the prisoners were serving sentence for their first felony and 90.4% of them did not have any security measure.[17] Most of the incarcerated population were Argentinean (94.8%), had an urban residence (88.3%) and were single (69.8%). Most of the population had a very low level of education (78.1% have at most primary school), did not have a full time employment (72.9%, of which 36.7

[15] This figure is lower when we consider Argentine sentenced inmates, but it is still very high. The lack of nation wide digital print records also worsens this problem.

[16] The figures presented here correspond to 2002-2005 averages unless otherwise specified.

[17] Having security measure means that the inmate must serve all the time in prison, without any possibility of parole. This instance is reserved to the most dangerous criminals or recidivists.

% corresponds to unemployed) and did not have any labor training (44.9%). Prisoners came mainly from the following cities/regions: Buenos Aires (44.3%), Córdoba (11.2%), Buenos Aires City (CABA) (7.3%), Mendoza (5.4%), and Santa Fe (5.1%).

With respect to what inmates had done during the year the information was collected, we have that mostly they had not worked (54.4%) or participated in labour training (71.5%) nor in educational programs (59.4%). Among most inmates who did work (29%): 4% did it for at most 10 weekly hours; 9.2% for 20 hours; 6.5% for 30 hours and 9.3% for 40 hours. A rate of 16.7% of the prisoners received primary education, while 30.2% of the inmates had not finished the mandatory years of schooling. From this we can observe that, although education is mandatory for those prisoners who had not achieved primary education, almost half of them did not comply with this obligation. Finally, 78.4% participated in recreative activities, 87.2% received medical attention and 79.4% received visits.

With respect to prisoners' conduct 69.3% of them did not participate in any type of conflict. Only 2.4% of the inmates who participated in in-prison conflict resulted in serious injuries or death. 68,6% of the inmates did not have any misconduct and 76.9% of the prisoners were not punished during those years. Most prisoners did not attempt to commit suicide (92.1%) nor to escape (92.1%), and were not injured (80.2%). Most inmates are in the treatment period (54.3%), 11.5% and 8.8% are in the test and observational period respectively There were very few cases of parole (0.6%), temporary release (8.5%) and reduction of sentence (5% of which 70% was for at most 6 months).

The more frequent felonies were robbery / burglary (40.2%), homicide (11.3%) and drug related felonies (7%). Most inmates were incarcerated "at most" two years ago (55.9%), and were convicted for less than 9 years (64.2%). Only a 6.4% were convicted to life imprisonment.

The statistics offer some odd features. For example, although 23.1% of the prisoners were punished only 21.2% had a misconduct. This is worth mentioning because according to the disciplinary regulation there is a correlation between misconduct and punishment. There are three types of misconducts: low, medium and high, and there are eight types of punishment according to the type of misconduct[18]. So if we perform a detailed analysis of the data about misconducts and sanctions we see that 20.4% of the inmates received

[18] Cfr. Decreto 18/97 sobre el Reglamento de Disciplina pra los Internos, Anexo I, artículos 14–20.

some type of punishment corresponding to high and medium misconduct, although only 15.4% reported to have those types of misconduct. On the other hand, only 1.7% of the prisoners received a punishment corresponding to a low misconduct while 5.8% of the inmates committed this type of misconduct. From this we can see that inmates received a more harsh punishment for their misconduct than what regulation states.

As we have mentioned above 30.2% of the inmates do not have primary education and only 16.7% were receiving primary education, although the law clearly states that education is mandatory both for convicted and remanded prisoners[19].

# 6 Methodology

## 6.1 Treatment and Selection of the Sample

The treatment is to participate in a basic educational program (primary school and three years of secondary school) for individuals that should receive this education by law. The law establishes that all prisoners when entering that do not have basic education are obliged to get if they cannot provide sound proofs that they have finished the mandatory years of education. As suggested above this treatment is partially exogenous since within prisons self selection can still occur in practice. In order to perform our estimations, we restricted the sample to Argentine[20] sentenced males. Also, we considered only prisoners who are in the treatment and observational period, dropping the ones who have security measures, since they might be isolated without access to schooling. This selection was done in order to consider only inmates who are not able to leave the prisons. Inmates in test or parole treatment may leave the prison for some period of time, and some of them may participate in educational activities outside the prisons, but this information is not available in SNEEP. Our sample is restricted to 34349 of all total prisoners. We build our treatment group with inmates who should receive education and are participating from the in-prison schooling system. Our control group comprises the prisoners who should be receiving education but who are not participating in educational programs. We worked with pooled cross-sections.

[19] Cfr. Ley 24.660, Capítulo VIII. Resolución 13/9, anexo I, "Reglamento General de Procesados", Título X

[20] Argentine inmates comprise 94,8% of the total prison population.

## 6.2 Empirical Specifications

The census data for 2002-2005 of the prison population allows us to consider several specifications. Given the fact that we cannot guarantee exogeneity of treatment in practice, in spite that theoretically it could be assumed, we face the problem of endogeneity We perform two different sets of estimations: pooled (linear and probit) regressions and instrumental variables (linear and probit) regressions.

### 6.2.1 Pooled Regressions

A parametric empirical model which can be used is a pooled regression

$$P\left(bhvr_{it}=1|\,educ_{it},time_t,x_{it}^c,x_{it}^p\right)=G\left(\alpha+\beta educ_{it}+time_t\tau+x_{it}^c\gamma+x_{it}^p\delta\right) \quad (1)$$

for $t=1,..,4$ where $G\left(\cdot\right)$ can be the identity mapping which yields a linear probability model or a standard normal cumulative distribution function which generates a probit specification; $bhvr_{it}$ is a binary variable taking the value one if the inmate $i$ behaved badly during period $t$, $educ_{it}$ is a binary variable that takes the value one if the inmate received basic schooling in period $t$ and was supposed to have received this schooling given his level of education when entering the prison (treatment). The row vector $time_t$ is a set of time/census dummies while $x_{it}^c$ is a row vector that represents a set of individual control variables accounting for characteristics of the inmate like age, whether the inmate works in prison, marital status, time deprived of freedom, if unemployed when entering the prison, if inmate participated in sport activities, attempted a prison break, had any medical assistance in prison and if he received personal visits among others. Finally, the row vector $x_{it}^p$ represents a set of prison control variables that account for characteristics of the prison in which the inmate was serving his sentence such as number of prisoners, average age of inmates, percentage of murderers, rapists and thieves; average education levels of prisoners and percentage of failed prison break attempts. The parameter of interest is of course $\beta$ which is expected to be non-positive.

There are *four* measures of $bhvr_{it}$: i) $Sancs_{it}$ takes the value one if the inmate $i$ received any type of sanction during period $t$; ii) $Sevsancs_{it}$ takes the value one if the inmate $i$ received a severe sanction during period $t$ where severe sanction means that the inmate was isolated in his chamber for fifteen consecutive days or seven weekends as well if the inmate was taken to a higher security facility; iii) $Viomed_{it}$ takes the value

one if the inmate $i$ participated in any violent behavior where material damages occurred during period $t$; and iv) $Vioext_{it}$ takes the value one if the inmate $i$ participated in any violent behavior that involved injuries or dead people during period $t$. While $Sancs_{it}$ includes $Sevsancs_{it}$ the two measures $Viomed_{it}$ and $Vioext_{it}$ are disjoint.

### 6.2.2 Instrumental Variables Estimation

Even though the controls used in (1) can in principle attenuate omitted variable bias, the schooling decision can still be correlated with unobserved characteristics due to self-selection. This endogeneity problem can be circumvented by an adequate instrumental variables approach. Naturally valid instruments should be variables that are correlated with participating in educational attainment while not correlated with any determinant of in-prison bad behavior. Since there has been a chronic shortage of teachers for adult population in general at the province level we propose two instruments: i) number of teachers (for adult population) per prisoner denoted $prfpresop$ at the province level, and ii) per capita expenditure on education at the province level denoted $gsteducpc$. Naturally since the dependent variable is binary then a probit or linear probability IV estimation procedure is be called for.

# 7 Results

We conducted several sets of estimations. Pooled regressions according to (1) are shown in table 2a and 2b in the appendix. For all measures of $bhvr$ the estimate of $\beta_1$ is negative and statistically significant at 5% for a one tail test under robust standard errors where the corresponding critical value for the $Z$ statistic is $-1.645$. The marginal effects (evaluated at the mean of the independent variables) are quite small: if an inmate received basic schooling in period $t$ the probability of in prison bad behavior in period $t$ decreases on average between 0.005 to 0.048 depending on the type of measure used. These can hardly be taken as big effects.

Nonetheless, as argued above pooled estimates can be biased because the schooling decision can still be endogenous in (1). Table 3 shows the first stage estimations while tables 4a and 4b show the instrumental variable linear probability model and probit regressions where only $educ$ was instrumented. As shown the two proposed instruments

(number of teachers per prisoner at the province level and per capita expenditure on education at the province level) are positive and individually significant at the 1% for a two tail test under robust standard errors. Moreover, they are jointly significant at the 1% using a likelihood ratio test. The IV results include the full set of prison characteristics.

The results are quite different from what was found with the pooled regressions. The estimate of $\beta_1$ for three out of the four measures of *bhvr* is negative and statistically significant for one tail test at usual significance levels. For the $Vioext$ measure the point estimate of $\beta$ is actually positive (for the probit case) but not statistically significant at any usual level. This suggests that extreme violent behavior is not affected by basic school participation in this population. For the other three measures $Viomed$, $Sancs$, and $Sevsancs$ the estimate of $\beta_1$ is negative and significant at the 5% for a one tail test. The estimated marginal effects for the linear case are quite big: if an inmate received basic schooling in period $t$ the probability of in prison bad behavior decreases on average between 0.15 and 0.24 when either $Viomed$, $Sancs$ or $Sevsancs$ are used as dependent variables. For the probit case (evaluated again at the mean of the independent variables) the estimated effects vary more but are still quite big when $Sancs$ or $Sevsancs$ are used as dependent variables: if an inmate received basic schooling in period $t$ the probability of in prison bad behavior decreases on average between 0.13 and 0.20. When $Viomed$ is used as dependent variable the effect is small, 0.034. These are big effects which suggest that only non-extreme behavior in prison can be affected by basic school participation (primary and some part of secondary schooling).

# 8 Conclusions

The literature on crime has already acknowledged the effect of education on crime. There is also some evidence of the correlation between in prison conflict and reincidence and recidivism. However, most of the literature corresponds to developed countries. We used prison census data and IV estimation to test if education programs had some effect on several indicators on prison conflictivity. We found that education lowers participation in for indicators of moderate conflictivity.

Some important policy implications arise. One is the need to make educational supply available to all inmates who have not achieved the compulsory level in Argentina. The

second one, is that if violent conflict in prison is related to posterior reincidence, then lowering the former via educational programs may affect the latter. All these arguments, united with the positive effects that have been found on prison based education programs on future labor opportunities for ex-prisoners, imply that these programs can become important policy instruments.

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# Appendix

**Table 1a: Participation in education**

| Province | Total inmates | Participated in education | % |
|---|---|---|---|
| Buenos Aires | 1.376 | 567 | 41.21 |
| Catamarca | 180 | 2 | 0.01 |
| Córdoba | 3.576 | 1.529 | 42.76 |
| Corrientes | 678 | 395 | 58.26 |
| Chaco | 635 | 447 | 70.39 |
| Chubut | 1.125 | 868 | 77.16 |
| Entre Rios | 449 | 110 | 24.5 |
| Formosa | 306 | 138 | 45.1 |
| Jujuy | 171 | 62 | 36.26 |
| La Pampa | 199 | 70 | 35.18 |
| La Rioja | 22 | 0 | 0 |
| Misiones | 808 | 142 | 17.57 |
| Neuquen | 432 | 161 | 37.27 |
| Rio Negro | 414 | 164 | 39.61 |
| San Juan | 338 | 43 | 12.72 |
| San Luis | 289 | 9 | 3.11 |
| Santa Cruz | 147 | 129 | 87.76 |
| Santa Fe | 1.773 | 225 | 12.69 |
| Tierra del Fuego | 24 | 4 | 16.67 |
| Ciudad de Bs.As. | 161 | 45 | 27.95 |

**% of sentences inmates who should study**

Table 1: Descriptive Statistics

| **Age** | |
|---|---|
| Under 18 | 0.1% |
| 18 to 24 | 30.2% |
| 25 to 34 | 39.7% |
| 35 to 44 | 17.7% |
| 45 to 54 | 7.9% |
| 55 to 64 | 2.8% |
| 65 and more | 0.7% |
| n.a. | 0.8% |
| Total | 100.0% |

| **Marital Status** | |
|---|---|
| Single | 69.4% |
| Married | 12.9% |
| Widowed | 1.2% |
| Separated or Divorced | 1.5% |
| De facto separated | 1.5% |
| Concubine | 12.8% |
| n.a. | 0.6% |
| Total | 100.0% |

| **Labor training when entry** | |
|---|---|
| Had some occupation | 35.2% |
| Had some proffesion | 7.7% |
| Didn't have occupation nor proffesion | 44.9% |
| n.a. | 12.1% |
| Total | 100.0% |

| **Sex** | |
|---|---|
| Male | 94.8% |
| Female | 5.1% |
| n.a. | 0.0% |
| Total | 100.0% |

| **Education** | |
|---|---|
| None | 7.1% |
| Primary Incomplete | 23.1% |
| Primary Complete | 47.9% |
| High-School Incomp. | 13.2% |
| High-School Comp. | 2.9% |
| Tertiary Incomp. | 0.4% |
| Tertiary Comp. | 0.3% |
| College Incomp. | 0.5% |
| College Comp. | 0.2% |
| EGB 1 Incomp | 0.3% |
| EGB 1 Comp | 0.1% |
| EGB 2 Incomp | 0.3% |
| EGB 2 Comp | 0.1% |
| EGB 3 Incomp | 0.6% |
| EGB 3 Comp | 0.3% |
| Polimodal Incomp | 0.2% |
| Polimodal Comp | 0.0% |
| n.a. | 2.5% |
| Total | 100.0% |

| **Working status when entry** | |
|---|---|
| Full-time worker | 15.8% |
| Part-time worker | 36.2% |
| Unemployed | 36.7% |
| n.a. | 11.3% |
| Total | 100.0% |

| **Place of residence** | |
|---|---|
| Rural | 7.4% |
| Urban | 88.3% |
| n.a. | 4.3% |
| Total | 100.0% |

| **Legal Status** | |
|---|---|
| Convicted | 40.4% |
| Accused | 58.0% |
| Petty crime | 0.0% |
| Without penal responsability | 1.0% |
| Other | 0.5% |
| n.a. | 0.1% |
| Total | 100.0% |

**Table 2a: Pooled Linear Regressions**

| | (1a) **vioext** | (1b) **vioext** | (2a) **viomed** | (2b) **viomed** | (3a) **sancs** | (3b) **sancs** | (4a) **sevsancs** | (4b) **sevsancs** |
|---|---|---|---|---|---|---|---|---|
| *educ* | -0.005 | -0.005 | -0.011 | -0.005 | -0.013 | -0.043 | 0.001 | -0.030 |
| | (0.003)†† | (0.003)†† | (0.005)* | (0.004)† | (0.009) | (0.009)** | (0.009) | (0.009)** |
| *works in prison* | -0.012 | -0.015 | -0.005 | -0.006 | -0.080 | -0.079 | -0.077 | -0.076 |
| | (0.003)** | (0.003)** | (0.004) | (0.004) | (0.009)** | (0.009)** | (0.008)** | (0.008)** |
| *years in prison* | 0.001 | 0.001 | 0.007 | 0.005 | 0.007 | 0.008 | 0.006 | 0.007 |
| | (0.001)* | (0.001) | (0.001)** | (0.001)** | (0.002)** | (0.002)** | (0.002)** | (0.002)** |
| *age* | -0.001 | -0.001 | -0.001 | -0.002 | -0.009 | -0.009 | -0.008 | -0.008 |
| | (0.000)** | (0.000)** | (0.000)** | (0.000)** | (0.000)** | (0.000)** | (0.000)** | (0.000)** |
| *married* | -0.004 | -0.005 | -0.011 | -0.015 | -0.041 | -0.022 | -0.034 | -0.017 |
| | (0.004) | (0.004) | (0.007) | (0.006)* | (0.013)** | (0.012) | (0.012)** | (0.012) |
| *unemployed entering prison* | 0.004 | -0.008 | 0.034 | 0.001 | -0.046 | -0.041 | -0.047 | -0.044 |
| | (0.004) | (0.004) | (0.005)** | (0.005) | (0.009)** | (0.009)** | (0.009)** | (0.009)** |
| *number of felonies* | 0.004 | 0.003 | -0.016 | -0.011 | 0.014 | 0.013 | 0.012 | 0.012 |
| | (0.003) | (0.003) | (0.003)** | (0.002)** | (0.007)* | (0.007) | (0.006) | (0.006) |
| *practices sports in prison* | 0.000 | 0.003 | -0.010 | -0.015 | -0.091 | -0.090 | -0.092 | -0.096 |
| | (0.005) | (0.005) | (0.007) | (0.006)** | (0.013)** | (0.013)** | (0.013)** | (0.013)** |
| *received visits in prison* | -0.001 | 0.003 | 0.023 | 0.012 | -0.040 | 0.018 | -0.047 | 0.010 |
| | (0.004) | (0.004) | (0.005)** | (0.004)** | (0.011)** | (0.012) | (0.011)** | (0.012) |
| *attempted prison break* | -0.016 | 0.031 | -0.051 | 0.007 | 0.171 | 0.166 | 0.206 | 0.199 |
| | (0.006)** | (0.016) | (0.007)** | (0.017) | (0.018)** | (0.036)** | (0.018)** | (0.037)** |
| *prison characteristics* | No | Yes | No | Yes | No | Yes | No | Yes |
| *Constant* | 0.050 | 0.055 | 0.070 | 0.093 | 0.668 | 0.486 | 0.627 | 0.568 |
| | (0.009)** | (0.043) | (0.012)** | (0.036)** | (0.024)** | (0.109)** | (0.024)** | (0.108)** |
| Observations | 9165 | 9165 | 9411 | 9411 | 10858 | 10858 | 10299 | 10299 |
| R-squared | 0.01 | 0.05 | 0.02 | 0.27 | 0.07 | 0.11 | 0.08 | 0.12 |

Robust standard errors in parentheses

† significant at 10% one tail, †† significant at 5% one tail, * significant at 5%; ** significant at 1%

**Tabla 2b: Pooled Probit Regressions**

| | (1a) **vioext** | (1b) **vioext** | (1c) **vioext** Mg effect | (2a) **viomed** | (2b) **viomed** | (2c) **viomed** Mg effect | (3a) **sancs** | (3b) **sancs** | (3c) **sancs** Mg effect | (4a) **sevsancs** | (4b) **sevsancs** | (4c) **sevsancs** Mg effect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *educ* | -0.105 | -0.105 | -0.003 | -0.133 | -0.146 | -0.004 | -0.040 | -0.148 | -0.048 | 0.002 | -0.118 | -0.035 |
| | (0.065)† | (0.077)† | | (0.051)** | (0.072)* | | (0.028)† | (0.030)** | | (0.029) | (0.031)** | |
| *works in prison* | -0.223 | -0.283 | | -0.023 | -0.061 | | -0.246 | -0.246 | | -0.258 | -0.256 | |
| | (0.064)** | (0.069)** | | (0.043) | (0.057) | | (0.027)** | (0.028)** | | (0.028)** | (0.029)** | |
| *years in prison* | 0.028 | 0.026 | | 0.062 | 0.059 | | 0.025 | 0.031 | | 0.027 | 0.032 | |
| | (0.011)* | (0.011)* | | (0.007)** | (0.009)** | | (0.005)** | (0.005)** | | (0.005)** | (0.005)** | |
| *age* | -0.018 | -0.021 | | -0.013 | -0.024 | | -0.032 | -0.032 | | -0.033 | -0.034 | |
| | (0.004)** | (0.004)** | | (0.003)** | (0.004)** | | (0.002)** | (0.002)** | | (0.002)** | (0.002)** | |
| *married* | -0.084 | -0.123 | | -0.124 | -0.201 | | -0.154 | -0.082 | | -0.146 | -0.076 | |
| | (0.113) | (0.121) | | (0.085) | (0.111) | | (0.049)** | (0.050) | | (0.053)** | (0.054) | |
| *unemployed entering prison* | 0.064 | -0.112 | | 0.306 | 0.065 | | -0.141 | -0.114 | | -0.150 | -0.129 | |
| | (0.065) | (0.076) | | (0.043)** | (0.062) | | (0.029)** | (0.030)** | | (0.031)** | (0.032)** | |
| *number of felonies* | 0.064 | 0.057 | | -0.189 | -0.036 | | 0.043 | 0.045 | | 0.039 | 0.048 | |
| | (0.042) | (0.043) | | (0.042)** | (0.053) | | (0.019)* | (0.020)* | | (0.021) | (0.021)* | |
| *practices sports in prison* | 0.012 | 0.047 | | -0.102 | -0.132 | | -0.277 | -0.290 | | -0.301 | -0.333 | |
| | (0.086) | (0.090) | | (0.064) | (0.083) | | (0.040)** | (0.041)** | | (0.042)** | (0.044)** | |
| *received visits in prison* | -0.021 | 0.085 | | 0.289 | 0.075 | | -0.128 | 0.047 | | -0.162 | 0.025 | |
| | (0.079) | (0.087) | | (0.072)** | (0.098) | | (0.034)** | (0.036) | | (0.036)** | (0.038) | |
| *attempted prison break* | -0.361 | 0.430 | | -0.583 | 0.173 | | 0.476 | 0.489 | | 0.602 | 0.606 | |
| | (0.144)* | (0.211)* | | (0.113)** | (0.245) | | (0.049)** | (0.099)** | | (0.050)** | (0.104)** | |
| *prison characteristics* | No | Yes | | No | Yes | | No | Yes | | No | Yes | |
| Constant | -1.383 | -2.120 | | -1.428 | -0.248 | | 0.702 | 0.005 | | 0.692 | 0.308 | |
| | (0.172)** | (0.830)* | | (0.140)** | (0.897) | | (0.078)** | (0.339) | | (0.083)** | (0.359) | |
| Observations | 9165 | 9165 | | 9411 | 9411 | | 10858 | 10858 | | 10299 | 10299 | |

Robust standard errors in parentheses

† significant at 10% one tail, †† significant at 5% one tail, * significant at 5%; ** significant at 1%

**Table 3: First Stage of IV**

| | **OLS** (1) **educ** | **Probit** (2) **educ** |
|---|---|---|
| *prfpresop* | 0.009 | 0.028 |
| | (0.001)** | (0.004)** |
| *gsteducpc* | 0.000 | 0.001 |
| | (0.000)** | (0.000)** |
| *works in prison* | 0.037 | 0.110 |
| | (0.009)** | (0.027)** |
| *years in prison* | -0.009 | -0.029 |
| | (0.002)** | (0.005)** |
| *age* | -0.002 | -0.007 |
| | (0.000)** | (0.001)** |
| *married* | -0.035 | -0.111 |
| | (0.014)* | (0.045)* |
| *unemployed entering prison* | -0.033 | -0.106 |
| | (0.010)** | (0.030)** |
| *number of felonies* | 0.043 | 0.127 |
| | (0.006)** | (0.018)** |
| *practices sports in prison* | 0.201 | 0.643 |
| | (0.012)** | (0.042)** |
| *received visits in prison* | -0.035 | -0.097 |
| | (0.012)** | (0.035)** |
| *attempted prison break* | 0.119 | 0.338 |
| | (0.029)** | (0.087)** |
| *Constant* | -0.079 | -1759 |
| | (0.114) | (0.328)** |
| Observations | 11346 | 11346 |
| R-squared | 0.14 | --------- |

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

**Table 4a: LPM-Second Stage of IV**

| | (1) **vioext** | (2) **viomed** | (3) **sancs** | (4) **sevsancs** |
|---|---|---|---|---|
| *educ* | -0.015 | -0.157 | -0.242 | -0.187 |
| | (0.020) | (0.022)** | (0.079)** | (0.079)* |
| *works in prison* | -0.015 | 0.001 | -0.071 | -0.069 |
| | (0.003)** | (0.004) | (0.009)** | (0.009)** |
| *years in prison* | 0.001 | 0.003 | 0.006 | 0.006 |
| | (0.001) | (0.001)** | (0.002)** | (0.002)** |
| *age* | -0.001 | -0.002 | -0.009 | -0.008 |
| | (0.000)** | (0.000)** | (0.000)** | (0.000)** |
| *married* | -0.005 | -0.019 | -0.027 | -0.021 |
| | (0.004) | (0.006)** | (0.013)* | (0.012) |
| *unemployed entering prison* | -0.008 | -0.003 | -0.044 | -0.046 |
| | (0.004) | (0.005) | (0.010)** | (0.009)** |
| *number of felonies* | 0.003 | -0.003 | 0.023 | 0.020 |
| | (0.003) | (0.003) | (0.008)** | (0.008)** |
| *practices sports in prison* | 0.005 | 0.015 | -0.049 | -0.063 |
| | (0.007) | (0.007)* | (0.021)* | (0.020)** |
| *received visits in prison* | 0.002 | -0.002 | 0.002 | -0.003 |
| | (0.005) | (0.005) | (0.013) | (0.013) |
| *attempted prison break* | 0.032 | 0.023 | 0.188 | 0.217 |
| | (0.016) | (0.017) | (0.038)** | (0.039)** |
| *Constant* | 0.057 | 0.114 | 0.512 | 0.588 |
| | (0.043) | (0.036)** | (0.110)** | (0.109)** |
| Observations | 9165 | 9411 | 10858 | 10299 |
| R-squared | 0.05 | 0.27 | 0.11 | 0.12 |

Robust standard errors in parentheses
† significant at 10% one tail, †† significant at 5% one tail
* significant at 5%; ** significant at 1%

**Table 4b: Probit-Second Stage of IV**

| | (1) **vioext** | (2a) **viomed** | (2b) **viomed** mg effect | (3a) **sancs** | (3b) **sancs** mg effect | (4a) **sevsancs** | (4b) **sevsancs** mg effect |
|---|---|---|---|---|---|---|---|
| *educ* | 0.504 | -1.159 | -0.034 | -0.603 | -0.199 | -0.433 | -0.130 |
| | (0.419) | (0.604)†† | | (0.239)* | | (0.262)†† | |
| *works in prison* | -0.307 | -0.036 | | -0.228 | | -0.244 | |
| | (0.070)** | (0.059) | | (0.029)** | | (0.031)** | |
| *years in prison* | 0.032 | 0.050 | | 0.027 | | 0.029 | |
| | (0.012)** | (0.011)** | | (0.006)** | | (0.006)** | |
| *age* | -0.020 | -0.027 | | -0.033 | | -0.035 | |
| | (0.004)** | (0.004)** | | (0.002)** | | (0.002)** | |
| *married* | -0.114 | -0.246 | | -0.095 | | -0.083 | |
| | (0.123) | (0.112)* | | (0.051) | | (0.055) | |
| *unemployed entering prison* | -0.104 | 0.027 | | -0.119 | | -0.131 | |
| | (0.076) | (0.062) | | (0.030)** | | (0.032)** | |
| *number of felonies* | 0.028 | 0.013 | | 0.067 | | 0.063 | |
| | (0.048) | (0.063) | | (0.023)** | | (0.025)* | |
| *practices sports in prison* | -0.078 | 0.079 | | -0.191 | | -0.265 | |
| | (0.127) | (0.135) | | (0.062)** | | (0.066)** | |
| *received visits in prison* | 0.125 | 0.006 | | 0.016 | | 0.004 | |
| | (0.095) | (0.112) | | (0.041) | | (0.043) | |
| *attempted prison break* | 0.404 | 0.308 | | 0.538 | | 0.640 | |
| | (0.216) | (0.255) | | (0.103)** | | (0.109)** | |
| *Constant* | -2.133 | -0.053 | | 0.023 | | 0.309 | |
| | (0.802)** | (0.873) | | (0.338) | | (0.359) | |
| Observations | 9094 | 9339 | | 10853 | | 10294 | |

Robust standard errors in parentheses
† significant at 10% one tail, †† significant at 5% one tail
* significant at 5%; ** significant at 1%