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Socio-economic and geographic profiling of crime in Chile

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Many empirical studies of crime assume that victims and perpetrators live in a single geographical unit, the implication being that the socio-economic characteristics of victims' places of residence can be treated as determinants of crime. This study offers an alternative approach which consists in measuring crime by the proportion of alleged offenders in the whole population and treating the characteristics of their home communes as socio-economic causes of criminal behaviour. The conclusion is that those charged with crimes present a high degree of geographic mobility. In the case of economically motivated crimes, the evidence partly supports Becker's propositions. Lastly, we show that the number of people charged with crimes tends to be greater in communes that have low incomes, a larger police presence, a predominance of urban areas with higher levels of education and a geographical location in the north of the country, which to some degree bears out the findings of other studies on Chile.

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I
Introduction

Crime has increased in Chile over the past decade, becoming one of the foremost concerns for the public. Robbery and theft, for example, have increased by 12% and 13% a year, respectively, while homicides and drug offences have risen by 2% and 33%.[1] This upward trend in crime has naturally aroused concern among citizens, who see it as one of the most important problems facing Chilean society today.[2] Notwithstanding this, research into and knowledge of the determinants of crime in the country are still in short supply.

Ever since the pioneering work of Ehrlich (1973), empirical and econometric studies of crime have allowed considerable progress to be made in understanding some of its fundamental causes.[3] In most of these publications, crime is measured by the number of reported offences, and the socio-economic characteristics of the geographical areas concerned are treated as variables determining it, the tacit assumption being that the perpetrators come from the same place as their victims. Although this approach seems reasonable when large geographical areas are being considered, its explanatory power diminishes when these are heterogeneous or the perpetrator is not from the place where the crime was reported.[4]

This paper will attempt to deal with the limitations referred to by considering the geographical origin of alleged offenders instead of the place where the crime is reported by the victim. As far as we know, this is the first exercise of its kind in Chile and Latin America. The conceptual justification for this approach is that if the propensity to commit crimes depends on the physical, social and economic environment of individuals, an analysis based on the alleged perpetrators' places of origin and the relevant characteristics could shed new light on the determinants of crime in the country.

For this purpose, we used information from the criminal charges database of the Chilean Public Defender's Office (DPP) for 2005 and 2006. The geographical unit of analysis was the commune and the figure taken was the number of people charged with crimes for every 100,000 inhabitants, divided by the types of crime recorded.[5]

Although people charged with crimes are not necessarily their perpetrators, the analysis was based on the idea that this was an imperfect but close measure given that a large and fairly constant proportion of them are found guilty of the crimes for which they are tried.

One of the findings of the study is that, for most crimes, there are communes which are not home to any suspects at all. This made it necessary to develop a procedure that could deal separately with the issue of the number of suspects from each commune and with the situation where there were none at all, and this was done using a Heckit model calculated by maximum likelihood. Estimates were made for different types of crime, the explanatory variables used being

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[1] See *Anuario de estadísticas criminales 2008*, published by the Paz Ciudadana Foundation. The annual growth rates are for reported crime.

[2] According to the 2005 National Citizen Security Survey, 29% said that crime and drug trafficking were the greatest problems currently facing the country. Londoño, Gaviria and Guerrero (2000) put the cost of violent crime in Latin America at between 5% and 13% of GDP.

[3] Other early and influential econometric contributions were those of Wolpin (1980) and Dryden Witte (1980).

[4] This type of approach could imply a proportional relationship between income level and criminality. See Rivera, Núñez and Villavicencio (2004) for a more detailed discussion.

[5] The DPP database contains data on practically all criminal proceedings conducted in the country in recent years. The information on each individual charged includes, among other things, age, sex, declared income, crime charged with, duration of the proceedings and penalty handed down by the judge. In particular, it records the individual's domicile and commune of origin and the place where the crime was alleged to have been committed. Chile is divided for administrative purposes into 15 regions, 51 provinces and 342 communes. Communes contain an average of about 50,000 inhabitants, with a high degree of geographical dispersion. All the socio-economic data on communes used in this study are from the National Socio-economic Survey (CASEN), which has been conducted nationwide every two years since the late 1980s. These surveys are used to gather certain significant data about the population in each commune, such as age structure, income level and household characteristics and composition. The present study used the findings of CASEN 2006. For further details see [online] www.mideplan.cl.

legal or illegal income, the likelihood of punishment and the characteristics of the home communes of those charged. This is the so-called selection model described further on.

To complement this, a crime participation model was developed and estimated in this study to establish the factors determining the likelihood of a person being charged with a crime, considering the variables normally employed in studies of the subject and the communes suspects come from. The latter consideration is one of the innovations that set this study apart from earlier work. The conclusions thus arrived at agree with the findings of other research carried out in Chile using regional data on reported crime (Rivera, Núñez and Villavicencio, 2004).

The paper is structured as follows. After this introduction, section II presents some stylized facts on the behaviour of reported crime by offence type that arise when the geographical origin of suspects is taken as the unit of analysis. Section III describes the theoretical and econometric model applied in this study and the data used in the estimates. Lastly, sections IV and V present the findings and conclusions of the study, respectively. The annex contains tables setting out the econometric results discussed in the body of the text, together with a more detailed discussion of the relationship between crime and its attribution that supports our decision to evaluate crime at the communal level with reference to the numbers charged with but not necessarily guilty of offences.

II
Stylized facts

This section offers and discusses a number of stylized facts concerning the communes of origin of those charged with crimes in Chile, touching on some issues that will be dealt with in the sections that follow. Table 1 shows the number of communes where residents were charged with the offences named and the percentage they represent out of the total of 335 communes with information available for 2006. The data reveal that there are crimes for which the "commune non-participation" rate is as high as 31% (homicide), while others (larceny and assault) are more widespread geographically.

This information is new, since although earlier studies concluded that crime patterns differed substantially by geographical area,[6] in Chile at least the existence and proportion of communes where residents were charged with virtually no crimes in certain categories had not come to light. This raises the question of what factors may account for the presence or otherwise in a particular community of people who are charged with and perhaps guilty of crimes, a subject that will be addressed later on using the so-called participation equation.

[6] See, for example, Fundación Paz Ciudadana (2008), Benavente and Melo (2006), Defensoría Penal Pública (2007), Núñez and others (2003) and Rivera, Núñez and Villavicencio (2004).

TABLE 1

Communes where residents have and have not been charged with crimes, by type of offence

(Number of communes and percentages of the total)

	Robbery		Non-violent robbery		Larceny		Assault		Homicide		Sex offences		Drug offences	
No	67	20.0	32	10.0	18	5.0	10	3.0	104	31.0	44	13.0	74	22.0
Yes	268	80.0	303	90.0	317	95.0	325	97.0	231	69.0	291	87.0	261	78.0

Source: criminal charges database 2006, Public Defender's Office (DPP).

Owing no doubt to a lack of detailed information, studies on the subject tend to infer that criminals live in the geographical area examined. The charge data call this assumption into question, however, as they reveal that the numbers depend greatly on the size of the area considered. As table 2 shows, only about half of all charges brought in a given commune are against residents of that commune. Nonetheless, large percentages of those charged are from the same province or region, implying that the mobility of possible perpetrators is constrained by geographical distance.

As regards the age composition of alleged offenders, table 3 shows that a large proportion are minors, particularly in the case of property crimes (robbery, non-violent robbery and larceny).

The data also reveal an apparent inverse correlation between age and the likelihood of being charged. As figures 1 and 2 show, the indicator of net participation by age (defined as the percentage of people aged *x* who are charged minus the percentage of the population of that age) is higher for young people than for other age segments of the population.[7]

[7] Various authors have found evidence that young people are more likely to take part in criminal activities. The reasons for this behaviour range from the psychological aspects of adolescence to a gloomy view of future legal earning potential because of the low wages earned by this age group, with its lack of experience and training. See Buonanno (2003a), Freeman (1996) and Freeman (1991).

TABLE 2

Mobility of alleged offenders between communes, provinces and regions

(Percentages resident in the geographical area concerned)

Type of offence	Communes	Provinces	Regions
Robbery	51	87	93
Non-violent robbery	58	88	93
Larceny	43	79	88
Assault	64	91	94
Homicide	58	87	93
Sex offences	61	87	91
Drug offences	51	82	86

Source: criminal charges database 2006, Public Defender's Office (DPP).

TABLE 3

Crimes with which minors are charged

(Percentages)

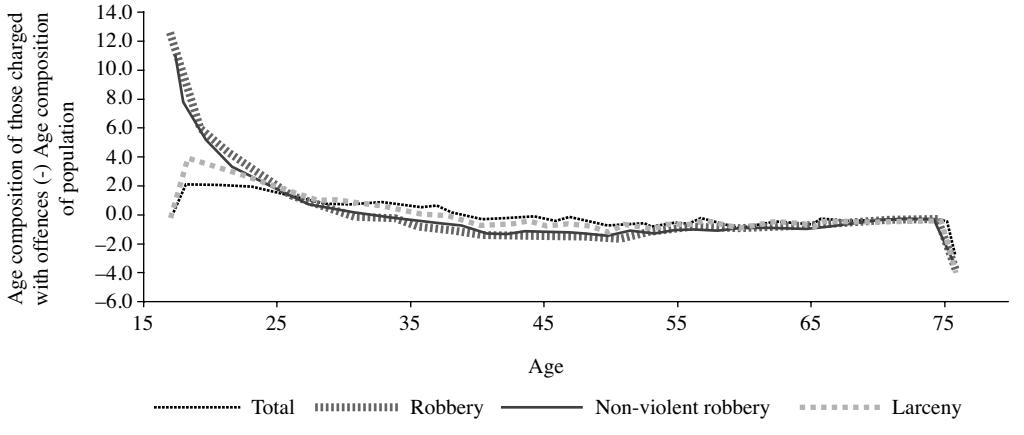
Type of offence	Proportion charged who are minors
Robbery	24.03
Non-violent robbery	22.10
Larceny	11.39
Assault	7.97
Homicide	10.48
Sex offences	9.48
Drug offences	6.36

Source: criminal charges database 2006, Public Defender's Office (DPP).

FIGURE 1

Net alleged participation in robbery, non-violent robbery and larceny, by age

(Percentages)



Source: prepared by the authors on the basis of data from the Public Defender's Office.

To complement this information, a preliminary inference can be drawn from figure 3 that there is an inverse relationship between education level and the number of people charged by type of offence: as education levels rise, the indicator of criminal participation (defined as the percentage of people charged who have an education level *x* minus the percentage of the population with that level of education) diminishes. This relationship has been identified by a number of authors (Lochner, 1999; Lochner and Moretti, 2001; Buonanno, 2003a; Buonanno, 2003b; Buonanno and Leonida, 2005), although other studies contain findings that show the opposite (Ehrlich, 1973; Núñez and others, 2003; Rivera, Núñez and Villavicencio, 2004).[8]

[8] Ehrlich (1973) put forward three possible explanations: (i) that education may increase the returns on illegal activities, (ii) that this relationship may be due to more educated victims being more likely to report crimes and (iii) that more educated people are more likely to be victims of crime because they have higher incomes. The last two hypotheses are linked to the way crime is defined (i.e., by reported crime statistics), which does not allow the perpetrator's place of origin to be identified.

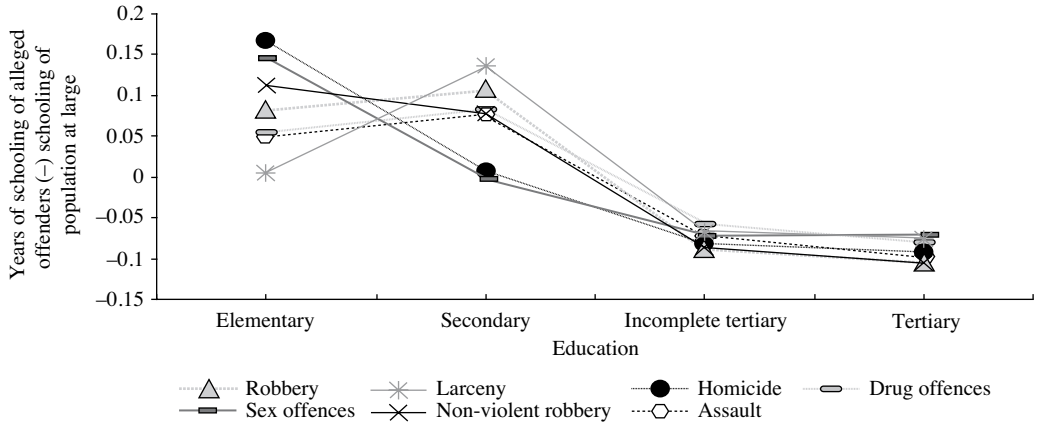
FIGURE 2

Net alleged participation in assault, homicide and sex and drug offences, by age
(Percentages)

Source: prepared by the authors on the basis of data from the Public Defender's Office.

FIGURE 3

Relationship between alleged crime and education level, by type of offence



Source: prepared by the authors on the basis of data from the Public Defender's Office.

Lastly, the data show a positive correlation between the number of people charged with offences and the different types of offence. Table 4 allows us to establish that the highest correlations are for economically motivated crimes (robbery, larceny, drugs), suggesting the presence of a number of common determinants that do not play a very important role in offences with non-economic motives (homicide, sex offences). These last usually have a low level of correlation with the other types of crime, suggesting that their causes are different from those of economically motivated offences.

The subject will be looked at later, since one of the major conclusions of this study is that the determinants of crime differ by the type of offence. The same conclusion has been arrived at in other studies on Chile conducted using reported crime data (Rivera, Núñez and Villavicencio, 2004).

TABLE 4

Correlation between the number of people charged with offences per 100,000 inhabitants, by commune and offence type

Offence	Homicide	Sex offences	Economic crimes	Assault	Robbery	Larceny	Drug offences
Homicide	1.000	0.372	0.080	0.193	0.119	0.137	0.202
Sex offences		1.000	0.148	0.478	0.097	0.093	0.150
Economic crimes			1.000	0.403	0.669	0.650	0.546
Assault				1.000	0.295	0.419	0.312
Robbery					1.000	0.803	0.492
Larceny						1.000	0.521
Drug offences							1.000

Source: criminal charges database 2006, Public Defender's Office (DPP).
N.B.: Includes only communes where residents were charged with these crimes in 2006.

III

Description of the model and the data used

This section describes the general model developed to identify the determinants of crime. Following the static model proposed by Ehrlich (1973), we take an individual representative of the commune concerned, hereinafter $i = 1,2,\ldots,335$, who spends his or her time carrying out legal $\left(t_L^{ij}\right)$ or illegal $\left(t_{NL}^{ij}\right)$ activities related to a particular offence, hereinafter j = robbery, non-violent robbery, larceny, assault, homicide, sex offences and drug offences.[9]

It will be assumed that no entry or training costs have to be incurred prior to carrying out these activities[10] and that the returns to them increase constantly in proportion to the time spent on them. However, the returns to illegal activities are uncertain as they depend on penalties and the likelihood of being caught. Thus, given the logic of the individual concerned and considering a utility function $U(.)$, that individual's optimization problem consists in maximizing the expected utility given by:

[9] All the information on criminal charges brought comes from the DPP criminal charges database for 2006, which gives a classification of 236 crimes grouped into 17 categories. The present study takes what we consider to be the main categories of offence, given their social implications; their exact composition is given in Defensoría Penal Pública (2007). The 2006 database contains records of 202,328 cases handled by the DPP. Commune-level socio-economic and demographic information, meanwhile, comes from the CASEN 2006 survey.

[10] This assumption has been widely discussed, as it implies that a person can move between criminal and legal activities without cost, yet a criminal record is often a barrier to obtaining legal work and this can have an inertial effect that causes people to persist in criminal activities. According to Buonanno (2003a), it has been shown that a very high percentage of criminals carried on legal activities before turning to illegal ones.

$$EU\left(t_L^{ij}, t_{NL}^{ij}\right) = p^{ij}U\left(X_a^{ij}\right) + \left(1 - p^{ij}\right)U\left(X_b^{ij}\right)\ldots \quad (1)$$

subject to $t_o^i = t_L^{ij} + t_{NL}^{ij}$, where $W_L^{ij}\left(t_L^{ij}\right)$ is the total income obtained by spending t_L^{ij} units of time on legal activities and $W_{NL}^{ij}\left(t_{NL}^{ij}\right)$ is the corresponding illegal income; $X_a^{ij} = W_L^{ij}\left(t_L^{ij}\right) + W_{NL}^{ij}\left(t_{NL}^{ij}\right) - F_{NL}^{ij}\left(t_{NL}^{ij}\right)$ is the total income received by the individual if caught, which happens with probability p^{ij} involving punishment of F_{NL}^{ij}, while $X_b^{ij} = W_{NL}^{ij}\left(t_{NL}^{ij}\right) + W_{NL}^{ij}\left(t_{NL}^{ij}\right)$ represents the income received by the individual if not captured, for which the likelihood is 1 - p^{ij}. On the basis of this optimization problem, the relationship between illegal and legal activities is defined by the following equation:

$$-\frac{\dfrac{dW_{NL}^{ij}}{dt_{NL}^{ij}} - \dfrac{dW_L^{ij}}{dt_L^{ij}}}{\dfrac{dW_{NL}^{ij}}{dt_{NL}^{ij}} - \dfrac{dW_L^{ij}}{dt_L^{ij}} - \dfrac{dF_{NL}^{ij}}{dt_{NL}^{ij}}} = \frac{p^{ij}U'\left(X_a^{ij}\right)}{\left(1 - p^{ij}\right)U'\left(X_b^{ij}\right)}\ldots \quad (2)$$

If the payoff for illicit activities involving the likelihood of punishment is lower than that for legal activities, the person will not spend time on the former. For a crime to take place, therefore, the marginal income expected from a particular illegal activity minus the possible punishment for committing the crime must be greater than the marginal income from a legal activity, i.e.:

$$w_{NL}^{ij} > w_{NL}^{ij} - f_{NL}^{ij}p^{ij}\ldots \quad (3)$$

For the purposes of the estimation it is assumed that, first, individuals must decide whether to commit crimes (participation decision), for which they evaluate equation 3. If they do so decide, they take a second decision which consists in determining how much time they will spend on the criminal activity (charge rate equation) in accordance with equation 2. Accordingly, to take account of the possible selection bias that the presence of a correlation between the two decisions would entail, the charge rate and participation econometric estimates were calculated using Heckit models, by maximum likelihood, assuming that the errors presented a bivariate normal distribution.

The participation decision, taken using equation 3, will be positive if illegal income net of possible penalties exceeds legal income. Given that no information is available on the illegal income received by agents, however, let alone that yielded by crimes of type *j*, a proxy variable was used in the form of per capita income Y_{reg}^i in the region to which the alleged perpetrator's commune of origin belonged. It is feasible to use a proxy of this sort because the opportunities for obtaining illegal income are related to the wealth that might be available to victims, most of whom (as shown in the previous section) are from the region containing the alleged perpetrator's own commune. We thus get:

$$w_{NL}^{ij} = w_{NL}^{ij}\left(Y_{reg}^i\right) = X_{w_{NL}}^i\alpha_1^j\ldots \quad (4)$$

where $X_{w_{NL}}^i = \left[Y_{reg}^i\right]$.

The proxy for legal income was average income in the commune $\left(Y_{commune}^i\right)$; to capture possible disparities in its distribution, however, the percentage of poor people in the commune ($poor^i$) was included as an additional variable.[11] The model considered unemployment in the population aged 18 to 40 as a variable ($unemployment^i$) to take account of actual opportunities for obtaining legal income.[12] Given the above considerations, legal income is defined as follows:

$$\begin{aligned} w_L^{ij} &= w_L^{ij}\left(Y_{commune}^i, poor^i, unemployment^i\right) \\ &= X_{w_L}^i\alpha_2^j\ldots \end{aligned} \quad (5)$$

where $X_{w_L}^i = \left[Y_{commune}^i, poor^i, unemployment^i\right]$.

Meanwhile, it is assumed that the punishment function f_{ij} is equivalent to the penalty imposed by law on crimes of type *j*, i.e. (c_{law}^j), which would be the same in all communes depending on the type of crime involved. Its effects cannot be determined for

[11] Fajnzylber, Lederman and Loayza (2002) studied aggregate crime in various countries and found the influence of income disparities to be significant, which is why it was considered important to include it here.

[12] As indicated earlier, however, it has been shown that a majority of individuals who commit crimes are in work. Imrohoroglu, Merlo and Rupert (2001) estimated that about 70% of criminals in the United States were in work at the time they committed their crimes.

the purposes of our estimate, as they will be included in the constant term of the equations.

In the light of the criticisms of Block and Heineke (1975) and William and Sickles (2002) (see also Buonanno, 2003c), we included the following sociodemographic variables, which are considered to be determinants of crime and are routinely employed in studies of the subject: (i) the percentage of the population aged between 13 and 17 ($pop^{i}_{13\text{-}17}$), (ii) the percentage of the population aged between 18 and 40 ($pop^{i}_{18\text{-}40}$), (iii) the percentage of single-parent households headed by the mother ($house^{i}_{fem}$), (iv) the percentage of households containing minors aged 13 to 18 in which both parents work ($house^{i}_{parents\text{-}work}$)[13] and, lastly, (v) average years of education of over-13s in the commune ($educ^{i}$).

Given the above, the punishment applied in commune *i* for type *j* crimes can be expressed by the following equation:

$$f^{ij} = f^{ij}\left(c^{j}_{law}, CS\left(pop^{i}_{13-17}, pop^{i}_{18-40}, house^{i}_{fem}, house^{i}_{parents-work}, educ^{i}\right)\right) = X^{i}_{f}\,\alpha^{j}_{3}\ldots \tag{6}$$

where $X^{i}_{f} = \left[\overline{c^{j}_{law}}, pop^{i}_{13-17}, pop^{i}_{18-40}, house^{i}_{fem}, house^{i}_{parents-work}, educ^{i}\right]$ and $\overline{c^{j}_{law}}$ is the constant already mentioned.

Following the hypotheses put forward by Becker (1968), the variable p^{ij} representing the possibility of being punished depends on the likelihood of capture $p^{ij}_{capture} = \dfrac{crim - captured^{ij}}{crim - reported^{ij}}$, the level of crime that goes unreported $underreport^{ij} = \dfrac{crim - reported^{ij}}{crim - total^{ij}}$ and the possibility of being found guilty, which is conditional on being captured $p^{ij}_{responsibility} = \dfrac{crim - punished^{ij}}{crim - captured^{ij}}$.

For the purposes of the estimate, it was assumed that the likelihood of capture was a function of the number of police stations in the commune $p^{ij}_{capture} = p^{ij}_{capture}(station^{i}) =$ [14] and that the number of offences that went unreported in the different communes was constant. The likelihood of being punished once captured ($p^{ij}_{responsibility}$) was estimated from the ratio between the number of those charged who were found guilty and the total number charged in the region, both for 2005.[15] Accordingly, the likelihood of being punished is represented by the following equation:

$$p^{ij} = \frac{crim - punished^{ij}}{crim - total^{ij}} = p^{ij}_{capture}(station^{i}) \times underreport^{ij} \times p^{ij}_{responsibility} = X^{i}_{p}\alpha_{4}\ldots \tag{7}$$

where $X^{i}_{p} = \left[station^{i}, \overline{underreport}, p^{ij}_{responsibility}\right]$ and $\overline{underreport}$ is the constant indicated.

When rewritten and supplemented by a random shock term, equation 3 of the participation model is expressed as follows:

$$S^{ij} = w^{ij}_{NL}(.) - f^{ij}(.)\,p^{ij} - w^{ij}_{L}(.) + \varepsilon^{i}_{participation} = X^{i}\Gamma^{j} + \varepsilon^{i}_{participation}\ldots \tag{8}$$

where $\Gamma = \left[\alpha_1, \alpha_2, \alpha_3, \alpha_4\right]$ and $X^{i} = \left[X^{i}_{W_{NL}}, X^{i}_{W_{L}}, X^{i}_{f}, X^{i}_{p}\right]$.

It should be pointed out that in the above equation a commune *i* will present positive charge rates always provided that $S^{ij} > 0$. Generally, for any type of crime,

[13] William and Sickles (2002) show that the family and local environment play a major role in driving criminal behaviour.

[14] Police information is taken from the official statistics of the Chilean national police service (Carabineros de Chile) published on the web page of the Chilean National Institute of Statistics, police statistics section [online] www.ine.cl.

[15] In point of fact, the lack of national information for 2005 meant that the variable was constructed using data from the second half of that year. They were lagged on the assumption that they could be observed by individuals in the following period.

let us define the dichotomous variable H^i whose value is 1 if commune *i* presents charges for the crime analysed and 0 otherwise. The participation equation for the offence concerned can be estimated using a probit model, assuming variable ε^i_{part} is normal, with a mean of 0 and a variance of $\sigma_{\varepsilon^i_{participation}}$:

$$prob\left(H^i=1\right)=prob\left(\varepsilon^i_{part}>-X^i\Gamma\right)=\Phi\left(\frac{X^i\Gamma}{\sigma_{\varepsilon^i_{participation}}}\right)\ldots \quad (9)$$

As for those charged with offences, criminal activity levels are determined using equation 2 and by the time constraints on the representative individual. This equation shows that the number of people charged with each type of offence is a function of the same variables as the participation equation. For the purposes of the estimation, however, it was considered appropriate to express the number of people charged in log form using equation 10, whose variables have a linear relationship plus a random term. To properly identify the participation equation, some variables were excluded from the charge rate equation (a topic that is discussed in the following section), so that this was expressed as follows:

$$Ln\left(t^{ij}_{NL}\right)=\Pi^j X^i+\varepsilon^i_o\ldots \quad (10)$$

where $\Pi^j=\left[\pi_1,\pi_2,\pi_3,\pi_4\right]$. Nonetheless, given that crime is only observable when S^{ij} is greater than 0, the existence of a possible correlation between the random $\left(\varepsilon^i_o\right)$ and error terms of the participation equation means that the conditional error term cannot be equal to 0, which tends to bias the least squares estimate. Thus, to control for any idiosyncratic differences between communes, we included the following variables,[16] which were also included in the participation equation: (i) the dichotomous variable *small – community*^{i}, which takes the value 1 if commune *i* has less than 7,000 inhabitants; (ii) the dummy variable *rural*^{i}, which takes the value 1 if the rural population of commune i is greater than 50% of the total; (iii) *density*^{i}, which represents the number of inhabitants per square kilometre in commune *i*; (iv) the dichotomous variable *north*, which takes the value 1 if commune *i* is in the country's north (region I, II, III or IV); and (v) *centre*, which takes the value 1 if commune *i* is in region V or VI or the Metropolitan Region. The participation equation also included the *distance*^{i} variable, which measures the distance between commune *i* and the main urban centre of the region concerned.

Following Sah (1991), we also included the number of people charged with crimes in the province, expressed in logarithms (*Lncrimprov*), on the hypothesis that certain areas may have higher levels of crime because there is a lower probability of capture, so that the inhabitants of the communes concerned will revise their expectations and show a more significant propensity to engage in illicit activities. Thus, the final equation to be estimated is expressed as follows:

$$E\left(Ln\left(t^{ij}_{NL}\right)\mid S^{ij}>0\right)=\Pi^j X^i+\text{Idiosyncratic}+\mathrm{E}\left(\varepsilon^{\mathrm{i}}_{\mathrm{o}}\mid S^{ij}>0\right)\ldots \quad (11)$$

Assuming that the error terms of the two equations $\left(\varepsilon^i_o \text{ and } \varepsilon^i_{participation}\right)$ come from a normal distribution of means 0, with variances $\sigma_{\varepsilon^i_o}$ $\sigma_{\varepsilon^i_{participation}}$ and covariance $\sigma_{\varepsilon^i_{(o,participation)}}$, the conditional error can be calculated using the following equation:

$$E\left(\varepsilon^i_o\mid S^{ij}>0\right)=\rho\sigma_{\varepsilon^i_o}\lambda\left(\frac{\Gamma X^i}{\sigma_{\varepsilon^i_{participation}}}\right)\ldots \quad (12)$$

where ρ is the correlation coefficient of the participation and charge rate equations, while $\lambda(.)$ is the inverse Mills ratio. The coefficients of the two equations were estimated using the maximum likelihood method to ensure consistency of the estimators.[17]

[16] Various studies have shown that small communities tend to have lower rates of crime because criminals would find it harder to go unnoticed there (Rivera, Núñez and Villavicencio, 2004; Glaeser and Sacerdote, 1999).

[17] Purely by way of explanation, it should be pointed out that the analysis was not undertaken by estimating an unbalanced panel for the following reasons: (i) lack of information prior to 2006 on the communes of origin of many of those charged with offences; (ii) lack of annual data on the explanatory variables during the relevant period, since these come from the CASEN surveys held every two years or so; (iii) possible undercounting of offenders in some communes because potential criminals moved from their region of origin to areas where the criminal law reform had yet to be implemented. Implementation of this was gradual: the last region to be incorporated into the new system was the Metropolitan Region (Santiago) in 2005. See Defensoría Penal Pública (2007) for further information.

IV
Results

Because the charge rate equation by offence category is the one that offers the most interesting results, the main findings from this will now be presented and commented upon (the results of the other estimates are detailed in annex 2).

The results concerned were obtained using two econometric specifications for each type of offence: one that included all the variables presented previously and one that only included variables which were significant at 90% (reduced model), retaining however the most important economic variables $\left(Y^{t}_{commune}, Y^{t}_{reg}\right.$ and $\left.p^{ij}_{responsibility}\right)$ irrespective of statistical significance.

Notwithstanding this, while the theoretical analysis undertaken indicates that the determinants of participation in criminal acts are also those that account for the level of crime (charge rate equation), the distance variable was included only in the participation equation so that it could be correctly identified (Heckman estimate). For the same purpose, other variables from the charge rate equation were omitted from the reduced models to improve the identification of the equations.[18]

Using the test of independence between the charge rate equation and the participation equation (the Wald test, at 90%), it was not possible to reject the hypothesis of independence, except in the cases of homicide and sex crimes, which is tantamount to stating that the charge rate equation could be estimated on the basis of the observed crime level. The results of the two equations are presented in the annex.[19]

To validate the foregoing result, the correlation between the Mills ratio and the explanatory variables of the charge rate equation was analysed to discard high correlations that might affect the validity of the test and the consistency of the coefficients estimated. As described in annex 2, R^2 levels below 57% were found in all the reduced models, indicating that the correlation between the Mills ratio and the explanatory variables of the charge rate equation is low.[20]

The results of the charge rate equation by category of offence could be interesting. First, they indicate that while there are some cross-sectional determinants, there is a high degree of heterogeneity between those charged with the different offences, suggesting that different causes and motivations are at work.

Communal income levels, meanwhile, show an inversely proportional relationship to crime, with a coefficient significant at 99% for all offences (except homicide, which does however have the expected sign). This finding agrees with the theoretical model predictions and indicates that it is in the poorest communes that people are most likely to be charged with a wide range of offences. The elasticities associated with communal income levels (see annex 2) range from –0.25 in the case of assault to –0.65 in that of non-violent robbery.

In the case of offences whose motivation is clearly economic (robbery, non-violent robbery and larceny), the relationship between regional income and the number of people charged is positive and significant, by contrast with other offences that may not be economically motivated. This is consistent with the hypothesis about the opportunities for illegal earnings represented by economically motivated offences. According to the result of the estimates, the elasticities associated with the latter range from 0.52 (larceny) to 0.97 (non-violent robbery).

The effects of the *deterrence* variable are only significant for crimes associated with the drugs law. Unemployment in the commune is statistically significant only in the case of robbery, which agrees with the theoretical model, and has an elasticity of 0.23. There is a positive relationship, meanwhile, between education and the number of people charged

[18] The variables omitted for identification purposes in the participation equations for the different offences were as follows. For robbery: *distance*, *centre*, *small-community*, *rural* and *poor*; for non-violent robbery: *distance*, *pop 13-17*, *poor*, *house-parents-work* and *unemployment*; for larceny: *distance* and *educ*; for homicide: *distance*, *pop 18-40*, *north* and *educ*; for sex offences: *distance*, *pop 13-17*, *rural* and *unemployment*, and for offences classified in the drugs law: *distance*, *north*, *small-community* and *unemployment*.

[19] The crime of assault was not studied in the participation equation as it is present in 97% of the communes analysed.

[20] The procedure implemented is similar to that used by Elias and Okseniuk (2002), who applied the recommendation of Nawata and Nagase (1996). See [online] http://www.aaep.org.ar/espa/anales/PDF_02/elias_okseniuk.pdf.

with the offences of robbery and larceny, a result that appears to bear out the findings of other studies in Chile and around the world.

People are more likely to be charged with a wide range of offences in the communes of the north of Chile, a finding that bears out previous studies (Núñez and others, 2003; Rivera, Núñez and Villavicencio, 2004).

The proportion of young people in a commune does not significantly affect the number of people charged by category of offence, except in the case of assault, which has an elasticity of 0.48. Fewer people tend to be charged for a variety of offences in rural communes. Lastly, the number of police stations in a commune has a large and significant effect on the number of people charged for all offences other than homicide, although the sign is positive for this as well. The meaning of this finding is ambiguous. It may reflect the success of police efforts to apprehend criminals, but it could also be because police stations are more likely to be situated in communes whose populations are particularly likely to offend. The true meaning of this sign remains an open question.

V
Conclusions

This study represents an effort to examine the determinants of crime from the perspective of the places of origin of those charged with offences, rather than following the traditional approach of employing data based on reported crime and treating the place where the offence was recorded as the suspect's place of origin. Thus, the present study recognizes the geographical dissociation between victims' and perpetrators' home areas, so that the characteristics of the former's places of residence become a determining factor in the propensity to commit crime (illegal income).

This study shows that about half of all reported crime is notified outside the commune of residence of the perpetrator, albeit in the same region in the great majority of cases, which indicates that it would be inappropriate to base the analysis on reported crime at the communal level. Again, studies based on data for criminal charges brought at the regional level could have limitations if social and economic heterogeneity within regions is high, as it is in Chile and the other countries of Latin America.

Another striking finding of this study is the high level of correlation between the communes of residence of those charged with different types of crimes, raising the question of why so many people are charged in these. The study notes that while the causes of criminal acts differ, some are transversal. In particular, other things being equal, the number of people charged with offences tends to be greater in poorer communes, those in urban areas, those in the north of the country and those with higher levels of education. This last finding has come up in other studies on Chile and other parts of the world, although there is still debate as to its interpretation.

Unemployment, meanwhile, does not greatly influence the number of people charged with offences, and nor does the deterrence variable (the likelihood of being captured in a given commune in earlier periods). Police presence, measured by the number of police stations in the commune, markedly increases the number of people charged in the various communes for almost all types of crime.

Another finding of interest is that opportunities for obtaining illegal income, for which regional income is used as a proxy, tend to increase the number of people charged in each commune only in the case of crimes for which these are relevant, i.e., those whose motivation is mainly economic (robbery, non-violent robbery and larceny), and not for other types of offence (homicide, assault, sex offences). These findings agree with those of earlier studies on Chile[21] and suggest that when crimes are not economically motivated, it is necessary to seek explanations and determinants in other approaches and disciplines, such as sociology and psychology.

There are all sorts of areas in which future research could be done on the determinants of crime with regard to the places of origin of suspects and perpetrators. In particular, it would be well worth studying the persistence

[21] See, for example, Rivera, Núñez and Villavicencio (2004) and Núñez and others (2003), where it is likewise observed that economic factors play an important role, chiefly in economically motivated crimes.

of criminal behaviour over time, a subject which this study, as a cross-sectional analysis, could not address. It would also be interesting to differentiate between first-time and repeat offenders, on the assumption that the latter could have embarked upon a career of crime. Again, there is scope for analysing a wide range of crime determinants at the regional level where adequate conceptual or theoretical support exists, in addition to the determinants included in this paper.

Lastly, it should be added that non-rejection of the hypothesis of independence between the participation and selection equations is not necessarily due to any identification problems with the latter. Although the decision to participate might depend on socio-economic variables, the empirical evidence indicates that it is not linked to the level of crime, contrary to what the theoretical approach applied in this study would suggest.

ANNEX 1

Relationships between crime and its attribution

Ideally, the charge rate indicator in a given geographical area should be the ratio between the percentage of people who have participated in criminal activities and the percentage residing in that area. One of the problems with analysing crime, however, is the existence of components that are not observable and rule this out as a direct approach.

As was pointed out in the introduction, studies of crime generally use reported crime databases, so that the place of origin of alleged offenders cannot be determined. Another problem with this approach is the number of crimes that go unreported, an issue we attempted to solve by using panel data techniques or assuming it was random.

While the approach followed in this document obviates the first of these problems, it is affected by underreporting, since a person cannot be charged with a particular crime unless accused of it by the victim or public prosecutor. In addition to the points made in the previous paragraph, however, use of the charge ratio is open to objections from a legal point of view, in that those charged are implicitly being treated as responsible for crimes without having been found guilty by a judge, and there is the possibility that an innocent person may be apprehended, found guilty or both.

As can be appreciated in equation 1A, however, using the charge ratio is valid if the $\frac{cri_{rprtd\text{-}uncaptd} - inoc_{captd}}{pop}$ ratio is random or can be captured by one of the observable variables, such as police effort or socio-economic characteristics. For the present study, we took it that this factor did not depend on socio-economic causes, and accordingly proceeded to correlate the degree of criminal liability with per capita income levels, finding very low values. Nonetheless, the effect of police presence was controlled for by including a dummy identifying the existence of a police station in the commune analysed.

$$\begin{aligned}\frac{cri}{pop} &= \frac{cri_{rprtd} + cri_{unrprtd}}{pop} = \frac{cri_{rprtd\text{-}captd} + cri_{rprtd\text{-}uncaptd} + cri_{unrprtd}}{pop} \\ &= \frac{cri_{rprtd\text{-}captd} + cri_{rprtd\text{-}uncaptd} + inoc_{captd} - inoc_{captd} + cri_{unrprtd}}{pop} \\ &= \frac{charged}{pop} + \frac{cri_{rprtd\text{-}uncaptd} - inoc_{captd}}{pop} + \frac{cri_{unrprtd}}{pop}\end{aligned} \tag{1A}$$

where:
cri = number of people involved in a particular criminal activity.
cri_{rprtd} = number of people involved in a criminal activity who are reported, whether identified or not.
$cri_{unrprtd}$ = number of people involved in a criminal activity who are not reported.
$cri_{rprtd\text{-}captd}$ = number of criminals reported and captured.
$cri_{rprtd\text{-}uncaptd}$ = number of criminals reported and not captured.
$inoc_{captd}$ = number of innocent people captured and charged.

ANNEX 2

Estimation of the charge rate equations

	Robbery		Non-violent robbery		Larceny		Assault		Homicide		Sex offences		Drugs law offences	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Ycommune	-0.00000447 0.000	-0.00000428 0.000	-0.00000467 0.000	-0.00000473 0.000	-0.00000314 0.000	-0.00000214 0.000	-0.00000178 0.000	-0.00000185 0.000	-0.00000053 0.748	-0.00000179 0.138	-0.00000270 0.005	-0.00000275 0.000	-0.00000299 0.000	-0.00000287 0.000
Yreg	0.00000690 0.001	0.00000584 0.001	0.00000663 0.000	0.00000624 0.000	0.00000424 0.003	0.00000332 0.012	0.00000203 0.237	0.00000186 0.232	-0.00000092 0.686	-0.00000040 0.859	-0.00000131 0.483	-0.00000125 0.402	0.00000115 0.532	0.00000147 0.396
Pop 13-17	0.0207156 0.506	0.0367582 0.201	0.037954 0.122		0.0169947 0.391		0.0364721 0.071	0.0394906 0.024	0.0077868 0.830	0.0331546 0.317	-0.0106576 0.732		-0.0159746 0.549	
Pop 18-40	0.0064443 0.693		-0.0153074 0.217		0.0049361 0.627		0.0030036 0.780		0.0023408 0.902		0.0122723 0.376		0.0030293 0.841	
North	0.2786917 0.127	0.3086892 0.061	0.486412 0.000	0.534519 0.000	0.3725706 0.001	0.4409929 0.000	-0.0230857 0.848		0.1212323 0.559		0.3244853 0.025	0.3094532 0.006	1.113147 0.000	1.151187 -
Centre	-0.1072758 0.467		-0.0367552 0.731		-0.1620505 0.073		-0.0337157 0.695		-0.0102334 0.955	-0.0734292 0.647	0.0013666 0.991		0.2805883 0.035	0.3063811 0.013
Small-community	-0.0327023 0.880		-0.2367204 0.026	-0.2465319 0.022	-0.0508082 0.536	-0.1258466 0.126	-0.0451135 0.543		0.591111 0.002	0.5656653 0.002	0.4745701 0.000	0.437404 0.000	0.0578213 0.747	
Rural	-0.0464646 0.826		-0.447295 0.001	-0.4522725 0.000	-0.1906745 0.070	-0.2869428 0.002	-0.2428457 0.016	-0.2556397 0.002	-0.0761384 0.718	0.1005056 0.598	0.0055062 0.970		0.1754967 0.408	
Density	0.0000481 0.058	0.0000432 0.081	-0.0000503 0.014	-0.0000517 0.011	0.0000223 0.218	0.0000222 0.234	-0.0000387 0.022	-0.0000366 0.031	0.0000136 0.593	0.0000168 0.514	-0.0000524 0.018	-0.0000454 0.021	0.0000339 0.139	0.0000286 0.196
Educ	0.2289716 0.046	0.1959734 0.057	0.2078743 0.017	0.1659508 0.030	0.1682314 0.022		-0.0205584 0.761		-0.2556365 0.070		-0.0423491 0.658		0.1011784 0.335	0.0926236 0.272
Poor	0.0097841 0.350		0.0070681 0.381		0.0028853 0.654		0.0032845 0.559		-0.0107669 0.369		-0.0173505 0.036	-0.0181656 0.003	-0.0076298 0.439	
Station	0.2983196 0.001	0.3170384 0.000	0.2135252 0.003	0.2121611 0.002	0.2258829 0.000	0.2506295 0.000	0.1550473 0.002	0.1876787 0.000	0.0998236 0.313	0.0995098 0.324	0.1078832 0.163	0.1157943 0.071	0.1998855 0.009	0.1971645 0.007
House-fem	-0.0108982 0.337		0.0001179 0.989		-0.003415 0.645		0.0052529 0.511		0.0074227 0.583		0.0165629 0.078	0.0126862 0.095	-0.0064274 0.533	
House-parents-work	0.0113753 0.076	0.0089568 0.125	0.0032525 0.489		0.007498 0.062	0.0087668 0.019	0.0033702 0.335		-0.005348 0.460		-0.0008947 0.861		0.0075459 0.151	0.0086522 0.083
Unemployment	0.0426948 0.060	0.0511822 0.013	-0.0022514 0.897		0.0111198 0.450		0.0014045 0.918		-0.0093764 0.716		-0.0163843 0.380		0.0143481 0.476	
Lncrimprov	-0.0139217 0.781	-0.0034423 0.943	0.061957 0.132	0.0665054 0.094	0.0448431 0.165	0.0470775 0.200	0.0747338 0.047	0.0806785 0.026	0.0826125 0.192	0.0650951 0.298	-0.0170994 0.713	-0.053442 0.215	0.0699987 0.124	0.0793248 0.072
Deterrence	0.0025696 0.184	0.0027822 0.144	0.00000726 0.997	-0.0005544 0.750	-0.0003163 0.833	-0.0002074 0.890	0.0013453 0.384	0.0012696 0.389	-0.0014061 0.387	-0.0009256 0.557	-0.0009876 0.383	-0.0010545 0.310	0.003641 0.022	0.0034547 0.026
Distance							0.002006 0.0008042	0.0018979 0.0004451						
Constant	-0.5649357 0.707	-0.2212857 0.854	1.278315 0.259	1.872988 0.024	1.623571 0.099	3.872609 -	4.092927 0.000	4.231916 0.000	5.170165 0.012	1.793187 0.003	3.903068 0.002	3.891872 -	1.77506 0.195	1.471467 0.111

(a) General model.
(b) Model with coefficients significant at 90%; also includes economic and deterrence variables, irrespective of statistical significance.
The figures below the model coefficients represent the p-values.

ANNEX 2

Estimation of the participation equations

	Robbery		Non-violent robbery		Larceny		Homicide		Sex offences		Drugs law offences	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Lncrimprov	-0.0002535 0.999	0.05444800 0.699	0.38260320 0.050	0.20476630 0.195	0.57932530 0.012	0.09450950 0.430	0.11707270 0.425	0.14755600 0.292		0.57077740 0.001	0.25484970 0.084	0.18780430 0.177
Ycommune	-0.00000120 0.819	-0.00000147 0.749	-0.00000095 0.888	-0.00000334 0.362	-0.00000941 0.065	0.00000135 0.692	-0.00000921 0.002	-0.00000965 0.001	-0.00000545 0.072	-0.00000675 0.001	-0.00000263 0.420	-0.00000304 0.265
Yreg	0.00000929 0.244	0.00000669 0.356	0.00001800 0.197	0.00000278 0.743	0.00003840 0.056	0.00000099 0.885	0.00001140 0.023	0.00001010 0.039	0.00001080 0.202	0.00000896 0.202	0.00000657 0.360	0.00000481 0.454
Pop 13-17	0.1462928 0.076	0.095168 0.189	0.1641899 0.079	0.2265013 0.004	0.0116173 0.930		0.1955962 0.009	0.1969403 0.004	0.3417962 0.000	0.2894021 0.000	-0.0690647 0.409	
Pop 18-40	-0.0217452 0.579		-0.0076276 0.851		0.0344552 0.540		0.1043037 0.007	0.105129 0.004	0.0313606 0.403		0.0295569 0.501	
North	-0.276419 0.500		-0.4127183 0.369		-0.9748585 0.064	-0.5977859 0.076	-0.799653 0.066	-0.817654 0.054	-0.3555414 0.345	-0.4491146 0.174	1.168022 0.005	1.166955 0.002
Centre	0.4533725 0.250	0.5162114 0.139	0.078283 0.853		-0.1475275 0.815		-0.7498508 0.025	-0.7358388 0.022	-0.0212373 0.950		0.6622045 0.057	0.7944762 0.012
Small- community	-1.994767 0.000	-1.938995 0.000	-1.211041 0.058	-1.119569 0.035	-0.0579991 0.938				-0.8062825 0.029	-0.7461597 0.034	-1.417913 0.000	-1.421839 0.000
Rural	-0.6360799 0.048	-0.6613137 0.011	-0.7181044 0.064		-0.9629715 0.098		0.4934632 0.150	0.4102274 0.197	-0.5703053 0.070	-0.6517036 0.019	-1.142415 0.001	-0.9159514 0.001
Density	-0.0001062 0.608		-0.0001735 0.451		-0.0002255 0.543		0.0005392 0.334	0.0005852 0.345	0.0004913 0.388		-0.0000365 0.922	
Distance	-0.0035344 0.108	-0.0029038 0.159	-0.0006958 0.804	-0.0024298 0.286	-0.0039341 0.222	-0.0049873 0.011	-0.0028386 0.166	-0.0028365 0.161	0.0006587 0.736	0.0026798 0.186	-0.0020735 0.375	-0.0022733 0.303
Educ	0.06969 0.813		-0.2448184 0.499		0.1845425 0.708	0.3179201 0.089	0.7359402 0.008	0.5872488 0.019	-0.0075288 0.979		-0.3264098 0.275	
Poor	-0.007749 0.749	-0.0039706 0.856	-0.0460973 0.076	-0.0621189 0.006	-0.0326194 0.291		0.0168205 0.437		-0.0409692 0.052	-0.0410199 0.031	-0.0166032 0.486	
Station	1.217119 0.013	1.229399 0.008	1.363373 0.048	1.791086 0.019	1.26485 0.095		1.666057 0.000	1.653629 0.000	0.6372622 0.073	1.019399 0.008	1.119842 0.010	1.01939 0.014
House-fem	0.0355155 0.174		-0.0336653 0.249		-0.0720699 0.082		-0.0165623 0.523		-0.0016697 0.950		-0.009347 0.728	
House- parents-work	-0.0163943 0.222	-0.01639 0.190	-0.0202836 0.193	-0.0143462 0.294	-0.0463831 0.041	-0.0220976 0.114	-0.0066766 0.622		-0.0241181 0.054		0.0027372 0.821	
Unemployment	-0.0050508 0.931		0.0199777 0.765	0.0478168 0.420	-0.0935486 0.318		-0.0270045 0.643		0.0750328 0.203	0.0303431 0.579	0.0363505 0.527	0.0068442 0.894
Constant	-0.6566284 0.860	0.6744739 0.637	1.555463 0.723	-0.2909929 0.854	-3.114075 0.626	-1.178189 0.557	-15.43562 0.000	-14.19154 0.000	-3.401666 0.343	-3.932027 0.005	3.536611 0.362	0.4754747 0.671
Mills Lambda	0.2098581 0.506	0.212048 0.212	0.2060069 0.486	0.2282041 0.360	0.099254 0.703	0.3608824 0.402	0.1970658 0.372	0.3792285 0.059	-0.6330605 0.032	-0.4407759 0.009	-0.1425871 0.615	-0.0013444 0.993
R^2 of the Mills ratio in relation to the explanatory variables of the charge rate equation												
	0.7940	0.3260	0.6244	0.4786	0.3810	0.5644	0.6100	0.5673	0.4205	0.4163	0.7705	0.3573

a) General model.
(b) Model with coefficients significant at 90%; also includes economic and deterrence variables, irrespective of statistical significance.
The figures below the model coefficients represent their respective p-values.

ANNEX 2

Marginal effects estimation

	Robbery		Non-violent robbery		Larceny		Assault		Homicide		Sex offences		Drugs law offences	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Ycommune	-0.61437310 0.000	-0.58870880 0.000	-0.63947990 0.000	-0.64851960 0.000	-0.43122980 0.000	-0.29700810 0.000	-0.23869580 0.000	-0.24870010 0.000	-0.07162260 0.748	-0.24629110 0.138	-0.37142480 0.005	-0.38008030 0.000	-0.40903690 0.000	-0.39366450 0.000
Yreg	1.07972800 0.001	0.91460350 0.001	1.03154500 0.000	0.97078120 0.000	0.65877320 0.003	0.51799850 0.012	0.31465960 0.237	0.28756040 0.232	-0.14593810 0.686	-0.06409150 0.859	-0.20392570 0.483	-0.19463090 0.402	0.17907640 0.532	0.23061170 0.396
Pop 13-17	0.2521327 0.506	0.4474879 0.201	0.4623723 0.122		0.2071571 0.391		0.4451609 0.071	0.4820033 0.024	0.0949039 0.830	0.4035298 0.317	-0.1296449 0.732		-0.1943264 0.549	
Pop 18-40	0.2684279 0.693		-0.6373282 0.217		0.2052156 0.627		0.1249768 0.780		0.0976248 0.902		0.5109857 0.376		0.1262479 0.841	
North	0.0362199 0.127	0.0398309 0.061	0.0603934 0.000	0.065924 0.000	0.050248 0.001	0.0587036 0.000	-0.0027587 0.848		0.0146315 0.559		0.0465171 0.025	0.0421982 0.006	0.1532593 0.000	0.1567925 0.000
Centre	-0.0410514 0.467		-0.013814 0.731		-0.061302 0.073		-0.0128289 0.695		-0.0042345 0.955	-0.0301248 0.647	0.0004874 0.991		0.1138619 0.035	0.1229917 0.013
Small-community	-0.0138129 0.880		-0.1064447 0.026	-0.1117611 0.022	-0.0233985 0.536	-0.0588374 0.126	-0.0219893 0.543		0.2675287 0.002	0.2586589 0.002	0.2140544 0.000	0.1972906 0.000	0.0257682 0.747	
Rural	-0.0093936 0.826		-0.0885584 0.001	-0.0904545 0.000	-0.0407692 0.070	-0.063351 0.002	-0.0542203 0.016	-0.0570768 0.002	-0.0164091 0.718	0.0223346 0.598	0.0012514 0.970		0.0381515 0.408	
Density	0.0480476 0.058	0.0431291 0.081	-0.0468458 0.014	-0.048092 0.011	0.0203719 0.218	0.0201428 0.234	-0.0337388 0.022	-0.0318926 0.031	0.0146598 0.593	0.017878 0.514	-0.0488548 0.018	-0.0426306 0.021	0.0340077 0.139	0.0285508 0.196
Educ	2645325 0.046	2263668 0.057	2396393 0.017	1912788 0.030	1935989 0.022		-0.2359911 0.761		-2946266 0.070		-0.4873192 0.658		116798 0.335	1069059 0.272
Poor	0.1418193 0.350		0.1007866 0.381		0.0409435 0.654		0.0468233 0.559		-0.1491325 0.369		-0.2473101 0.036	-0.2596646 0.003	-0.1074786 0.439	
Station	0.1615449 0.001	0.1704507 0.000	0.1132113 0.003	0.1117382 0.002	0.1188858 0.000	0.1301971 0.000	0.0775237 0.002	0.0938394 0.000	0.0563659 0.313	0.0557085 0.324	0.058091 0.163	0.0619459 0.071	0.1042881 0.009	0.1017623 0.007
House-fem	-0.3004415 0.337		0.0032167 0.989		-0.0932207 0.645		0.1415489 0.511		0.2048335 0.583		0.4541889 0.078	0.3469578 0.095	-0.1757268 0.533	
House-parents-work	0.4345207 0.076	0.3419393 0.125	0.12435 0.489		0.2861049 0.062	0.3369466 0.019	0.126871 0.335		-0.2080422 0.460		-0.0345105 0.861		0.2920265 0.151	0.335519 0.083
Unemployment	0.2514523 0.060	0.3016061 0.013	-0.0129602 0.897		0.0637625 0.450		0.0079956 0.918		-0.0524721 0.716		-0.0933643 0.380		0.0821104 0.476	
Lncrimprov	-0.0139217 0.781	-0.0034423 0.943	0.061957 0.132	0.0665054 0.094	0.0448431 0.165	0.0470775 0.200	0.0747338 0.047	0.0806785 0.026	0.0826125 0.192	0.0650951 0.298	-0.0170994 0.713	-0.053442 0.215	0.0699987 0.124	0.0793248 0.072
Deterrence	0.1718136 0.184	0.1860304 0.144	0.0005319 0.997	-0.0406145 0.750	-0.0246572 0.833	-0.0161872 0.890	0.1053711 0.384	0.0994406 0.389	-0.0895938 0.387	-0.0591907 0.557	-0.0633107 0.383	-0.0675956 0.310	0.2521995 0.022	0.2392959 0.026
Distance							0.1483887 0.0008042	0.1403877 0.0004451						

(a) General model.
(b) Model with significant coefficients; also includes economic and deterrence variables, irrespective of statistical significance.
Given the functional form, the marginal effect of *lncrimprov* is the coefficient of the supply of crime.

(Original: Spanish)

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