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Identifying the Socioeconomic Determinants of Crime across Spanish Provinces

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Abstract

In this paper we study, having as theoretical reference the economic model of crime (Becker, 1968; Ehrlich, 1973), which are the socioeconomic and demographic determinants of crime in Spain paying attention on the role of provincial peculiarities. We estimate a crime equation using a panel dataset of Spanish provinces (NUTS3) for the period 1993 to 1999 employing the GMM-system estimator. Empirical results suggest that lagged crime rate and clear-up rate are correlated to all typologies of crime rate considered. Property crimes are better explained by socioeconomic variables (GDP per capita, GDP growth rate and percentage of population with high school and university degree), while demographic factors reveal important and significant influences, in particular for crimes against the person. These results are obtained using an instrumental variable approach that takes advantage of the dynamic properties of our dataset to control for both measurement errors in crime data and joint endogeneity of the explanatory variables.

Key words: Crime; Socioeconomic factors; Demographics; Panel Data.
JEL Classification: I2; J24; K42

Resumen

Este trabajo estudia, teniendo como referencia teórica el modelo económico del crimen (Becker, 1968; Ehrlich, 1973), cuáles son los determinantes socioeconómicos del crimen en España, prestando especial atención a las peculiaridades provinciales. Estimamos una ecuación de los determinantes del crimen usando el estimador GMM-system para los datos de panel de las provincias españolas durante el periodo 1993-1999. Los resultados empíricos sugieren que la tasa de crimen retardada y la tasa de crímenes esclarecidos están correlacionadas con todas las tipologías de crímenes consideradas. Los crímenes contra la propiedad parecen estar mejor explicados por variables socioeconómicas (PIB per capita, crecimiento del PIB y porcentaje de la población con estudios medios y superiores), mientras que los factores demográficos revelan influencias importantes y significativas para los crímenes contra las personas. Estos resultados se obtienen utilizando variables instruméntales que aprovechan las propiedades dinámicas de los datos para controlar los errores de medida en los datos criminales y la posible endogeneidad de las variables explicativas.

Palabras clave: Crimen; Factores socioeconómicos; Factores demográficos; Datos de panel.
Clasificación JEL: I2; J24; K42

1. Introduction

During the last three decades the economics of crime has become a new field for economic investigation, in particular due to the fact that over the same period of time there has been an outstanding increase in criminal activities in many western countries, as confirmed by several empirical studies. The large majority of empirical studies consider common law countries: United States (Ehrlich, 1973; Freeman, 1996; Glaeser, 1999, Grogger, 1995 and 1998; Lochner, 2004) and United Kingdom (Wolpin, 1978; Machin and Meghir, 2000), even if during the last five years a growing number of works analyzes the determinants of crime for European countries such as Germany (Entorf and Spenger, 2000) and Italy (Marselli and Vannini, 1997; Buonanno and Leonida, 2005) or for Latin American countries: Colombia (Gaviria, 2000) or Argentina (Garcette, 2004).

The economics literature on crime sprung from the seminal contribution by Becker (1968) and Ehrlich (1973). In 1968 Becker presents a paper that radically changes the way of thinking about criminal behaviour. Becker builds the first model of criminal choice, stressing that “some individuals become criminals because of the financial and other rewards from crime compared to legal work, taking account of the likelihood of apprehension and conviction, and the severity of punishment” (p. 176). Criminal choice is not determined by mental illness or bad attitudes, but it is made on the basis of a maximization problem in which agents compare the costs and the benefits of legal and illegal activities taking into account the probability of being arrested and punished and the expected returns from crime.

Since the beginning of 80s, Becker's paper opens the door to a new field of empirical research whose main purpose is to verify and study the socioeconomic variables that affect crime. The economics of crime interacts with different and

heterogeneous fields (i.e. sociology, criminology, psychology, geography and demography) and it is closely related to poverty, social exclusion, wage and income inequality, cultural and family background, level of education and other economic and sociodemographic factors that may affect individual's propensity to commit crimes such as age, gender and urbanization.

Despite this evidence and a growing concern about the relationship between crime and socioeconomic and demographic variables, Spain's criminal activity has received little attention and remains largely neglected by the economics of crime literature,[1] while it exists an increasing concern in society about crimes, partly motivated by the spectacular increase in gender violence over the last years.

Hence, the objective of this paper is to study the socioeconomic and sociodemographic determinants of crime for Spanish provinces. Having as theoretical reference the economic model of crime (Becker, 1968; Ehrlich, 1973), we test which are the socio-economic determinants of crime in Spain paying attention on the role of provincial peculiarities. In particular, we use panel data techniques for 46 Spanish provinces over the period 1993 to 1999.[2]

Our paper differs from the existing literature in four ways. First, to our knowledge is the first paper on crime determinants in Spain that uses provincial data, this allows us to better capture the nature of crime given that criminal activities are related to a specific area and its characteristics.[3] Second, we explicitly consider in our analysis demographic and urban factors. After controlling for GDP and other economic variables, we are able to isolate the "pure" effect of variables such as age, gender and urbanization. Furthermore, we analyze whether and to which extent immigrants could be related to crime, as

[1] Although using a completely different approach, Rodríguez Andrés (2003) and Bandrés and Diez-Ticio (1998) represent few notable exceptions.
[2] See the data section for more details on the time span and the provinces finally chosen.
[3] For instance, the activities of police forces in Spain are organized at a provincial level.

this is a perception shared by part of society.[4] Third, we explicitly account for dynamics in criminal activities. We estimate a dynamic model of provincial crime rates using a Generalized Method of Moments (GMM) methodology. This allows us to control for unobserved province-specific effects, the joint endogeneity of some of the explanatory variables of crime, and the existence of measurement errors afflicting in particular the crime data. Controlling for joint endogeneity is extremely important in order to obtain consistent estimates of the effect of socioeconomic and demographic variables on crime rates. Finally, the use of panel data allows us to control for the effect of unobserved variables that can be considered as province-specific effects, as systematic measurement errors of crime rate. By controlling for these specific effects, we are able to reduce the estimation bias due to the underreporting of crime. Fourth, differently from previous studies on crime in Spain that use the overall crime rate to measure the level of criminal activity, we separate the crime measure into two broad crime types: property crimes and crimes against the person. Furthermore, by using the classification of Spanish Home Office (Ministerio del Interior, MIR), we are even able to separate the crime measure in serious crimes (called "*delitos*") and in minor crimes (called "*faltas*"). This approach allows us to avoid aggregation bias, as stressed by Cherry and List (2002) "it is inappropriate to pool crime types into a single decision model...much of the existing empirical estimates suffers from aggregation bias" (p. 81).

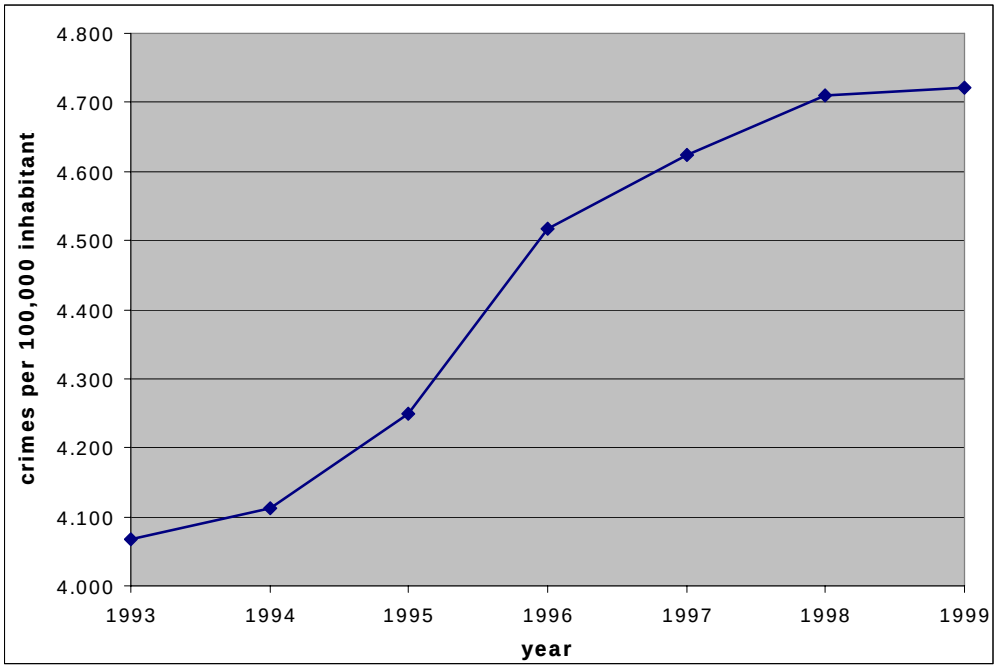
The rest of the paper is organized as follows. Section 2 outlines the main characteristics of crime rates in Spain. Section 3 presents our dataset and discusses the potential factors of crime. After illustrating the empirical procedure in Section 4, results are reported and interpreted in Section 5. Finally, Section 6 concludes.

[4] For instance, the European Popular Party states, in its political program referring to EU policies, the need to increase protection of European citizens using common policies in fields such as immigration, right of asylum and help for refugees to effectively combat cross-border crime and terrorism at European level.

2. A few stylized facts about Spain's crime rates

In 1996, 1.48 millions crimes were recorded by Spanish police. On the basis of the latest official statistics, the trend of crime in Spain can be depicted as in Figure 1. Over the period 1993-1999 Spain has experienced a steadily and sharply increase in the total crime rate passing from 4 to 4.7 offences per 100 inhabitants.

Figure 1 - Total crime rates in Spain (1993-1999)



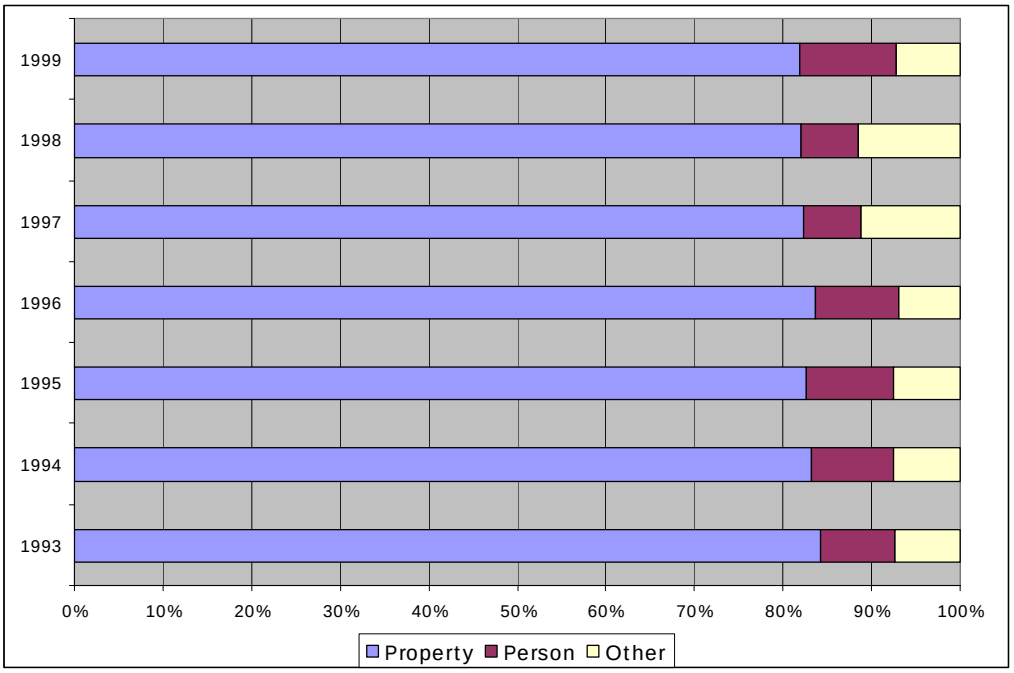
Note: Own elaboration using data from the Spanish Home Office (MIR).

The bulk of crimes are offences against property that account for more than 80% of all crimes, while crimes against the person represent almost 10% of total crimes as depicted in Figure 2.

Table 1 shows the clear-up rates, defined as the ratio of the number of crimes cleared by police to the total number of crimes reported, for both property crimes and crimes against the person. In 1993 the clearance rate for property crimes was 13.4% and increased to 15% in 1999, also the clear-up rate

for crimes against the person shows an increasing trend passing from 74.7% in 1993 to 85% in 1999.

Figure 2 - Composition of crime rates by typology of crime



Note: Own elaboration using data from the Spanish Home Office (MIR).

Table 1 - Clear-up rates (1993-1999)

	Total crime	Property crime	Crime against Person
1993	23.94%	13.44%	74.72%
1994	24.40%	13.18%	76.02%
1995	25.68%	13.93%	79.05%
1996	25.42%	14.22%	79.97%
1997	26.94%	14.60%	81.85%
1998	27.23%	14.45%	83.28%
1999	28.06%	15.06%	85.02%

Note: Own elaboration using data from the Spanish Home Office (MIR).

Following the classification from MIR we distinguish between two types of crimes. First, those crimes that can imply severe penalties (for instance, prison) for the offender: called "*delitos*" (hereafter serious crimes); second, those crimes that can imply a less severe penalty (payment of fines, etc): called "*faltas*" (hereafter minor crimes). The different nature of both types of crimes seems to

indicate that the study of the determinants of crime should be done for both types separately, as we do in our analysis. Table 2 presents the incidence of serious crimes and minor crimes on the overall number of crimes (defined as the sum of serious crimes and minor crimes) over the period 1993 to 1999. It is extremely interesting to notice that for which concerns crimes against the person the incidence of minor crimes is around 90%, while for property crimes the percentage of serious crimes on the total was more than 60% in 1993 but decreased to 53% in 1999; the same holds for total crimes.

Table 2 – Serious crimes (*delitos*) and minor crimes (*faltas*)

	Overall Crimes			**Property Crimes**			**Crimes against the person**		
	Delitos + Faltas	%Delitos	%Faltas	Delitos + Faltas	%Delitos	%Faltas	Delitos + Faltas	%Delitos	%Faltas
1993	1,484,152	60.68%	39.32%	1,249,967	62.40%	37.60%	124,003	11.65%	88.35%
1994	1,504,104	57.67%	42.33%	1,250,637	59.53%	40.47%	140,711	10.19%	89.81%
1995	1,557,216	56.65%	43.35%	1,287,151	58.87%	41.13%	153,637	8.23%	91.77%
1996	1,659,255	54.86%	45.14%	1,388,831	56.67%	43.33%	155,188	8.21%	91.79%
1997	1,702,943	53.48%	46.52%	1,401,292	55.66%	44.34%	112,251	13.01%	86.99%
1998	1,741,614	52.14%	47.86%	1,427,488	54.08%	45.92%	115,201	14.87%	85.13%
1999	1,756,496	51.68%	48.32%	1,439,203	53.75%	46.25%	189,317	9.48%	90.52%

Note: Own elaboration using data from the Spanish Home Office.

3. Data and potential factors of crime

In this section we provide an extensive discussion about the data used in our empirical analysis and about the potential determinants of crime. Our panel dataset comprises annual observations from 46 Spanish provinces (NUTS3)[5] over the period 1993 to 1999. Crime data, that represent the dependent variable,

[5] Spain has 52 provinces. We do not include in our sample the three provinces of the Basque Country (Álava, Guipúzcoa and Vizcaya) and Girona (Catalunya) because the existence of its own police forces and, therefore, crime figures in those provinces are not included in the official data base of the Spanish Home Office. We also exclude the autonomous Spanish cities in North Africa (Ceuta and Melilla) because of lack of information for many of the variables used in this study.

are taken from Home Office Statistics. We use the number of total crimes, the number of total crimes against property and against the person normalized by population, taken from Spanish Statistics Bureau (INE). Furthermore, as discussed in the previous section, in the second part of our empirical analysis, we distinguish between serious crimes and minor crimes.

The explanatory variables are separated into three groups: deterrence variables, sociodemographic variables and socioeconomic variables.

Deterrence variables (i.e clear-up rate, probability of apprehension and severity of punishment) determine the expected returns from crime. The deterrence variable used is the clear-up rate (*Clear-up*) since this is the only deterrence variable for Spain available at provincial level. The clearance rate for each offence group was obtained from MIR.

We include three demographic variables in our analysis that are likely to be correlated with crime. These variables, taken from INE, are: the percentage of men aged 15-29 years (*YMale*), the share of population living in provincial capital (*Capital*) and the share of foreigners (*Foreign*). Young men are said to be more prone to engage in criminal activities than the rest of the population, this means that the participation to crime is higher at the initial stage of adulthood. (Freeman, 1991; Grogger, 1998). Recent studies (Entorf and Spengler, 2000; Entorf and Winker, 2001; Buonanno, 2005) have included the percentage of foreigners as a possible determinant of crime. In particular, illegal immigrants are more likely to be engaged in crime because they are not eligible for regular works. Due to the fact that data on irregular immigrants are not available we use the percentage of legal immigrants to proxy the phenomenon. We also consider the share of population living in provincial capital. It is well documented that there is more crime in big cities compared to small cities or rural areas (Glaeser and Sacerdote, 1999). In particular, returns form crime may be higher and the probability of arrest may be lower in urban areas.

We complete our dataset by including a set of socioeconomic variables: the GDP per capita at 1995 constant prices (*GDP*) taken from INE, the growth rate in the GDP (*Growth*) taken from INE, the unemployment rate (*Unemp*) taken from INE and the share of population with high school and university degree (*Edu*) taken from IVIE (Instituto Valenciano de Investigaciones Economicas). Following the analysis made by Ehrlich (1973) we can consider the GDP per capita and the growth rate of the GDP as proxies for the general level of prosperity in the provinces, then as indicators of illegal income opportunities. An other economic factor that affects crime is unemployment. It exists the general belief that unemployment and crime are positively correlated. The existence of a casual link between unemployment and crime has been widely investigated in the past, even if the strength of this relationship remains ambiguous both in its nature and in its robustness. If legal income opportunities are less lucrative than potential gains from crime activity, individuals will be more prone to be engaged in crime. Since unemployment may reduce legal returns from work, it could exist a substitution effect that induces agents to commit more crime. From a pure theoretical perspective unemployment may be a determinant of crime, but the existing empirical literature fails to reach a consensus on the relationship between unemployment and crime, see Chiricos (1987), Freeman (1999) and Masciandaro (1999) for a complete review of the empirical literature.

Education may affect the decision to engage in criminal activities through several channels. First, higher levels of educational attainment are associated with higher returns in the labour market, increasing the opportunity cost of criminal behaviour. Second, education may alter personal preferences in a way that affects decisions to engage in crime. In particular education may have a sort of “civilization” effect. Fajnzylber et al. (2002) suggest that education, incorporating a civic component, may increase the individual's moral stance, and then affect the individuals’ perception of crime. Usher (1997) stresses that

education perpetuates the values of society, enculturates people to serve their communities, and promotes the virtues of hard work and honesty. Furthermore, as noted by Lochner and Moretti (2004) schooling generates benefits beyond the private return received by individual. Finally, education also increases the cost associated with incarceration, since more educated individuals will experience greater losses in earnings while in jail.

Finally, we consider dynamics in delinquency. In fact, past experience in criminal activity affects in several ways the decision to commit a crime (Sah, 1991; Glaeser et al., 1996; Fajnzylber et al., 2002); in other words, higher crime today is associated with higher crime tomorrow (i.e. persistence over time). Criminals can learn-by-doing and acquire an adequate criminal know-how level; this acquisition, in turn, makes the costs of carrying out criminal acts to decrease over time (Case and Katz, 1991). Convicted criminals have fewer opportunities of legal employment and a lower expected wage (Grogger, 1995). These arguments strongly suggest the possibility of criminal hysteresis or inertia.

4. The Empirical procedure

Starting from the theoretical framework, based on Becker (1968) and Ehrlich (1973), we propose a dynamic panel data econometric model to test the hypothesis of the economic model of crime (ECM) for Spanish provinces. The econometric specification of our empirical model, that we use to analyze the socioeconomic and demographic determinants of crime, is the following:

$$CRIME_{i,t} = \eta_i + \eta_t + CRIME_{i,t-1} + \beta X_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where the subscripts i and t represent province and time period, respectively; η_i is a province fixed effect, η_t is a time effect, $X_{i,t}$ is the set of explanatory variables defined in the previous section and $\varepsilon_{i,t}$ is the error term.

From an econometric perspective, there are several estimation problems that may arise in estimating these empirical models. First, using a panel data set it is well-known that OLS coefficients are biased both in the case that unobservable province-specific effects (η_i) are statistically significant, and in the case that regressors and these effects are correlated. Second, as discussed in the previous section, there exists a significant relationship between crime rates in *t* and *t-1*; for this reason, we include the lagged dependent variable ($CRIME_{i,t-1}$) in our empirical model. In such a framework, OLS results in inconsistent estimates since $CRIME_{i,t-1}$ and η_i are necessarily correlated, even if the idiosyncratic component of the error term is serially uncorrelated. An obvious solution to these problems is to eliminate the term η_i by taking first-differences. However, OLS still does not consistently estimate the parameters of interest because first-differencing introduces correlation between the lagged dependent variable and differenced error terms, i.e. $CRIME_{i,t-1}$ and $\varepsilon_{i,t}$ are correlated trough the terms $CRIME_{i,t-1}$ and $\varepsilon_{i,t-1}$. The alternative to first differences transformation is the within transformation; however, and although controlling for fixed effects, the within transformation leads to consistent estimates only under the hypothesis of strictly exogenous regressors. Third, it is unlikely that explanatory variables are strictly exogenous; the relationship between crime rates and their determinants is often characterized by a two-way causality. Fourth, it is very likely that crime data may be subject to measurement errors, which induce biases in the estimates.

The econometric problems presented above suggest the use of an instrumental variables procedure applied to a dynamic model of panel data. This paper therefore employs the GMM estimator that uses the dynamic properties of the data to generate proper instrumental variables (Arellano and Bond, 1991; Arellano and Bover, 1995). The GMM technique allows to control for (weak) endogeneity by using the instrumental variables, which consist of appropriate lagged values of the explanatory variables. To deal with the fact that measurement errors are likely to be determined not only by random errors but by

specific and persistent characteristics of each province we employ the GMM-system estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) which joins into a single system the regression equation in both differences and levels.

The consistency of the parameters obtained by means of the GMM estimator depends crucially on the validity of the instruments. We therefore consider two specification tests suggested by Arellano and Bond (1991) and Arellano and Bover (1995). The first test is the Sargan test of overidentifying restrictions, which tests the null hypothesis of overall validity of the instruments used. Failure to reject this null hypothesis gives support to the choice of the instruments. We also report the test for serial correlation of the error term, which tests the null hypothesis that the differenced error term is first and second order serially correlated. Failure to reject the null hypothesis of no second-order serial correlation implies that the original error term is serially uncorrelated and the moment conditions are correctly specified.

5. Results

The results obtained from the regressions are presented in table 3 to table 5. Table 3 shows GMM estimates for the set of determinants of the overall number of criminal offences, defined as the sum of serious crimes and minor crimes, for each category of crime (property crime, crime against the person and total crime), while table 4 and 5 show GMM estimates for the same categories but differentiating between serious crimes (*delitos*) and minor crimes (*faltas*), respectively.

The first column of each table provides the results for crimes against the person, the second column for property crimes, while the third one for total crimes. Four test statistics are reported: (i) the Wald test of joint significance of

the time dummies; (ii) Sargan test of overidentifying restrictions; (iii) and (iv) first and second order serial correlation test.

From the analysis of the results presented in table 3 emerges that the lagged crime rate, the percentage of males aged 15-29 and the clear-up rate have significant coefficients with the expected signs for all typologies of crimes considered (person, property and total). The unemployment rate also appears to be significantly correlated with crime rates but in a negative way. This result, even if not expected, is not surprising since the strength of the relationship between unemployment and crime is ambiguous both in its nature and in its robustness, as widely discussed in the previous section. The percentage of foreigners and the share of population living in provincial capital are not significant even if they display the expected signs.

With regard to the GMM specification adopted all regression models are supported by the Sargan test, thus confirms that the instruments used are valid (i.e. the instruments used are not correlated with the error terms). As expected there is evidence for first-order serial correlation, while there is no evidence of second-order serial correlation, although for some models this test is significant but at a 90% level. Finally, time dummies are jointly significant in all the models estimated.

As previously noticed, the significance of the lagged value of crime rate in all the estimated models indicates that the dynamic specification used is appropriate, giving evidence that there exists a persistence of crime over time in Spanish provinces.

In the GMM estimates for property crime, the share of population with high school and university degree, the GDP per capita and the growth rate have significant coefficients with the expected sings. In our opinion this is due to the fact this typology of crime is more likely to depend on economic motivations than crime against the person or total crimes.

Table 3 – GMM estimates: Overall Crimes (Serious Crimes + Minor Crimes)

	PERSON	PROPERTY	TOTAL
$Crime_{t-1}$	0.5949	0.7725	0.8016
	(7.98)***	(11.5)***	(12.0)***
Foreign	0.0230	0.0486	0.0763
	(1.43)	(0.964)	(1.29)
Capital	0.0007	0.0021	-0.0039
	(0.723)	(0.668)	(-0.922)
YMale	0.0215	0.1422	0.1786
	(2.54)**	(2.72)***	(3.38)***
Edu	-0.0043	-0.0287	-0.0168
	(-1.44)	(-2.94)**	(-1.29)
GDP	0.0002	0.0003	0.0002
	(-0.733)	(1.95)*	(1.09)
Growth	0.0008	-0.0234	-0.0202
	(0.211)	(-2.06)**	(-1.61)*
Unemp	-0.0033	-0.0113	-0.0120
	(-2.37)**	(-1.70)*	(-1.65)*
Clear-up	-0.0001	-0.0299	-0.0140
	(-0.103)	(-5.81)***	(-1.89)*
Wald (time)	0.000**	0.000**	0.000**
Specification tests			
Sargan test	0.229	0.451	0.459
Serial correlation			
AR(1) test	0.358	0.004**	0.000**
AR(2) test	0.052	0.017*	0.162

Note: First Order and Second Order Test are test statistics for first and second order autocorrelations in residuals, respectively, distributed as standard normal N(0,1) under the null hypothesis of no serial correlation. Sargan test is a test of overidentifying restrictions, distributed as chi-square under the null hypothesis of validity of instruments. T-values are reported in parentheses. Standard errors are robust to heteroskedasticity and autocorrelation (Arellano, 1987). ***, ** and * indicate coefficient significant at the 1%, 5% and 10% levels, respectively.. Estimations performed using GMM-system procedure combining transformed and level instruments. Variables instrumented: Crime, Education, GDP per capita, Growth, Unemployment, Clear-up rate. Time dummies are used. Number of observations = 322. Time span: 1993-1999.

The results presented are partially confirmed when we take into account the difference between serious and minor crimes. As, widely discussed in the introduction pooling crime types into a single decision model may affect the

significance and the robustness of the results. Considering separately serious crimes from minor crimes allows us to avoid aggregation bias and to better analyze crime determinants.

Table 4 shows GMM estimates for serious crime. Lagged crime rate, percentage of males aged 15-29 and clear-up rate are significant and with the expected sign for serious property crimes and serious total crimes, while in the case of serious crimes against the person only lagged crime rate is significant. Serious total crime rate is significant and positively affected by the percentage of foreigners, as crimes against the person, and negatively by the GDP growth rate. Serious crimes against the person are even negatively and significantly correlated to the variable used to proxy education. The results for serious property crimes confirm that the socioeconomic factors play an important role for this typology of crime: GDP per capita, GDP growth rate and the share of population with high school and university degree are significant and with the expected signs. Unemployment is not significant for all the typologies of crime considered, this result, which differs from the previous estimate, confirms the frailty of the relationship between crime and unemployment.

Finally, for minor crimes, (table 5), we obtain similar results to the previous models, indicating the robustness of the relationships between crime and its socioeconomic and demographic determinants. As presented in Section 3, minor crimes against the person account for more than 90% of the overall number of crimes against the person for the period 1993 to 1999. Then disaggregating for minor crimes allows us to better determine which factors are related to this typology of crime. Lagged crime rates and clear-up rates have significant coefficients with the expected signs. Percentage of foreigners and males aged 15-29 are significantly and negatively correlated to minor crimes against the person, while share of population living in provincial capital has a positive and significant sign, as expected. These results confirm that demographic and deterrence determinants appear to be strongly correlated to

crimes against the person, while property crimes are better explained by socioeconomic factors.

Table 4 – GMM estimates: Serious Crimes

	PERSON	PROPERTY	TOTAL
$Crime_{t-1}$	0.450	0.766	0.811
	(5.50)***	(14.8)***	(22.2)***
Foreign	0.009	0.029	0.065
	(5.98)***	(0.896)	(2.72)**
Capital	0.0001	0.001	-0.001
	(0.045)	(0.636)	(-0.514)
YMale	0.0004	0.127	0.078
	(0.226)	(3.48)***	(2.28)**
Edu	-0.001	-0.015	-0.007
	(-1.77)*	(-2.13)**	(-0.922)
GDP	0.0001	0.0002	0.0001
	(-0.215)	(2.26)**	(0.708)
Growth	0.0002	-0.020	-0.017
	(0.486)	(-3.02)**	(-2.37)**
Unemp	-0.003	-0.004	-0.002
	(-0.762)	(-0.949)	(-0.722)
Clear-up	-0.0005	-0.013	-0.007
	(-1.37)	(-3.79)***	(-2.08)**
Wald (time)	0.000 **	0.000**	0.000**
Specification tests			
Sargan test	0.974	0.951	0.461
Serial correlation			
AR(1) test	0.017*	0.001**	0.000**
AR(2) test	0.113	0.011*	0.014*

Note: See notes to table 3.

Summarizing, the main results are as follows. First, crime rates display persistence over time. The coefficient of the lagged dependent variables is between 0.5 and 0.8, confirming that crime rates show a sizeable degree of inertia. In particular, total crime rate show a bigger degree of inertia compared to property crime and crime against the person.

Second, the clear-up rate is negatively and significantly correlated to crime rates. This variable allows us to capture the effect of deterrence and law enforcement, a higher level of crime cleared by police is associated with lower expected returns from crime.

Table 5 – GMM Estimates: Minor Crimes

	PERSON	PROPERTY	TOTAL
$Crime_{t-1}$	0.584	0.722	0.671
	(8.09)***	(7.67)***	(7.05)***
Foreign	-2.94	0.017	0.058
	(-2.82)***	(0.415)	(1.12)
Capital	0.179	0.001	0.0002
	(2.02)**	(0.648)	(0.069)
YMale	-1.617	0.083	0.099
	(-1.71)*	(2.27)**	(2.49)**
Edu	-0.166	-0.014	-0.008
	(-0.703)	(-1.55)	(-0.753)
GDP	-0.006	0.0003	0.00003
	(-1.95)*	(2.00)**	(0.224)
Growth	0.299	-0.008	-0.005
	(1.12)	(-1.06)	(-0.657)
Unemp	-0.035	-0.011	-0.012
	(-0.278)	(-2.25)**	(-2.41)**
Clear-up	-0.160	-0.004	-0.009
	(-1.66)*	(-4.18)***	(-3.34)***
Wald (time)	0.000**	0.000**	0.000**
Specification tests			
Sargan test	0.981	0.948	0.967
Serial correlation			
AR(1) test	0.039*	0.012*	0.001*
AR(2) test	0.296	0.085	0.410

Note: See notes to table 3.

Third, property crimes are better explained by socioeconomic variables (GDP per capita, GDP growth rate and percentage of population with high school and university degree), since this type of crime is more likely to be motivated by economic reasons than crimes against the person or total crimes.

Instead, crimes against the person and in particular minor crimes are strongly correlated to sociodemographic factors.

Finally, our results are robust to different measures of crime and empirical specification.

6. Conclusions

In this paper, we estimate a crime equation using a panel dataset of Spanish provinces for the period 1993 to 1999, employing the GMM-system estimator. Our analysis differs from previous studies of crime determinants in Spain for several reasons: 1) we use a provincial dataset; 2) we explicitly consider in our analysis demographic and urban factors; 3) we explicitly account for dynamics in criminal activities and 4) instead of using the overall crime rate to measure the level of criminal activity, we separate the crime measure into property crimes and crimes against the person and in serious crimes (called "*delitos*") and in minor crimes (called "*faltas*").

Our analysis better performs for property crimes, that are more likely to depend on economic motivations than crimes against the person or total crimes; while only weak support can be observed for crimes against the person, that seem to be more correlated to sociodemographic factors.

The main conclusions of this paper are that all the crime rates considered display persistence over time, implying that the incidence of crime appears to have inertial properties; the deterrence variable used (clear-up rate) is significant and negatively correlated to crime rate and the share of males aged 15-29 positively affects the crime rates.

Economic variables that are used to capture legal and illegal opportunities (GDP per capita, GDP growth rate and percentage of population with high school and university degree) perform as expected for property crimes.

Demographic factors reveal important and significant influences, in particular for crimes against the person. Furthermore, our analysis confirms the ambiguous relationship between crime and unemployment, while there is no clear evidence that the share of foreigners and the urbanization rate are positively associated to crime, apart from minor crimes against the person.

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