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**Immigration Status and Criminal Violence: How Much More Dangerous  
are Natives than Immigrants?**

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## **Immigration Status and Criminal Violence: How Much More Dangerous are Natives than Immigrants?**

### **Abstract**

The theory of immigration links migratory movements with seeking better standards of living, but could immigration be linked with people seeking the occasion to get involved in illegal activities? If so, are these criminals more violent than local criminals? In this paper we show that immigrants in Chile are, overall, significantly less prone to criminal activities than natives and that they also are significantly less violent. Only in the drug-related category do immigrants show higher probabilities of criminal behavior. These conclusions are contrary to some stereotypes held by local residents in many countries that observe criminal activities in immigrants and jump to inadequate conclusions

We test this in Chile, a country that after undergoing rapid growth over the past 20 years, has been subject to a large wave of immigration from neighboring countries. Immigrants already compromises over 3% of the workforce and are flowing in at increasing rates. We estimate a Multinomial Logit model on a data set of more than 33.000 inmates that covers the entire Chilean criminal population for 2008. To search into the relationship between immigrants, criminal behavior and the category of crime committed, we merge this data into an expanded sample that covers the whole Chilean population. In order to isolate this relationship, we control for several individual variables: education, age, income, city size and gender. We divide criminal activity in four: property crimes, violent crimes, drug related crimes and non-violent crimes. Our results show that the probability of committing a crime is significantly lower for immigrants versus nationals, that immigrants are less prone to all categories of crime except drug-related offenses and that there is a negative association between crime and education, age, current income and maternal income and a positive relation between crime and city size. These relations hold for immigrants and natives, but given that immigrants have already selected themselves positively crime-wise, the effect of these variables is smaller on immigrants.

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## **I. Introduction**

Immigration, though a relatively recent phenomena in Chile, has now become a very relevant issue because of the large immigrant flow observed in recent years. For 2008 there are an estimated 317,057 residents in Chile that were born abroad, the largest number of immigrants recorded in the history of Chile, and amounts to 2.36% of the work force. In fact, within the inter-census period (1992-2002) the number of immigrants rose by some 75%, the highest rate in the past 50 years. In 2009 permanent residency permits rose by 171% relative to 2008, and have grown by 266% within the past three years. Immigration is probably motivated by the greater per capita income that Chile now enjoys after 13 years of accelerated economic growth, that reached 7.1% in the period 1986 to 1998, and although it has since fallen to an average of 3.7%, the country still enjoys the highest per capita income in the region.

In many developed countries a generalized perception has been created in the public opinion that there is a strong link between immigration and crime, a perception fed by the weekly news procession covering Mexican drug-related violence. This perception is also followed among some economists, because economic theory tends to favour a link between crime and immigration, particularly due to the pioneering work of Becker (1968). In his work Becker associates a greater rate of criminality to more disadvantaged groups, that have fewer market opportunities as is the case with immigrants.

In general, immigrants are associated to two major problems: on the one hand, the negative repercussions of immigration on economic variables, primarily unemployment, salaries, and the use of social security services such as health and education. On the other hand, immigration is also stigmatised as favouring the increase in crime rates. While these first problems have been analysed in the economic literature, the second set of problems is generally studied by sociologists, and has not been studied thoroughly by economists.

The arguments sociologists have on how immigration can favour crime are reviewed in the next section. For example some assert that there may be a culture of poverty which states that low income people adapt themselves to their conditions in order to perpetuate their disadvantageous status. Thus, committing crimes as a mean to reach social status moves children away from schools, which hinders their possibilities of success. Since immigrants are more prone to living in areas where structural conditions have shifted the system away from middle-class ideals, and have taken it to a culture of opposition, they are more subject to these forces. Other non-economic arguments stress that laws reflects the values of society's dominant groups and those values of other social groups, particularly immigrants, are often different. When the cultural codes of the subordinated group and those of the dominant group differ, the legal agents label the behaviour of the subordinated group's members as illegal deviations and proceed to incarcerate.

As we shall see below, an analysis of prior academic studies on the relation among immigrants and crime does not lead to conclusive results. Some studies conclude that the arrival of immigrants leads to an increased rate of crime, while another set of studies concludes the opposite. As already mentioned, the overwhelming majority of these studies do not come from an economic stand point, but rather from sociology and criminology,

even when the decision to emigrate and to commit crime has important economic motivations. These studies have not focused in economic arguments to complement their sociological rationale for explaining criminality. This has implied significant limitations, such as the use of data bases having a poor footing in economic variables, insufficient use of econometrics and omitting relevant economic variables.

In this paper we use micro-data from a census of all inmates in the Chilean prison system for the year 2008, associating to each inmate a substantial amount of socio-economic data. This database is cross-referenced with another representative base of all Chilean homes. Using a multinomial logit analysis, we first isolate determinant factors for criminal behaviour, both for nationals as for immigrants. A second stage identifies the elements that determine the type of crime, divided into non-violent crime, crimes against property, violent crime and drug-related crimes. Criminal behaviour and the kind of crime committed is going to be closely correlated to a set of socio-economic variables. The use of micro-data and observing the individual features is a critical element to identify the specific impact of each variable on the crime rate and in each crime category.

This paper is structured as follows: the first section reviews the literature, the second examines the data, while the third section presents a detailed analysis of the econometrics. In the final section we present the conclusions of our paper.

## II. Literature

In spite of the many theories that state there is a positive link between immigration and crime, the empirical evidence in this matter is not conclusive. The economic theory tends to favor the association of crime and immigration, especially because the pioneering analysis by Becker (1968) associates a higher crime rate for the more defenseless groups, with fewer market opportunities.

The economic literature on the links between immigration and crime is not large. Moehling and Piehl (2009) and Butcher and Piehl (1998a, 2000) studied the issue and found that immigrants have somewhat smaller incarceration rates than natives, but not significantly different. Grogger (1998) did find some evidence of increased crime associated to immigrants, but found little evidence for negative spillover effects to the rest of society. In their micro-data study using multinomial logit, Butcher and Piehl (2000) find that immigrants have a much smaller incarceration rate than natives, that these rates are falling in time and attribute this finding to positive selection among immigrants. They do find a larger incarceration rate for foreigners in drug-related offenses, but this does not override their overall conclusion. Using panel data on US counties from 1980 to 2000, Spenkuch (2010) presents empirical evidence that immigration is associated with an increase in crimes motivated by financial gain, such as motor vehicle theft and robbery. Borjas, Grogger and Hanson (2010) argue that immigration caused unemployment and a decline in wages among black men, thereby leading to an increase in incarceration rates for this group.

Other theories derive from the fields of criminal sociology and criminal social psychology. One of the best known theories here is that of social disorganization, which states that there is likely to be more violence among immigrants. The conclusion is that when institutions weaken, social control also weakens and crime rates grow (Robert J. Sampson and W. Byron Groves, 2002). Another perspective suggests that groups in disadvantage (immigrants) relative to the others may feel hindered to reach social and cultural goals by using legitimate means. In this perspective Lee et al (2001) show with information on Miami, El Paso and San Diego neighborhoods that, by controlling other influences, immigration will not typically raise homicide levels among Latinos and Afro-Americans.

Sampson and Groves (1989) used information of 238 towns in Great Britain to support the theory of social disorganization and show that changes regarding social disorganization pass on a great extent of the effect of structural features to crime victimization and crime offense rates. Phillips (2002), using data of 1990 for 129 metropolitan areas of USA, studies the extent to which the differences in structural features among White Latinos, non-Latino Blacks and Latinos contribute to homicide differential. His analysis concludes that all the homicide differential of white Latinos and about half of the homicide gap between White and Black people could be reduced if minorities' features were improved to levels currently shown by white people.

Hagan and Palloni (1999) show that the figures showing the increasing number of Hispanic immigrants in American prisons generate a biased perception. Most of the Hispanic immigrants into USA are young men and, regardless of their nationality, they are always at a higher risk of committing a crime. Based on this, the authors argue that "these results cast

doubt on the hypothesis that immigration causes crime.” Martinez et al (1998), using data from the Miami and San Diego census analyze the influence of the distribution of Cubans, Central Americans, Haitians, Mexicans and South Eastern Asians, controlled by social and economic features over crime with drugs, with violence and non-violent crime. The results support the hypothesis of segmented assimilation in the Miami and San Diego neighborhoods. Shihadeh and Shrum (2004) combine information of the 1990 census with detention records for 1989-1991. The results show that structural factors largely explain the high percentage of Black people related with high crime rates. Martinez (2000) uses information of 1980 Homicide Reports and the 1980 census. His results show some evidence supporting economic deprivation and social disorganizations interpretations of violence; however, the role of immigration varies with the homicide type and this is limited.

Regarding education and its impact on crime, it influences the decision to commit or not a crime through several channels. First, higher educational levels are associated to a higher return in the labor market, thus increasing the opportunity cost of criminal behavior. Second, education may alter preferences in a way that affects the decision of getting involved in criminal activities. In this sense, education is considered a factor tending to reduce crime not only because of its impact on people’s income but also because of its formative effect, which may even have a civilizing effect that would reduce the tendency to commit a crime, regardless of their income level and the other features of the individual (Usher, 1993). Still, the the empirical evidence of the effect of education on crime is not conclusive (See Ehrlich (1975), Witte and Tauchen (1994), Lochner and Moretti (2004), Buonanno and Leonida, (2008), Groot and Brink (2007) and in Chile, Nuñez, Rivera, Villavicencio and Molina (2003).

Other studies have analyzed other factors related with crime, among which are income (Cook and Zarkin, 1985; Beki et. al., 1999; Diez-Ticio, 2000; Field, 1990; Hale, 1998; Osborn, 2000), unemployment rate (Corman and Mocan, 2002; Nuñez Et. Al, 2003), inequality (Chiu and Madden, 1998; Ehrlich, 1973; Trickett et. al., 1995; Loayza et al., 2002), age (Alfred Blumstein, 1986), gender (James Q. Wilson and Richard Hernstein, 1985), family history (H.Naci Mocan and Daniel Rees, 1999; Steven D. Levitt and Lance Lochner, 2001), background of relatives (Robert Sampson and John Laub, 1993), economic opportunities (Grogger, 1998; Lochner, 1999), and sentence severity (Levitt, 1998).

### III. Data Sources and Description

The central data base used in this study refers to the existing population of sentenced convicts in the 113 prisons in the country in December 2008 (includes all facilities). We considered individuals aged between 18 and 60. Each convict was surveyed by the penitentiary authorities on entering the prison system and questioned on a number of individual characteristics including educational level, age and gender, place of birth, nationality and place where they currently live. This information is consolidated into a data base where the individual characteristics of each inmate can be related with the crime(s) committed. As of December 2008, there were 37,173 sentenced inmates, of which 35,539 were men and 2,539 women, representing 93% and 7%, respectively. The prison population included 364 sentenced immigrants, representing 0.98% of total sentenced inmates. We classified a foreign inmate as immigrant if he provided an address in Chile.<sup>1</sup>

The second data base we use is the National Socio-Economic Characterization Survey (CASEN) for 2006 where we again only considered individuals aged between 18 and 60. This representative survey analyzes several social and economic aspects of the population that resides in Chile, but does not consider penitentiaries. This survey has been carried out since 1985, in a biannual and tri annual basis. This survey contains questions on educational level, current income, county of residence, place of birth, age and gender, among other things. The survey includes 306,951 individuals, where 189,932 are aged between 18 and 60 years. Men account for 75,101, while women number 77,385. Additionally, 150,603 were born in Chile and 1,283 were born abroad.

The database sample was expanded in order to obtain an approximation to the total population using the expansion factors suggested in the survey. For immigrants, expansion factors were factored with the immigration totals estimated by the Chilean Departamento de Extranjería y Migración (Department for Migration and Foreigners). The expanded data revealed 9,328,841 individuals born in Chile and 225,366 foreigners aged between 18 and 60 years (97.64% and 2.36%).

To obtain an approximate value for the income level at birth of all individuals born in Chile in both datasets (inmates and CASEN 2006) we used the CASEN 1987 survey and considered the 1987 average income of their county of birth. For immigrants we considered the relation of per capita income of their homeland to Chilean per capita income for 1987 using World Bank data. Thus if a homeland had 90% of Chilean income per capita at the time, we considered an income equivalent to 90% of the CASEN 1987 average per capita income. Current income for CASEN 2006 population was approximated by the average per capita income of the county where the individual lived at the time of the sample. Inmate

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<sup>1</sup> While there are 364 immigrants in prison, there are a further 898 additional foreign inmates that declared that they did not have residence in Chile. Most were caught in border areas, checkpoints, ports, airports and customs trying to smuggle drugs into the country. Their marginal probability associated to committing a crime cannot be calculated; as there is no group with which they can be compared with (they are not part of the Chilean population nor immigrants). These foreign drug traffickers rarely commit any other crime. For example, only 1% of foreigners without an address in Chile are detained for violent crimes, as opposed to 13% for foreign residents and 21% of all nationals.

current income was approximated by the average per capita income obtained from the CASEN 2006 of the county where the inmate lived right before his arrest.

The information specified above provides individual micro-data for all inmates and all those sampled in CASEN 2006 for: size of the city he currently lives or lived before arrest; current income or income before arrest; income at birth; gender; the crime committed if sentenced; education; and age. The data-set for inmates and the expanded CASEN 2006 data are merged to provide a final data-source that approximates the entire Chilean population, now including inmates.<sup>2</sup>

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<sup>2</sup> Care should be taken with this statement, since three problems arise that may bias the results obtained in the section below: first, the fact that the CASEN survey was conducted in 2006 and the information on convicts is at year end 2008. Therefore, an individual may be in the two databases. Second, former criminal who are no longer in prison and criminals who have not yet been caught are treated as if they had never committed crimes in the CASEN survey (i.e., considered as a non criminal). We analyze this problem in the appendix.



#### IV. Results

The estimations presented below are obtained using the following conventional multinomial logit specification:

$$P(Y_i = j) = \frac{e^{\beta_j' x_i}}{1 + \sum_{k=1}^4 e^{\beta_k' x_i}} \quad j = 1,2,3,4$$

The dependant variable is defined  $Y_i = 0$ , if the  $i^{\text{th}}$  individual is not convicted,  $Y_i = 1$  if the individual is convicted for a crime without violence,  $Y_i = 2$  if the individual is convicted for a drug related crime,  $Y_i = 3$  if the individual is convicted for a property crime and  $Y_i = 4$  if the individual is convicted for a violent crime. The explanatory variable vector is  $x_i$  is made up of the following variables: Age in years, Gender=1 if the individual is a woman and Gender=0 otherwise, Complete Secondary School=1 if the individual completed the secondary school and Complete Secondary School=0 otherwise, Complete Higher Ed=1 if the individual completed the higher education and equals 0 otherwise, Initial p/c Income represents the maternal income, Current p/c income is the average income of the municipality where the individuals currently lives, Dbigcity=1 if the individual lives in a city with more than 100.000 inhabitants, 0 otherwise and finally Dnationality= 1 if the individual is foreign born and 0 otherwise.

We have gathered crimes into four categories: non-violent crimes, drug-related crimes, crimes against property (all robbery and theft without injuries) and violent crimes (homicides, kidnapping, sexual crimes and any crime or violence that results in injuries). Table 1 shows the parameter estimates for the multinomial logit estimates. In the tables that follow we present the estimated and marginal probabilities that are derived from the parameters in Table 1.

**Table 1. Multinomial Logic Estimates of Type of Crime Decisions**

Dependent Variable: *Crime*  
p-values in parenthesis

Explanatory Variable	Non-violent	Drugs	Property Crimes	Violent Crimes
<i>Age</i>	-0.005 (0.000)	0.021 (0.000)	-0.061 (0.000)	-0.013 (0.000)
<i>Gender</i>	-3.129 (0.000)	-1.427 (0.000)	-2.941 (0.000)	-3.661 (0.000)
<i>Complete Secondary School Ed.</i>	-0.101 (0.000)	-0.051 (0.004)	-0.993 (0.000)	-0.689 (0.000)
<i>Complete Higher Ed.</i>	-0.484 (0.000)	-1.248 (0.000)	-2.924 (0.000)	-1.592 (0.000)
<i>Initial p/c Income</i>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>Current p/c Income</i>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>Dbigcity</i>	0.478 (0.000)	1.447 (0.000)	1.300 (0.000)	0.413 (0.000)
<i>Dnationality</i>	-0.321 (0.02)	1.280 (0.000)	-2.000 (0.000)	-0.722 (0.000)
<i>Constant</i>	-6.978 (0.000)	-8.729 (0.000)	-3.326 (0.000)	-5.318 (0.000)

Basecategory: Without Crime

**Table 2. Probabilities of committing crimes**

	Chilean		Foreigner	
	Probability	% of criminals	Probability	% of criminals
Committing Crimes	0.0071		0.0030	
Violent Crimes	0.0016	22%	0.0005	17%
Property Crimes	0.0044	62%	0.0005	18%
Drugs	0.0006	9%	0.0017	57%
Non violent	0.0005	7%	0.0003	9%

Table 2 shows that the probability of committing a crime for nationals is 2.3 times higher than for immigrants (0.0071/0.0030). Further, the probability of committing each of the different crime categories is higher for nationals except for drug related crimes.

Having already shown that the probability of committing a crime is much lower for immigrants in relation to nationals, we now turn to analyze what kind of crime each side commits. While a national criminal has a 22% probability of committing a violent crime, 62% probability of committing crimes against property, 9% for drug related crimes and 7% of non-violent crimes, immigrants reveal probabilities of 17%, 18%, 57% and 9% respectively. Immigrant criminals have a substantially lower property crime rate, a lower violent crime rate and a substantially higher drug related crime rate.

Table 3. probabilities of criminal behaviour

	Estimated Probability			Marginal Effect Education	
	Chilean	Foreigner	Differences	Chilean	Foreigner
Without Complete Secondary School Ed.	0.0098	0.0054	-0.0044		
Complete Secondary School Ed.	0.0063	0.0034	-0.0029	-0.0034	-0.0020
Complete Higher Ed.	0.0013	0.0009	-0.0004	-0.0085	-0.0045

Results show that the immigrant self selection process delivers individuals less prone to criminal behaviour, seen at all educational levels. Nationals without full secondary schooling show a probability of criminal behaviour of 0.0098, compared with 0.0054 for immigrants, thus, the probability of criminal behaviour is almost 80% higher in nationals. When comparing individuals with complete secondary and higher education, the probability of exhibiting criminal behaviour is 85% (secondary education) and 50% (higher education) more for the immigrant group. Table 3 also shows that the gap between immigrants and nationals increases when comparing those without secondary schooling with those having completed secondary education. However, on comparing individuals with complete secondary education with those having completed higher education, the gap between nationals and immigrants tends to decrease, thus, the effect of higher education on the probability of criminal behaviour tends to be higher for nationals than for immigrants.

Table 3 indicates that the probability of committing violent crimes, such as murder, sexual crimes or bodily harm, is less for those born abroad in all educational levels. For individuals without full secondary education and for individuals with full secondary education, the probability is less than half in the group of immigrants.

When taking into account the individuals with higher education, the probability that those born in Chile commit violent crimes is also higher than that of the immigrant group. In this case it falls to less than one third (0.00042 versus 0.00013). Furthermore, as regards to these types of crimes, the effect of higher education (with respect to individuals that have not had secondary school education) is higher among those born in Chile than among immigrants. This shows that the marginal effect of middle education is greater for national citizens than for immigrants. Immigrants with higher education have 50% less probability than nationals of committing a violent crime. Finally, regarding these types of crimes, the effect of higher education (in relation with individuals who have not reached secondary education) is greater for those born in Chile than for immigrants.

Table 4. Probabilities of violent criminal behaviour

	Estimated Probability			Marginal Effect Education	
	Chilean	Foreigner	Differences	Chilean	Foreigner
	Without Complete Secondary School Ed.	0.0023	0.0011	-0.0012	
Complete Secondary School Ed.	0.0013	0.0005	-0.0008	-0.0010	-0.0006
Complete Higher Ed.	0.0004	0.0001	-0.0003	-0.0019	-0.0010

Table 5. Probabilities of committing crimes against property

	Estimated Probability			Marginal Effect Education	
	Chilean	Foreigner	Differences	Chilean	Foreigner
	Without Complete Secondary School Ed.	0.006	0.001	-0.005	
Complete Secondary School Ed.	0.004	0.001	-0.003	-0.002	-0.001
Complete Higher Ed.	0.0003	0.0000	0.000	-0.006	-0.001

Now, as regards to crimes against the property (robberies and thefts), we observe that foreigners have smaller probabilities of committing these crimes. The difference is substantial: for an individual with incomplete secondary school education, the probability of committing crimes against the property is six times higher if born in Chile than for immigrants. For individuals with complete secondary school education, this probability is four times higher for nationals versus immigrants. For individuals that completed their higher education, nationals are over eight times more likely to commit crimes against property than immigrants. Education has a downward effect on these types of crimes for both groups, yet for nationals the effect is substantially greater.

Table 6. Probabilities of committing a drug-related crime

	Estimated Probability			Marginal Effect Education	
	Chilean	Foreigner	Differences	Chilean	Foreigner
	Without Complete Secondary School Ed.	0.0008	0.0026	0.0019	
Complete Secondary School Ed.	0.0007	0.0020	0.0014	-0.0001	-0.0006
Complete Higher Ed.	0.0002	0.0006	0.0003	-0.0005	-0.0021

Table 6 shows the probabilities associated with drug related crimes. The estimated probability of criminal behaviour for this type of crime is higher in the immigrant group. In the immigrant groups without full secondary education, full secondary education and full higher education, the probability of criminal behaviour is 3.5, 3.0 and 2.5 times higher the estimated probability for comparable groups of nationals. This is the only category of crime

where the probability is higher for foreigners. For non-violent crimes, the estimated probability is also less for immigrants in relation to nationals at all educational levels.

Table 7. probabilities of committing crimes without violence

	Estimated Probability			Marginal Effect Education	
	Chilean	Foreigner	Differences	Chilean	Foreigner
Without Complete Secondary School Ed.	0.0006	0.0004	-0.0002		
Complete Secondary School Ed.	0.0005	0.0003	-0.0002	0.0000	-0.0001
Complete Higher Ed.	0.0003	0.0001	-0.0002	-0.0003	-0.0003

## V. Conclusions

In this study we have estimated the factors that determine criminal behaviour in Chile, the aim being to compare criminal behaviour as seen in immigrants with that observed in comparable nationals. The probability of committing a crime is inversely correlated with education, income, age and positively correlated with living in a large city, for both nationals and immigrants. Yet, the coefficients estimated by the multinomial logit regressions show that immigrants have 60% less probability of committing a crime than locals with similar socio-economic characteristics. .

Male immigrants with complete secondary education living in large cities comprise the largest immigrant group. Given their average income, average income at birth, and average age (33), our estimations imply that this modal immigrant has a probability of .0039 of committing a crime. The largest group of male nationals also has completed secondary education and lives in large cities. Given their average income, average income at birth and average age (36), this modal male national has a probability of .0062 of committing a crime; rate substantially higher than the average modal immigrant. The modal male national has around a 50% higher chance of committing a crime than the modal immigrant. If our modal immigrant increases his educational level to the next category (full higher education), the marginal effect of that change leads to a decrease in the probability of committing a crime that falls to .0016, while the modal national falls by more, to .0017.

This study has also sought to determine the factors that influence the type of crime immigrants commit versus nationals. Particularly important is the violence of the crime, a relation that we have modelled. Our modal immigrant has a .000538 probability of becoming a violent criminal, while the modal Chilean has a twice the probability with .0013158. If we increase their educational categories (to complete higher education), the probabilities of the first are lowered to .0002673 and the second to .0005373. Similarly in crimes against property, our modal immigrant has a .0028701 probability of committing such a crime, while a national has a probability of .0033931. With non-violent crime, the probability of the modal immigrant is also less, .0003031 against .0004591.

Results associated with drug-related crimes are opposite to the above. The modal immigrant has a probability of .002543 of committing such a crime, compared with .0009522 of the national. This is probably due to the fact that two of the three bordering countries are cocaine producers (Peru and Bolivia). If the educational level increases to complete higher education the probabilities of the first drop to .0009279 while that of the second fall to .0002928.

Our overall conclusion is that immigrants have already self-selected themselves positively in relation to crime, reflected in a substantially smaller estimated probability of committing a crime in relation to nationals, and a much smaller probability of committing any crime except drug related offenses.

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## Appendix I. Parameter Bias and Missing Data on Criminal Behaviour

A problem that arises from the estimations is that crime is not directly observed. When using current convicts' information, we are considering only the individuals who were caught and sentenced. However, this is an approximation to the correct number of criminals in the population. There are all those that have never been caught plus all those that already finished their jail time.

In this sense, our estimations only compare the sentenced population with all the remaining population. However, the fraction of criminals who have neither been caught nor sentenced plus those that did their time are wrongly considered to be part of the population who has not committed crimes. This situation biases our results since estimations will present a criminal rate lower than the actual one. For instance, if we have a population of 100 individuals from which 40 of them are criminals and from that group there are only 30 condemned, the real probability of becoming a criminal would be 40%. However, the estimations would show that this probability is 30% (approximately), that is to say, the estimated probability of becoming a criminal is 1/4 lower than the real one.

Below we will determine what this parameter bias will depend on.

Let us assume in a more general way that capture and condemn are function of the current number of criminals  $t$ ,  $C_t$ . Let us assume that the probability of being caught (and sentenced) is  $P_N$  for nationals and  $P_I$  for immigrants. Then, the number of sentenced immigrants is:

$$\Pr(I) = P_I C_t(I)$$

And the number of sentenced nationals is

$$\Pr(N) = P_N C_t(N)$$

The difference (from both groups) is

$$C_t(N) - C_t(I)$$

While the difference in the sentenced ones is

$$P_N C_t(N) - P_I C_t(I).$$

If we assume that the probabilities of being caught and sentenced are the same for both groups,  $P$ , then the estimated difference in terms of crimes for both groups is lower than its real difference by this factor  $P$ .

Now, considering the effects of education in the criminal activity for both groups, let us assume that the number of immigrant criminals with education  $E = M$ , is  $C_t^I(M)$  and the

number of immigrant criminals with education  $E = B$  is  $C_t^I(B)$ , while for nationals these numbers are  $C_t^N(M)$  and  $C_t^N(B)$  respectively. The effects of education on immigrant crime are the following:

$$C_t^I(M) - C_t^I(B)$$

While for nationals it is:

$$C_t^N(M) - C_t^N(B)$$

Therefore, the difference in the marginal impact of education on crime for both groups is:

$$(C_t^N(M) - C_t^N(B)) - (C_t^I(M) - C_t^I(B))$$

Assuming that nationals and immigrants face the same probabilities of being captured and sentenced, the estimated difference would be:

$$P[C_t^N(M) - C_t^N(B)] - P[C_t^I(M) - C_t^I(B)] = P[C_t^N(M) - C_t^I(M) - C_t^N(B) + C_t^I(B)]$$

The differences between the estimated effects of education between both groups and the real effects is a factor  $P$ . Yet, this factor  $P$  multiplies all parameters evenly, so that the ratio of the estimated parameters between immigrants and nationals will remain identical to the true ratio.