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UNEMPLOYMENT, INEQUALITY, POVERTY AND CRIME

Spatial Distribution Patterns of Criminal Acts in Belgium, 2001–06

MARC HOOGHE*, BRAM VANHOUTTE, WIM HARDYNS and TUBA BIRCAN

Previous research has indicated that various deprivation indicators have a positive impact on crime rates at the community level. In this article, we investigate the impact of deprivation indicators on crime in Belgian municipalities (n = 589) for the period 2001–06. A spatial regression analysis demonstrates that unemployment figures have a strong and significant impact on crime rates, and this effect is stronger than the effect of income levels. Income inequality has a significant positive impact on property crime rates but a negative impact on violent crime. Crime is heavily concentrated in the urban centres of Belgium, but we also observe some important regional variations. Demographic structure was not related to crime levels, while spatial analysis shows there is a spill-over effect to neighbouring communities for property crime, but not for violent crime. We close with some theoretical and policy considerations on the relation between unemployment and crime.

Keywords: geographical distribution, crime rates, Belgium, spatial analysis, unemployment, inequality

Introduction

Investigating spatial distribution patterns of crime is a continuing concern within criminology. Traditionally, it has been argued that economic deprivation and inequality are positively correlated to crime rates (Blau and Blau 1982; Messner 1982; O'Brien 1983; Williams 1984; Sampson 1985a). A concentration of poverty, a lack of resources and various indicators for social disorganization have all been invoked to explain a concentration of crime. Both from a theoretical as from a policy perspective, it is of crucial importance to determine in a more precise and reliable manner what kind of community characteristics have an effect on specific crime rates. The effort to determine what specific indicators of poverty, exclusion or inequality have the strongest impact on crime rates is hampered by the fact that most data thus far have been collected for specific areas in the United States or the United Kingdom. Most of the existing research is concentrated on metropolitan areas, and there are not that many studies available on rural crime (see, however, Bouffard and Muftic 2006; Osgood and Chambers 2000). Although most of the available data suggest that at least some forms of crime are heavily concentrated in urban areas, it is clear that if one wants to achieve a comprehensive understanding of the geographical distribution of all forms of crime, it is crucial to take into account crime data covering an entire territory, and not just one specific urban setting.

In this study, we offer new evidence on the relation between deprivation, inequality and crime, based on nationally collected crime figures in Belgium. Since the year 2001,

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the Belgian federal police collects these data in a uniform manner, which allows us to test the impact of economic indicators on crime rates at the community level. More specifically, we want to investigate whether unemployment, inequality or poverty can be regarded as the strongest predictor for crime rates. Our hypothesis in this analysis is that inequality has a stronger effect on crime rates than income levels (Blau and Blau 1982). We also pay special attention to the effects of unemployment. The experience of unemployment leads to a loss of income and thus to an increased risk of poverty, but, simultaneously, various studies have demonstrated other negative outcomes, like a weakening of social relations, a feeling of social isolation and the loss of a socially meaningful role in society (Lin 2008). High unemployment rates also provide incentives to perform all kinds of criminal acts (Arvanites and Defina 2006). Given all these negative consequences, it can be assumed that unemployment has a strong effect on crime, over and above the effect of poverty and inequality. While previous studies have shown that unemployment is positively associated with crime in countries with a conservative social security system (and thus restrictive rules on unemployment allocations), there is less evidence available on the effect of unemployment in countries with a more generous social security system. Since Belgium clearly belongs to this latter category (e.g. unemployment benefits are not restricted in time), we can assume that the Belgian data are especially relevant in this regard. If, even in a generous social security system like the Belgian system, unemployment would have a strong effect on crime, this would suggest that the experience of unemployment cannot be reduced to the effects of a substantial loss of income. Investigating the spatial distribution of crime in Belgium therefore allows us to shed new light on the ongoing theoretical discussion about the relation between unemployment and crime.

In this article, we first review the literature on the relation between economic deprivation, inequality and crime, before presenting our data and methods. Subsequently, we include a section on data and the appropriate model specification, before turning to the results of the analysis. We close with some observations on the implications of our findings for the study of the spatial distribution of criminal acts.

Deprivation and Unemployment

The study of the spatial distribution of crime rates can be seen as one of the oldest research questions within criminology (Pratt and Cullen 2005). Already, since the early days of the Chicago school, a concentration of economic disadvantage indicators was assumed to be a key element in the occurrence of crime (Park and Burgess 1924; Shaw and McKay 1942). In addition, in more recent research efforts, various authors have claimed that the quality of neighbourhood relations can be a key factor in explaining the concentration of crime and delinquency (Sampson *et al.* 1997). This line of research has clearly established that there tends to be a positive correlation between deprivation and crime rates. Within the literature, however, there is an ongoing dispute on the question what specific aspects of deprivation have the strongest effect on crime. It is clear, however, that in the study on the social ecology of crime, a distinction has to be made between different types of crime. Usually, a general distinction is made between property crimes, which are offences against the property of a person or household, and violent crimes, which are offences against the physical integrity of a person. This theoretical distinction is partly motivated by the fact that different structural and social conditions

are responsible for the unequal spatial distribution of both types of crime. Property crimes are often associated with a high level of relative deprivation, while violent crimes are associated with high levels of population density (Field 1990; Wilkinson *et al.* 1998). In this review of the literature, we very briefly summarize the main strands in this line of research for both types of crime.

In most of the literature, a positive correlation is suggested between poverty and violent crime rates. This relation has been demonstrated for assault (Harries 1976; Crutchfield *et al.* 1982) and robbery (Sampson and Groves 1989). In the United States, homicide, too, has been found to be concentrated in poor regions, but this finding has not been repeated outside a US context (Kposowa *et al.* 1995; Kovandzic *et al.* 1998; Messner 2001; McCall and Nieuwebeerta 2007; Pridemore 2008).

Despite these findings, there is still an ongoing controversy about the nature of the causal relations involved (Rosenfeld and Fornango 2007). Patterson (1991) has claimed that the relation between poverty and crime rates should be considered as spurious: once adequate control variables are taken into account, there is no longer a significant relation between poverty and the occurrence of homicide, forcible rape or aggravated assault rates. Crutchfield *et al.* (1982), Messner (1983) and Sampson (1985*b*) question the positive relation between poverty and homicide, as they observe lower homicide rates in poor areas.

While there is some disagreement about the relation between poverty and violent crime, the evidence with regard to the relation between poverty and property crime is more consistent. All major studies demonstrate a positive relation between poverty levels and official rates of burglary, theft and motor vehicle theft (Sampson and Groves 1989; Kposowa *et al.* 1995; Ohlemacher 1995; Hope 2001; Hope *et al.* 2001; Edmark 2005; Oh 2005). In most studies, it can be observed that people in poorer areas suffer property crime most heavily (Trickett *et al.* 1992; 1995; Osborn *et al.* 1996; Ellingworth *et al.* 1997; Osborn and Tseloni 1998; Tseloni *et al.* 2002). While residents of affluent neighbourhoods have means at their disposal to protect themselves from property crime, residents from poor neighbourhoods cannot afford this kind of private protection (Hope 2000).

Not only poverty is assumed to have an effect on crime rates, but also economic inequality. It can be argued that a strong degree of inequality between population groups leads to (feelings of) deprivation, or simply implies more opportunities for various forms of crime (Blau and Blau 1982; Wilson 1987). Deprivation theory assumes that high levels of inequality will lead to feelings of aversion, jealousy and anger among groups with low levels of resources (Neckerman and Torche 2007). As Blau and Blau (1982: 121–2) summarize the argument, ‘income inequality in a metropolis substantially raises its rate of criminal violence. Once economic inequality is controlled for, the positive relationship between poverty and criminal violence disappears Apparently the relative deprivation produced by much inequality rather than the absolute deprivation produced by much poverty provides the most fertile soil for criminal violence’. Both for violent crime as for property crime, studies have been able to demonstrate a positive relation between income inequality in a community and crime rates (Kennedy *et al.* 1998; Kawachi *et al.* 1999; Fajnzylber *et al.* 2002; Fowles and Merva 1996). Furthermore, it is assumed that feelings of aversion and deprivation will lead more easily to the occurrence of property crimes such as burglary and larceny (Deutsch *et al.* 1992; Chiu and Madden 1998; Kawachi *et al.* 1999). The relation has also been confirmed for homicide, although it should be noted that most of this evidence originates from United

States-based research (Simpson 1985; Rosenfeld 1986; Sampson 1986; Kennedy *et al.* 1998; Kovandzic *et al.* 1998; Fajnzylber *et al.* 2002; Pratt and Godsey 2003; Pickett *et al.* 2005; Chamlin and Cochran 2006; Jacobs and Richardson 2008). Only a limited number of studies question this positive relation between income inequality and crime rates (Land *et al.* 1990; Kennedy *et al.* 1998; Lee and Bankston 1999). Therefore, we can conclude that from the literature, we can expect a significant positive relation between both violent and property crime and economic inequality.

Within the recent literature, there is a quite intensive debate on the role of unemployment in explaining crime rates. Raphael and Winter-Ebmer (2001) have argued that unemployment is the main driving force behind the relation between (relative) poverty and property crime. Unemployment implies that actors will be more inclined towards a criminal career, while they are also structurally available for non-legal forms of activity. High unemployment rates among specific groups in society might also be associated with social alienation and feelings of envy. In a recent article, Lin (2008) relies on new statistical methods to argue that the effect of unemployment on property crime rates is much larger than was earlier assumed. Both studies do not find effects of unemployment on violent crime rates.

The fact that we find strong relations between poverty indicators and crime rates does not inform us yet about the causal mechanism that might be responsible for this relation. As Sampson (2002: 216) argues, the central question is ‘why does concentrated poverty, which is after all the concentration of poor *people*, matter?’. We can assume that economic disadvantage and social exclusion have a harmful impact on the social organization of a community, as they erode networks of solidarity and trust (Sampson and Morenoff 2004). These processes, in turn, reduce the collective efficacy of a local community, as they prevent the community from maintaining a high level of social control. The available data for the Belgian case do not allow us to fully investigate these causal mechanisms. The police records that we will rely on only contain information on the place where the crime took place, not about the place where the perpetrator (if known) resides. Since we lack information on who committed the crime, one should proceed very carefully in constructing a causal claim. If one, for example, finds a positive relation between crime rates and poverty, this does not imply yet that poverty leads to criminal behaviour on the individual level. Another possibility is that poor groups of the population are structurally vulnerable for victimization, whether these acts are committed by fellow inhabitants of the community or by others, as has been illustrated by the results of the British Crime Survey (e.g. Trickett *et al.* 1995; Hope 2001).

For the time being, we will limit ourselves to the analysis of the relation between economic indicators and crime rates, without further speculation on the causal mechanism that might be involved. By relying on national community-level data, including both urban and rural areas, our aim is to arrive at a more comprehensive understanding of the spatial distribution of criminal acts, with an emphasis on the effects of poverty, inequality and unemployment.

Hypotheses

This overview of the literature allows us to derive a number of hypotheses. More specifically, we will address the concern that high levels of poverty, unemployment and

income inequality are responsible for high crime levels, also in a context with a rather generous social security system.

The hypotheses to be tested in this article are rather straightforward:

- H1. Property crime rates will be higher in communities with high levels of poverty.
- H2. Both violent and property crime rates will be higher in communities with high levels of income inequality.
- H3. Property crime rates will be higher in communities with high unemployment figures.

All three hypotheses will be tested in order to assess which one of these three independent variables (poverty, income inequality or unemployment) is most strongly associated with the level of reported crime acts within a community.

Data and Methods

In this article, we rely on crime data for the entire territory of Belgium for the period 2001–06. Although the number of unreported or unregistered crime remains a crucial problem in any analysis of crime rates (Tarling and Morris 2010), we can be confident that these data offer a reliable image of registered crime in Belgium. Although we have to be extremely cautious in comparing crime rates across countries, there is no indication that Belgium would offer an exceptional case, compared to other countries in Western Europe (Newman 1999).

Since 2001, a uniform crime-recording protocol has been used by the Belgian police force, and this has led to a reliable measurement of registered crime in the country. Since we want to determine a more general pattern and in order to cancel out yearly fluctuations, we opt for a six-year average (2001–06) as a dependent variable.¹ Belgium is a relatively small country in Western Europe, with a population of 10,540,000 inhabitants. The country is divided into 589 municipalities, with on average 17,900 inhabitants (median value: 11,500). The municipality, therefore, can be considered not only as a relevant political and administrative unit; we can also claim that the average scale of a municipality still allows for a feeling of ‘community’ among the inhabitants of that municipality. The general assumption in this line of research is that the geographical unit should be as small as possible (Weisburd *et al.* 2009) and, in this specific case, the municipality is the smallest geographical unit for which reliable data are available. Most studies on the spatial distribution of crime focus only on metropolitan or urban areas. Since our data were collected across the entire territory of a country, we have access to data from both rural and urban areas. Rural crime is generally understudied in criminology, but it is safe to assume that crime rates will be dramatically lower in rural areas than in the urban regions of Belgium (Hardyns 2010; Wells and Weisheit 2004).

In line with the literature, we will introduce a distinction between violent crime and property crime (Wikström 1991; Byrne 1986). Since homicide levels are rather low in Belgium, this form of crime had to be excluded from the analysis.² In the Belgian police

¹It has to be observed that correlations over the years are very strong (ranging from 0.86 to 0.93 for property crime and from 0.73 to 0.89 for violent crime), indicating that differences between municipalities remain very stable over the six observation years.

²Basically, the number of homicides is approximately 300 per year, while there are 589 communities. There are too many empty cells therefore to conduct a meaningful analysis.

records, and in accordance with the Belgian criminal code, violent crime refers to the acts of ‘intentional assault and battery’ and ‘destruction and damaging’. Property crime refers to theft from motor vehicles, stealing motor vehicles, ‘vandalism’ (whether aimed at cars or other material goods) and burglary. Although these two crime measurements are correlated, both theoretically and empirically, it makes sense to distinguish them in the analysis. It is believed that these different kinds of crimes will have different patterns of geographical concentration (Byrne 1986; Field 1990; Kawachi *et al.* 1999; Wilkinson *et al.* 1998).

While the police records only contain information on the absolute number of these offences, for our analysis, we constructed crime rates for every municipality, which are calculated as:

$$CR_{it} = [a_{it}/u_{it}] * 1000,$$

where CR is the crime rate, t is the year, i the municipality, a is the number of crimes recorded and u is the population of the municipality.

At this moment, data are available for the years 2001–06. Since we have only six observations, we cannot conduct a reliable trend analysis. We use the averaged annual crime rate for every municipality over this period. For every single year, the crime rate has been calculated using the population figure for that specific year.

Figure 1 illustrates the evolution of the mean of different crime rates on the country level across the observation period. The violent crime rate proves to be relatively stable with on average eight crimes registered per 1,000 inhabitants. Property crime rates on the other hand seem to have dropped slightly from, on average, 28 crimes per 1,000 inhabitants in 2002 to around 22 property crimes per 1,000 inhabitants. The explanation for this trend is a substantial reduction in motor vehicle theft and theft from motor vehicles in the areas where these crimes were most prevalent. The correlation between the yearly observations at the municipality level is very high (well above 0.73 for all types of crime), indicating that areas with high crime rates in one observation year also had high rates in the other years. This makes us confident that analysing the six-year average makes it possible to make robust and reliable conclusions on the occurrence of both types of crime. This also allows us to reach more robust conclusion, since we can eliminate the possibility that our results would be influenced by yearly random fluctuations.

FIG. 1 Evolution of crime rates in Belgium, 2001–06

Reported and registered crimes in Belgium, 2001–06/1,000 inhabitants. Source: Belgian Federal Police, Operational Police Information.

To explain differences at the local level, some variance in crime rates is needed. If we plot the average property crime rate for the period 2001–06 on a map of the Belgian municipalities (Figure 2), we can observe strong variations. The highest rates are recorded in the central area of the capital, Brussels, with also high rates in the area reaching north to the port of Antwerp, south to the city of Charleroi and east to the city of Liège. The rural areas in the north-east and the north-west of the country, on the other hand, typically show low rates of property crime.

For violent crime rates, the pattern of spatial distribution is different (Figure 3). Again, we find the highest rates in the main cities, but contrary to property crime, these high figures do not seem clustered in the central urban area of Belgium. Violent crime also occurs more often in the rather rural municipalities of the southern, French-speaking part of the country. The municipalities in the upper north-western part of the country are all seaside resorts, lining the North Sea coast. During the summer season, the original population of these municipalities is almost doubled by the influx of tourists, and this could partly explain the very high figures recorded in these municipalities.

FIG. 2 Spatial distribution of property crime (2001–06)

Note: Property crime rates, averages 2001–06 for 589 Belgian municipalities, divided into five equal groups.

Source: Belgian Federal Police, Operational Police Information. Entries: number recorded acts/1,000 inhabitants.

FIG. 3 Spatial distribution of violent crime (2001–06)

Note: Violent crime rates, averages 2001–06 for 589 Belgian municipalities, divided into five equal groups.
Source: Belgian Federal Police, Operational Police Information. Entries are recorded crime rates/1,000 inhabitants.

Operationalization

After this first descriptive exploration of the data, we will document the variables that will be used to explain these local differences in crime rates.

As dependent variables, we include the natural log of the property crime rate and the violent crime rate. We use a transformed form of the crime rates, since the original data are not normally distributed and normality of the data is a basic assumption for both ordinary least squares and spatial regression. This transformation is commonly used in analyses of crime rates.

For the independent variables, we will include both absolute and relative economic deprivation indicators. Within the literature, there is some controversy on how poverty or income levels can best be measured (Brady 2003). For poverty, we use data from the Belgian tax administration, documenting the median fiscal income in a municipality, averaged for the period 2001–06. Again, it should be noted that there is a considerable degree of variance in these figures, ranging from a median income of 15,080 to 26,000 Euros per inhabitant per year. In this study, we use the natural log of *median* income in the municipality as an indicator for income. In other models, we included the natural log of *average* income as an independent variable, but this did not lead to substantially different results.

For income inequality, we relied on the same fiscal income data that also include a measurement of income variation within the municipality. For every municipality, a Gini coefficient was constructed (again averaged for the 2001–06 period) indicating (in)equalities in the distribution of income in the community. The Gini coefficient is chosen as a measure of income inequality, since it provides an overall estimate of income inequality. It summarizes what proportion of the population gains what proportion of the total income (Lynch *et al.* 2001). The Gini coefficient can range between 0.00 (everyone in the population has exactly the same income) and 1.00 (one person earns 100 per cent of the income in the community) (Stuart and Ord 1994).

For both income indicators, it should be noted that figures are obtained from the fiscal administration, and therefore they do not include the grey economy, which remains completely undocumented in Belgium.

Finally, we also include the unemployment rate in the municipality. The unemployment rate is provided by the Federal Government Department of Economics, and is expressed as the number of unemployed divided by the total labour force (average 2001–06).

We also rely on a number of control variables. Because the age–crime relationship is an almost universal finding in criminological literature, different types of crime are frequently explained by the age structure of a community (Sampson and Wooldredge 1987; Steffensmeier *et al.* 1989; Nagin and Land 1993; Allen 1996; Tseloni *et al.* 2002). With regard to demographics, we include the percentage of young inhabitants, defined as the proportion of inhabitants between 15 and 24 years old, as a control variable.³

The geographical presentation of crime rates in Figures 2 and 3 indicates that tourist resorts might play a rather idiosyncratic role in this regard, with exceptionally high crime rates. On the one hand, this could be considered as a measurement error, since the real number of residents of these resorts during the summer season is much higher than the official population figure used to calculate crime rates. On the other hand, it has also been shown that tourism as such is related to crime (Schiebler *et al.* 1996; Walmsley *et al.* 1983). Again, we do not know who commits the criminal acts, so we do not know whether tourists themselves are associated with some forms of criminal behaviour (e.g. gambling or drugs-related), or whether they are available as potential victims for various forms of criminal behaviour (Giacopassi and Stitt 1993). Furthermore, mass tourism might be associated with a disruption of the local social fabric, reducing the level of collective empowerment of the community (Park and Stokowski 2009). In any case, it is important that we control for the presence of tourists, and therefore the total number of nights spent in hotels, bed-and-breakfast establishments and camping sites will be included as a control variable. This information is derived from the National Institute of Statistics, collecting data on tourism-associated economic activity.

Urbanization is generally seen as a factor strongly related to crime. In the classical literature, urbanization has been associated with social disintegration and consequently a proportional increase in crime according to the level of urbanization is expected (Wirth 1938; Christiansen 1970). One of the most common operationalizations of

³In line with the literature we defined young as the 15–24 age group. Other cut-off points were tried but did not yield different results. Theoretically, we could also have included the gender balance, as we can assume that men are more prone to violent crime than women are. However, the gender balance is almost equal in most of the localities, and this made the analysis meaningless.

urbanization is population density, or the number of inhabitants divided by the size of the municipality.

Some literature suggests that the presence of foreigners, too, will be associated with high levels of crime (Valier 2003). Although by no means should this relation be taken as having been firmly established (Sampson 2008), we still considered it safe to include the (natural log of) the percentage of foreigners in the population as a control variable in our models.

Finally, Belgium is a federal country, with strong autonomous regions (Deschouwer 2009). Although crime and justice are federal responsibilities, various initiatives that might have an effect on crime prevention are dealt with differently at the regional level. To control for the possible effect of regional policy differences, we included a dummy variable to indicate whether the municipality belongs to the Walloon, the Brussels or the Flemish autonomous region of Belgium.

Methods

The level of analysis is the municipality ($n = 589$). Not only is this level sufficiently small to assume that a municipality still reflects a real community, but one should keep in mind that local mayors have some authority on police policy in their municipality. As such, the municipality can be seen as a natural and the smallest possible entity for this form of analysis. This means that our analysis only allows us to reach conclusions at the municipality level, and we cannot make any statement about the individual level. In other words, we are looking at the indicators of contexts in which crime takes place more or less often, and not at the characteristics of criminals. While it might be preferable to investigate even smaller geographical units like neighbourhoods or even streets, reliable and comprehensive information on this level is simply not available for the Belgian context.

To take account of the spatial nature of the data, spatial regression techniques will be used to analyse the data. This is necessary, since it is possible and even likely that the standard assumption of the independence of observations, or the independence of error terms, needed for ordinary least squares (OLS) regression, are violated (Anselin 1988). This means that the coefficients or the standard errors can be biased, which renders the parameters of an OLS regression model less reliable.

Two forms of spatial models are commonly used to improve regressions on spatially correlated data. Theoretically, these two forms of spatial interdependence have a different interpretation. If two municipalities are adjacent, the crime rate of the first can be influenced by the crime rate of the other. This means that there is a contagion or dispersion effect of crime, represented best by a spatial lag model.⁴ If the error residuals of the municipalities are influenced by one another, this substantively means that the phenomenon under study is not analysed at the correct geographical level, or that there might be an unobserved variable correlated with the spatial structure of the data.

⁴In its structural form, a spatial lag regression equation reads as $Y = \rho WY + X\beta + \epsilon$, with $\epsilon \sim N(0, \Omega)$ and Y as the outcome, ρWY as the spatial lag component, $X\beta$ as the independent variables and ϵ as the error term. The spatial lag component is composed of a spatial coefficient ρ and a row standardized spatial weights matrix (W), in our case, a first-order queen contiguity matrix, capturing the geographical structure of our observations.

This would imply a clustering effect (for some unknown or unobserved reason, municipalities resemble one another) and this has to be studied by a spatial error model (Anselin 1988; 1994).⁵ A spatial lag model therefore is appropriate if neighbouring municipalities influence one another; the spatial error model documents that municipalities geographically cluster but for an unknown reason.

It is impossible to fully specify a model with both a spatial lag and spatial error component, so a choice between a spatial lag or spatial error model has to be made. A robust Lagrange multiplier test on the residuals of a non-spatial ordinary least squares regression is used to determine the best specification of the spatial regression model: spatial lag or spatial error (Anselin *et al.* 1996).

The first step to be taken therefore is to compute Lagrange multiplier tests on the residuals of a non-spatial ordinary least squares regression model. While in the case of property crime, a spatial lag model was clearly preferred over a spatial error model, for violent crime, a spatial error model was more appropriate. This means that property crime in one municipality is influenced by the crime levels of the neighbouring municipalities, where violent crime tends to cluster in zones larger than a municipality.

On a final methodological note, it has to be added that since unemployment and median income are strongly correlated, we will run separate models with these variables to prevent multi-collinearity.

Results: Property Crime Rates

First, we analysed the geographical distribution of property crime rates. In the first model (Table 1), we included the median income of the community. In line with our hypotheses, we did observe a negative impact of income levels and a positive effect of income inequality. There was no effect of the proportion of young people in the population, but a modest influence of the share of foreigners. We also observed that crime rates are much higher in urban areas (as expressed by population density) and in touristic areas. Controlling for these influences, crime rates are lower in both the Flemish and Brussels regions than in the Walloon region. In Model 2, median income was replaced by the unemployment level and it is clear that unemployment has a stronger impact than median income. Including unemployment levels also sharply reduces the significance level of the variable for the region. We also note that the presence of foreigners, and touristic activity, were less important to explain property crime in this model. All other control variables remained more or less in place, or became slightly weaker. The spatial lag coefficient ρ was moderately strong and positive, indicating a contagion mechanism in terms of property crime. Property crime rates spill over into neighbouring communities. Furthermore, and in line with our hypotheses, unemployment, inequality and income levels were all related to property crime.

⁵The structural form of the spatial error regression is $Y = X\beta + \lambda W\epsilon + \mu$, with $\mu \sim N(0, \Omega)$ and Y as the outcome, $X\beta$ as the independent variables, $\lambda W\epsilon$ as the spatial error component and μ as the homoscedastic error term. The spatial error component is composed of a spatial coefficient λ and a row standardized spatial weights matrix (W), in our case a first-order queen contiguity matrix, capturing the geographical structure of our observations.

TABLE 1 *Spatial lag regression of property crime rates in Belgian municipalities*

	Model 1 Coefficient (S.E.)	Model 2 Coefficient (S.E.)
Constant	9.174 (1.478)***	-0.442 (0.270)
Median income (log)	-0.770 (0.154)**	
Gini coefficient inequality	2.263 (0.502)***	2.921 (0.470)***
Unemployment rate (log)		0.347 (0.040)***
Young people proportion	-0.062 (1.140)	0.438 (1.095)
Non-nationals rate (log)	0.062 (0.017)***	0.036 (0.017)*
Population density (log)	0.208 (0.016)***	0.181 (0.015)***
Touristic activity (Ref. low)		
Middle	0.097 (0.029)**	0.067 (0.027)*
High	0.185 (0.027)***	0.162 (0.027)***
Region (Ref. Walloon)		
Flemish region	-0.274 (0.034)***	-0.046 (0.044) ns
Brussels region	-0.337 (0.082)***	-0.225 (0.079)**
Spatial multiplier (rho)	0.396 (0.040)***	0.342 (0.040)***
Squared correlation	0.709	0.731

Entries are a result of a spatial regression analysis at the level of the municipality. Dependent variable: natural log of property crime rates, 2001–06. $n = 589$. Sign.: * < 0.05; ** < 0.01; *** < 0.001.

Results: Violent Crime Rates

When turning to the violent crime rates (Table 2), we observed again that median income level had a strong and significant negative effect on crime rates. Rather surprisingly, we find a negative relation between income inequality and violent crime rates. Urban communities have higher crime rates and the same goes for tourist resorts. The proportion of non-nationals in the population did not have a significant relation with violent crime. Furthermore, we can observe there was no effect of the demographic structure. Violent crime rates tended to be higher in the Walloon region compared to the Brussels and Flanders regions, although the difference between Wallonia and Flanders was rendered weaker if we take unemployment into account. It has to be noted that the absolute violent crime rates do tend to be highest in the Brussels region, but taking into account the high degree of urbanization, unemployment and tourist activity, the violent crime rates are lower than could be expected, leading to a negative coefficient of the Brussels dummy variable. Including unemployment rate rather than income level again led to a strengthening of the model, and it weakened most other variables included in the analysis. Violent crime is less contagious among municipalities, as not a spatial lag, but a spatial error model had to be preferred. This means that rather than spilling over, if it comes to violent crime rates, there seem to be certain regions, composed of a number of municipalities, with high rates. Unemployment rates and median income levels again were strong determinants of violent crime rates—a finding that was not predicted by the literature. Income inequality played a rather small role in explaining violent crime.

Discussion

In the current article, we analysed the geographical distribution of crime rates in Belgium for the period 2001–06. As far as we know, this is the first time the appropriate spatial

TABLE 2 *Spatial error regression of violent crime rates in Belgian municipalities*

	Model 1 Coefficient (S.E.)	Model 2 Coefficient (S.E.)
Constant	22.325 (1.807)***	0.581 (0.289)*
Median income (log)	-1.990 (0.190)***	
Gini coefficient inequality	-1.498 (0.586)*	-1.605 (0.527)**
Unemployment rate(log)		0.691 (0.047)***
Young people proportion	0.641 (1.311)	1.157 (1.209)
Non-nationals rate (log)	-0.007 (0.023)	-0.036 (0.022)
Population density (log)	0.198 (0.019)***	0.131 (0.018)***
Touristic activity (Ref. low)		
Middle	0.129 (0.029)***	0.102 (0.027)***
High	0.199 (0.031)***	0.175 (0.029)***
Region (Ref. Walloon)		
Flemish region	-0.555 (0.046)***	-0.120 (0.056)*
Brussels region	-0.671 (0.113)***	-0.482 (0.108)***
Spatial multiplier (lambda)	0.491 (0.053)***	0.511 (0.051)***
Squared correlation	0.615	0.664

Entries are a result of a spatial regression analysis at the level of the municipality. Dependent variable: natural log of violent crime rates, 2001–06. $n = 589$. Sign.: * < 0.05; ** < 0.01; *** < 0.001.

regression techniques were used to analyse crime rates over the entire territory of a country. The fact that we can rely on six-year averages also implies that the patterns we find can be considered as quite robust. The fact that we obtain a degree of explained variance of up to 73 per cent also indicates that the effects we encountered are not negligible.

First of all, the results indicated that crime rates tend to be concentrated in the urban regions of Belgium, with a strong and consistent effect of population density on crime rates, and this holds both for property and for violent crime. As such, our findings are in line with the literature, confirming the fact that crime is mostly an urban phenomenon. The rate of non-nationals, however, only had a weakly significant impact on property crime and no effect at all on violent crime rates. In Belgium, non-nationals are concentrated in urban areas, which are also characterized by high crime rates. But the multivariate analysis clearly demonstrated that the direct link between the presence of non-nationals and crime rates was either weak or non-existent. Especially high unemployment levels seem to explain away the modest effect of the presence of a non-Belgian population on property crime. A second significant but under-investigated correlate of crime rates is touristic activity. Both property crime and violent crime are positively related to the degree of tourism. Since tourism inflates not only the population at risk, but also the opportunities for crime and the number of possible perpetrators, it is not entirely clear whether tourism substantively causes higher crime rates, or whether this is only an artefact of the way crime rates are calculated.

The main goal of the current article was to determine what specific aspect of deprivation is most powerful in explaining crime rates. First of all, it has to be acknowledged that all three indicators that we used (income level, income inequality and unemployment) were related to crime rates, and therefore we can state that deprivation in general clearly is associated with the occurrence of crime, and this is true both for property crime and for violent crime. Only for income inequality are our findings somewhat mixed.

Inequality was strongly associated with property crime, but contrary to expectations, we observed a negative relation with violent crime. This allows us to speculate that larger gaps in income, and thus also in available resource and property levels, apparently offered a positive opportunity and incentive structure for property crime. In the literature, however, it is suggested that income inequality will mostly be associated with violent crime, and this proved not to be the case. On the contrary: we observed a significant negative relation. A possible explanation for this pattern might be due to the specific characteristics of the Belgian welfare system. Within this system, minimum income levels are quite firmly entrenched. In practical terms, it is impossible than a substantial part of the population of a community would drop below that minimum level. Given this bottom threshold, there is no way a form of underclass would come into existence that would lead to stronger income inequality patterns. Since there is no upper limit to income, in practice, the presence of very high incomes in a municipality is the only way inequality within a municipality can be strengthened. Indeed, we can observe a positive correlation of 0.36 between median income and the inequality coefficient: there is more inequality in the richest municipalities, not in the poorest ones. We fully realize this pattern might be idiosyncratic to the Belgian context, or to countries with a similar social security system. In countries with lower levels of social protection, we might still expect a positive association between inequality and both crime rates. This rather specific finding, furthermore, should not obscure the general pattern that in general, there is a positive association between deprivation indicators and the occurrence of crime.

In comparing income levels and unemployment, for both property and violent crime, we observed that the effect of unemployment was larger than the effect of income levels. Replacing median income with unemployed in both cases increased the explained variance of the model. In line with the Lin (2008) argument, this points quite strongly to the direction of unemployment as a major ecological correlate of criminal behaviour: in municipalities with high unemployment rates, both property and violent crime occur more often, even controlling for various other community-level characteristics. While the Lin study documents a positive impact on property crime, our findings allow us to broaden this claim: unemployment is positively associated not just with property, but also with violent crime. The impact of unemployment therefore might even be larger and more pervasive than Lin (2008) already argued and certainly this is a relation that needs to be investigated further in future research.

Since we only had access to data on the community level, the current analysis did not allow us to make any inferences about the causal mechanism involved. The causal reasoning developed by Lin rests on individual-level mechanisms, but that step was not supported by strong empirical evidence, and the current study does not allow us to elaborate on these individual-level mechanisms. First of all, it should be remembered that we did not have any information about the place where the perpetrator resided. In our spatial analysis, we observed that neighbouring communities have an impact on both property and violent crime rates. This, by itself, already suggests the occurrence of some form of mobility or exchange between municipalities, and therefore one should proceed with caution if one tries to translate the relations we found at the municipality level into individual-level causal mechanisms. Second, the analysis did not inform us about on what side the effect occurs. Some of the elements we studied might increase the odds that one will perform criminal behaviour, while others might enhance the risk of being a victim of a criminal offence. To cite but one example: those having a paid job

during the daytime will often be present in another community, where they can be the victim of various criminal acts. Those without a job are much less mobile, and therefore they are structurally vulnerable to be victimized within their own community. Earlier studies have indeed shown that the unemployed are much likely to be the victims of specific forms of crime than the well-off in society. It is also plausible that high unemployment rates had a negative impact on the collective empowerment of a community, leading to forms of social disorganization. A more in-depth study of both victimization surveys and studies of criminal careers, therefore, is called for if we want to arrive at a better understanding of the causal mechanism involved on the individual level.

With regard to public policy, the main conclusion could be that especially unemployment is strongly related to crime rates. Communities with high levels of income inequality might encounter specific problems, such as with regard to property crime. But the effect of unemployment on crime rates occurs across the board, and it is much more powerful than the presence of non-nationals, for example. Currently, we cannot make any statements about the mechanisms linking crime and unemployment. We can note, however, that future research should take the role of unemployment more strongly into consideration than was the case thus far. Specific community studies in communities or neighbourhoods with high unemployment figures might be a promising method to elucidate the question of whether there is indeed a causal mechanism between unemployment and crime rates.

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Appendix: Variables Used in the Analysis

1. Median income: median income per inhabitant of the municipality 2001–06. Source: National Institute of Statistics, Belgium. Range: 15,080.51–25,960.53 Euros. Natural log values were used in the analysis.
2. Gini coefficient for income inequality (after taxes) 2001–06. Source: National Institute of Statistics, Belgium. Range: 0.233–0.428.
3. Unemployment rate: percentage of unemployed as percentage of the total labour force 2001–06. Source: National Employment Office, Belgium. Range: 3.16–33.35. Natural log values were used in the analysis.
4. Population rate for ages 15–24: percentage of people between ages of 15 and 24 in the municipality 2001–06. Source: National Institute of Statistics, Belgium. Range: 8.94–15.98.
5. Non-nationals rate: percentage of inhabitants of a municipality without Belgian citizenship status 2001–06. Source: National Institute of Statistics, Belgium. Range: 0.42–41.17.
6. Population density: population density of the municipality (inhabitants/surface in km²) 2001–06. Source: National Institute of Statistics, Belgium. Range: 22.16–20,766.73. Natural log values were used in the analysis.
7. Tourist activity: rate of the number of overnight touristic stays to the number of residents in a municipality (2001–06), divided into three categories; no or very few

overnight stays ($n = 283$), fewer overnight stays than inhabitants ($n = 118$), more overnight stays than inhabitants ($n = 188$). Source: National Institute of Statistics, Belgium.

8. Property crime rate: rate of the property crimes per 1,000 inhabitants of the municipality 2001–06. Source: Directorate of Operational Police Information of the Belgian Federal Police, Service Policy Information. Range: 2.23–92.80. Natural log values were used in the analysis.

9. Violent crime rate: rate of the violent crimes per 1,000 inhabitants of the municipality averaged for the years between 2001 and 2006. Source: Directorate of Operational Police Information of the Belgian Federal Police. Range: 2.03–35.85. Natural log values were used in the analysis.

10. Regional dummies: municipality belongs to one of the three autonomous regions in the country. Flanders ($n = 308$ municipalities), Brussels ($n = 19$), Wallonia ($n = 262$).

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