The International Crime Drop: Trends and Variations

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October 2009

Acknowledgements: This work was funded by the Economic and Social Research Council (ESRC) under grant number RES-000-22-2386. We thank the project's advisory group members, Ronald V. Clarke, Chris Kershaw, Martin Killias and Jan van Dijk, for continuous support and John van Kesteren for invaluable guidance throughout the preparation phase of the final data set for this analysis. The participants of the respective sessions on 'Explaining and sustaining the crime falls in industrialised countries', XV World Congress on Criminology, Barcelona, July 2008, and 'Victimisation, Crime Prevention and Crime Drop', European Society of Criminology meetings, Ljubljana, September 2009, the two anonymous Reviewers and the EJC Editor offered insightful comments on an earlier version.

Keywords: assault; burglary; car crime; crime concentration; international crime trends; multivariate multilevel models; theft from person.

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ABSTRACT

This paper examines aggregate crime trends and variation around them from 1988 to 2004 for 26 countries and five volume crime types using data from the International Crime Victims Survey. Multilevel statistical analysis is used to identify the main trends. Major drops in crime were experienced in many countries from the early to mid-1990s onwards. Between 1995 and 2004, the estimated mean international crime incidence reductions were: 77.1 percent in theft from cars, 60.3 percent in theft from person, 26 percent in burglary, 20.6 percent in assault, and 16.8 percent in car theft. Repeat thefts from car and thefts from person fell by 28.1 and 13.2 percent, respectively, over the same period.

INTRODUCTION

For a decade from the early to mid-1990s many countries witnessed the most major and widespread drops in street crimes they had ever experienced. Yet the global picture of these crime trends remains somewhat uncharted while those trends which have been examined remain largely unexplained. The consequence is that potential lessons for policy and practice may have been overlooked. Major falls in crime were observed first in the United States, where violent crime including homicide fell 40 percent over the 1990s and attracted much media and research attention. Most research to date has focused on the US and a series of prominent reviews have emerged (e.g. LaFree 1999; Blumstein and Wallman 2000, 2006; Levitt 2004; Blumstein and Rosenfeld 2008). Major crime falls have also been identified in countries including Australia, Canada, and Japan (see e.g. Zimring 2007; Rosenfeld 2009; Rosenfeld and Messner, forthcoming). In the UK, for example, the British Crime Survey finds that between 1995 and 2007, violent crime fell 49 percent, burglary 59 percent and car theft 65 percent (Hoare 2009: 21).

There is little consensus over explanations for the falls in crime. Consequently, in the hope of providing some fresh impetus, the present study takes a step back from explanation. It seeks to contribute to the knowledge-base by identifying the main international trends and patterns. This, it is hoped, may lead to research questions that will further explore both explanations of the trends and possible lessons for crime reduction policy and practice.

The present study builds on, and is viewed by the authors as complementary to, the work of van Dijk *et al.* (2005, 2006a, 2006b, 2007) by using the International Crime

Victims Survey (ICVS). One difference is that van Dijk and colleagues focused on Europe whereas a wider geographical set of countries is included here. The present analysis also uses trend estimates derived from multilevel statistical modelling, and seeks to identify the role of repeat victimization in the crime falls. The reason for using the statistical modelling is that it produces more reliable trends than descriptive analysis. An effort is made to report statistical findings in ways that are accessible to readers unfamiliar with the approach taken here.

Four main substantive issues are addressed. The first is to identify the main 'international' crime trends drawing on countries for which data are available. We do not refer to these as 'global trends' because of the over-representation of industrialized countries in the dataset, although our analysis suggests the downturns in crime during the 1990s did appear to be fairly global to the extent that this can be determined from the present analysis. The second is to identify the extent of country-level variation from those trends. The third is to determine whether any significant changes in crime are due to changes in the number of victims or in repeat victimization of the same victims. Each of these three issues is explored with respect to five main crime types: residential burglary, car theft, theft from cars, personal theft, and assaults (which include threats). The fourth substantive issue is therefore to compare the findings between crime types to identify similarities, differences, and potentially informative relationships. Suggestions for further research are outlined in the concluding part of the paper.

The next section presents an overview of the data which the study employs with detailed presentations in Appendix A, followed by a description of the analysis and

findings. Conclusions and future research suggestions end the paper. More specific details of the statistical methodology are available on request from the corresponding author.

THE ICVS DATA

The five ICVS sweeps available at the time of this analysis (1989, 1992, 1996, 2000 and 2005) are used herein. Detailed description of the ICVS methodology is available elsewhere (Mayhew and Van Dijk 1997; Van Dijk and Mayhew 1992; Van Dijk *et al*. 1990; Van Kesteren *et al*. 2000; Van Dijk *et al*. 2007) but some key issues are worth rehearsing for readers unfamiliar with the dataset and issues specific to the present paper need to be presented.

The ICVS samples adults who are 16 years old or older. In countries where a national sample cannot be drawn the survey may be undertaken in one of the main cities (see Van Dijk *et al*. 2007; Van Kesteren *et al*. 2000). The participation of countries in the ICVS is optional and until 2005 individual industrialized countries tended to fund their own part of the survey, while the United Nations Crime and Justice Research Institute (UNICRI) supported the survey in developing countries (Van Dijk *et al*. 1990; Van Kesteren *et al*. 2000). In 2005, EU funding was secured for EU countries wishing to participate (Van Dijk *et al*. 2007). Over the years many efforts have been made to widen the participation of countries and regions.

The survey is administered using Computer Assisted Telephone Interviewing (CATI) in industrialized countries and face-to-face interviews in developing countries. This means the sample is limited to households with a land-line telephone in industrialized

countries. Northern Ireland and Spain moved from face-to–face interviews in 2000 to CATI in 2005 but, while lower crime rates had been anticipated the opposite was found (Van Dijk *et al*. 2007: 28). If some upward bias in incidence was induced by this change in method its overall effect would be small in the present study because of the large number of countries involved. As with most surveys of its ilk, the ICVS also suffers from the memory biases of respondents who forget crimes or when they occurred (see Schneider 1981).

The ICVS has relatively low response rates in some countries. This was largely true for the European Union's 2005 International Crime Survey with the exception of Poland (Van Dijk *et al*. 2007: 32-33). A low response rate could induce a downward bias in crime rates if it resulted in further under-representation of hard-to-reach populations who experience more crime. However, this did not appear to occur in this instance (Van Dijk *et al*. 2007: 34-35).

The publicly available ICVS data sets result in underestimates of crime incidence rates (crimes per capita) and crime concentration rates (crimes per victim). This is because these versions of the data cap the number of incidents in a series (of crimes of a type reported by the same victim). This can make quite a difference to the overall volume of crime captured (Farrell and Pease 2007).

The sample of countries included in the ICVS has changed somewhat from one sweep to the next, which makes it slightly unbalanced when viewed as a panel of data for analyzing trends over time. Most countries appear in just one (29) or two (21) sweeps. Only five countries have taken part in all five ICVS sweeps to date: Canada, England

& Wales, Finland, the US and the Netherlands. This is important because the aim of this study is to examine international trends and cross-national variation, where the ideal situation would be that each country was present in the survey each time it was undertaken. Two steps were taken to overcome this problem. First, since the main focus was on trends over time from the early to mid-1990s, only countries that participated in the 2000 ICVS sweep were included in order that the relevant trend around that date could be examined. Second, to permit examination of change over time, only countries which had participated in at least three ICVS sweeps were included. Twenty six countries met these criteria and constitute our sample. Of these, 12 provided information relating to the 1989 ICVS sweep, 19 relating to 1992, 23 for 1996, 26 for 2000, and 19 for 2005. This gave a total count of 99 country-year combinations which is the number of cases that could be used in our statistical modelling.[1] The panel of countries is shown in Appendix Table 1. In terms of geography this panel of countries over-represents North Europe and North America.

The sample size of the ICVS is typically around two thousand respondents per country. This produces country-level crime estimates with significantly greater margins of error than those of surveys with much larger samples. The result is that there are sometimes anomalies in the data. In the present data set, some of the ICVS trends for England and Wales, for example, differ from those found by the British Crime Survey. Some other unexpected findings, such as some unusually low and zero crime rates are reviewed in the analysis section. However, this analysis is based on the expectation that any such limitations will for the most part be greatly exceeded by the advantages of the ICVS data set.

Overall, although several limitations of the ICVS have been identified, it is not believed that they would unduly affect findings of the present study. This is because it is reasonable to assume that most such biases have remained relatively consistent over time, and the focus of the present study is on trends.

The unique contribution of the ICVS is that it asks respondents in different countries the same questions about their crime experiences. This means the survey is vastly more appropriate for cross-national comparative analysis than police recorded crime or other data which are less comparable.

ANALYSIS

Measuring Crime

Three crime rate measures were generated. Crime incidence is measured as the number of crimes per 100 possible victims (individuals, households or car-owning households depending on the crime type). Crime prevalence is measured as the percentage of victims in the respective population. Crime concentration is measured as the number of crimes per victim. Assault and personal theft are measured relative to the number of individuals, burglaries relative to households, and car crimes relative to households with car(s).[2] Crime incidence rates are higher than prevalence rates because some victims experience more than one crime, with the average rate of repeats shown by the concentration rate.

This analysis uses unweighted data because the weighting makes minimal differences to country-level rate estimates (Van Dijk *et al.* 2007).[3] Summary statistics for each

crime type and measure are included as Appendix Table 2.[4] The crime rates derived are the overall mean of the annual rates for those countries with available data.

Some Country Specifics

Specific anomalies in the data were identified during preliminary descriptive analysis. Switzerland reported no thefts from person in 1999 and 2004 (i.e., in the 2000 and 2005 ICVS, respectively), no car theft in 1988 and 1999 and no theft from car in 1999. Georgia reported unusually low incidence and prevalence rates for assault in 1991, respectively 0.7 and 0.4 per 100 persons. These highly implausible rates are due to sampling variation and the small country-level sample size. Finland reported low incidence and prevalence rates for burglary in 1999, respectively 0.5 and 0.3 per 100 households, though these may not be surprising for this country. These minimum incidence and prevalence rates are listed in Appendix Table 2. The highest (incidence and prevalence) rates for theft of personal property and burglaries were reported in Uganda in 1991; for assaults in South Africa in 1991; for theft from car in Moscow (Russia) in 1995; and for theft of car in Johannesburg (South Africa) in 2004 (incidence) and 1995 (prevalence).[5]

All 26 counties in the sample have repeat assaults, repeat thefts of personal property (except Switzerland as discussed above) and repeat thefts from car (except Georgia and Switzerland as discussed above). A number of countries did not report repeat car theft and we suspect the infrequency of this crime type renders few re-occurrences within a calendar year (the time-to-replacement of a stolen car can also reduce the time-window in which a repeat can occur – see Farrell and Pease 1993: 20). Finland, France and Northern Ireland were the only countries without reported repeat

burglaries for selected ICVS years. The highest burglary concentration (1.74 per victimised household) was reported for 1999 by US residents. Brazil reported the most frequent thefts of personal property (1.82) and thefts from cars (2.05) in 1995. Each Georgian victim reported on average nearly three assaults (2.65) while victim car owners from Uganda reported the maximum repeat car thefts (1.67) in 1999. These concentration rates, as mean averages, tend to mask the skewed distribution of victimization which is usually disproportionately experienced by a small percentage of the population (Pease 1998; Hopkins and Tilley 2001).

Methodology

Here we tend to present technical aspects of the modelling in footnotes in order to focus on the findings.[6] The main advantages of the statistical modelling warrant brief delineation. The ICVS data entail sampling and other measurement errors and the crime rates should not be taken at face value or without consideration of their respective confidence intervals. Statistical modelling disentangles the *systematic* over-time changes, namely the trends, of crime rates from the more erratic changes. The trend here is centred in 1995 and refers to annual changes rather than differences from one ICVS sweep to the next. Whether the estimated trend from the statistical model is plausible or largely an artefact of the available data can also be indicated by measures of statistical significance which are derived from the model.

The analytic models seek to account for sample variation that is due to the over-representation of cities in some national samples, and any issue induced by the sweeping political changes in former communist countries. That is, the models seek to account for variation in the nature of the sample that can occur within countries over

time. This can occur with a change from a national to a city/capital only sample and vice versa. In addition, some countries have an additional booster city sample to *over-represent* city dwellers. In either case a 'city booster' identifier measures the percentage (the proportion in the models for the concentration rate) of city booster samples. This is because cities tend to have higher crime rates (Osborn and Tseloni 1998). The 'city booster' control variable is to account for the over-representation of city residents in the national sample. During the life of the ICVS unique political and economic changes occurred in Eastern Europe. To capture otherwise unexplained crime differences between countries from this region and the other ICVS participating countries a dummy variable 'former communist country' (FCC) is included in the models.

The Technical Section

The reader who is not versed in multilevel modeling may wish to read around this section somewhat or review it to gain a general overview of its substance. It is included for the more statistically specialized reader, to allow them to read and interpret a wider range of results that can be easily summarized in statistical tables rather than text, but, we hope, in a fashion that also makes it accessible to a fairly broad audience.

The estimated trends in incidence, prevalence and concentration rates in theft from car, theft from person, car theft, burglary and assault are shown in Table 1. Contrary to common practice of presenting regression results, summary statistics and the parameters' estimates are given in the columns of the Table, while each model is presented in a different row. Table 1 includes two models for each offence type and

measure. The first model in each case is a linear model. The second is the non-linear trend with controls (the percentage of city booster in the aggregate data and former communist country).

<Insert Table 1 about here>

The dependent variables are listed in the first column of Table 1. The second column shows the percentage of total explained variance for each model. The middle four columns of Table 1 display the trend and the parameters for the controls. The estimated linear trend is found in the column under the heading '*Time*', while this in conjunction with '$Time^2$' represents non-linear trend, which in this case has an inverse – U shape. The statistical significance of each estimated parameter is indicated via superscripts. The statistical significance for both parameters of the non-linear trend is indicated via subscripts. [7] The last two columns of Table 1 present the estimated between-countries and within-countries variances of the crime rates.

Countries face different levels of crime and those with high rates tend to have high rates for more than one crime type. That is, crime rates tend to co-vary. This study investigates such tendencies using the multivariate extension of the multilevel model for joint crime rates.[8] The correlation estimates between crime rates at each level of analysis, that is, over time and cross-nationally (after controlling for trend, city booster and FCC) are presented in Table 2 with an indication of their statistical significance. The respective unadjusted correlations are given in brackets.[9] Table 3 offers the same information for crime concentration.

RESULTS

The Main International Trends

This section presents the trend with adjustments to the data based on the statistical modelling.[10] The mean international crime incidence (crimes per 100 possible victims) trends which are derived from the models are shown in Figure 1. The same data are shown indexed to 1988 in Figure 2.

<Insert Figures 1 and 2 about here>

Personal property theft and theft from cars dropped exponentially: recent reductions were sharper than the initial ones. Assault increased until 1995, then remained stable until 1999 and, finally, fell but not back to its 1988 levels. Car theft and domestic burglary fell steadily by a respective annual 1.9 and 2.9 percent.

The post-1995 fall in crime is the key item of interest here as it denotes and confirms the international crime drop identified by van Dijk and colleagues and in a range of country-level studies. This is a pronounced overall trend and, as so often with fragmented data, the key trend is identifiable despite limitations of the data (which in this case are the limited number of years and countries for which data were available). The post-1995 crime fall is the most important finding here because it is generally expected that the trend for many years prior to 1995 was upward, as this was the overall story of crime in the second half of the twentieth century.

<Insert Figure 3 about here>

Between 1995 and 2004, the estimated mean international crime reductions were: 77.1 percent in theft from cars, 60.3 percent in theft from person, 26 percent in burglary, 20.6 percent in assault, and 16.8 percent in car theft. These figures are shown alongside the unadjusted means from the ICVS 'raw' data in Figure 3.[11]

Although these results may appear rather straightforward in substantive terms (crime fell – no real surprises there), they are important because of the statistical validation of the fact that there was no evidence of country-level differences around the main crime trend.[12] That is, the slope of over-time changes in crime rates was roughly similar across countries. However, on a regional level, our preliminary analysis suggests that burglary incidence and prevalence fell faster in Latin America, Africa and Asia (to the extent that these regions are adequately represented in the data) than in North America, Europe and Australia. These regions would seem to be a potentially important area for future crime drop research, as research to date has focused mainly on Europe and North America.

The Role of Repeat Victimisation in the Main Crime Trends

This section examines the role of repeat victimisation. That is, did crime rates fall more because of reductions in the number of victims or because the same victims experienced crime less often? Exploring this dynamic can be crucial to determining the nature of changes in crime trends and hence to understanding what generated such change (Tilley and Hopkins 1998; Hopkins and Tilley 2001). It is analogous to determining whether crime rate falls were due to fewer offenders or due to the same offenders committing less crime (an issue we discuss elsewhere as warranting scrutiny in this context – see Farrell et al., forthcoming). The potentially critical role

of repeat victimization in the crime drop was raised in Thorpe's excellent study of England and Wales. Thorpe (2007) found that:

> "The number of single *incidents* of crime has fallen by 16 per cent since the peak of crime in 1995 but there has been a much larger drop (51%) in the number of multiple incidents. This relatively large decline in multiple victimisation is a major factor in the overall decline in BCS crime since 1995." (Thorpe 2007: 81)

For four of the five main crime types included here using the ICVS, incidence dropped faster than prevalence in the 1990-s onwards. The exception was car theft. That is, for the most part, and with variations by crime type, the crime falls were composed of reductions in both targets and repeat victimisation. Specifically, the concentration rate (the average crimes experienced per victim) for theft from cars decreased exponentially, yielding a 28.1 percent drop from 1995 to 2004. That for theft from person fell gradually and the estimated drop was 13.2 percent over the same period. However, the concentration rate of repeat burglary and repeat assault did not fall internationally, while car theft concentration dropped only until the end of the 1990's. The international trend of crime concentration is shown in Figure 4.

<Insert Figure 4 about here>

Systematic and Residual Variations in Crime Rates

The overall extent to which trend and the controls predict individual country crime rates is denoted by the percentage of explained variance (see the first numeric column of Table 1). The main international trend for each of theft from car and personal theft is fairly representative for many countries, but the crime type for which the respective trend is least indicative is assaults. Specifically, theft from car and personal theft are

predicted by the trend for over 50% and roughly 40%, respectively, which, in light of the nature of the sample can be considered quite a high prediction rate. By contrast, the majority (over 90%) of over-time and between-country difference in assaults is not captured by the international trend. For the five main crime types considered here, the international mean trend is generally more indicative for prevalence and incidence rates than for concentration rates.

The crime rates of individual countries vary from the respective international mean rates. The nature of this variation can change over time. The remainder of this section seeks to explore the variations from the mean international rate that is *not* explained by the trend, 'city booster' and FCC. This for the present study is erratic and entails two components: The aggregate statistical measure of the extent to which crime rates of individual countries vary around the trend is the *between-country variation* or variance and is shown in the penultimate column of Table 1. The aggregate measure of the extent to which crime rates of individual countries vary around the trend over time is the *within-country variation* and is shown in the final column of Table 1.

The between-country variance suggests that there is large cross-national variation in the incidence (and to a lesser extent the prevalence) of theft from cars and theft from the person. The rate of these two crime types also varies substantially over time as indicated by the within-country variance measure.[13] The variation in car theft and burglary tends to be overwhelmingly between countries. By contrast, assault rates differ more over time than cross-nationally (that is, the within-country variance is considerably greater than the between-country variance for both incidence and prevalence). As might be expected, concentration rates do not vary to the same extent

as incidence and prevalence. When concentration rates vary it tends to be over time rather than between countries.[14]

The Relationship between Different Crime Types

Generally speaking, countries with high rates of one type of crime tend to have high rates of other types of crime, and vice versa. However, some crime types are more related than others, and this can be examined for each of the main crime types. Tables 2 and 3 show the correlations between the different crime types for crime incidence and concentration, respectively. It should be stressed that the relationships between crime types discussed here refer to differences in the crime rates that are *not* due to their respective trends.

With respect to personal theft, countries with a high incidence of personal theft are more likely to have high rates of burglary, theft from cars, and car theft, and this relationship is stronger in cities.[15] With respect to car theft, countries with high incidence rates tend to also have high rates of burglary and assault. With respect to burglary, its incidence tends to correlate with that of theft from car and assault, and more moderately with the two types of car crime. The incidence of assault appears largely independent of theft from car and personal theft.

<Tables 2 and 3 about here>

In general therefore, it appears that acquisitive crimes tend to correlate with each other cross-nationally in terms of incidence, but not with assaults. Likewise, the cross-national concentration rates of burglary, personal property theft and theft from car are

highly related but repeat assaults appear largely independent. Theft from car and personal theft rates are associated both over time and cross-nationally. However, car theft rates appear to be somewhat independent from all other crimes over time. We will not speculate here on the possible causes of these relationships.

Over-Representation of Cities in National Samples and Former Communist Countries

To identify the effect upon the crime rate that was due to trend, the main variables or 'levels' for which effects were controlled in the multilevel model were the effects of including former communist countries and the effects of having some national samples with an over-representation of city residents. We have left this discussion until last in the results section because, while important, the presentation of the findings needs to be somewhat more technical and the results are arguably less substantive in criminological terms than those discussed above.

The second numeric column of data in Table 1 shows the crime rates (incidence, prevalence, and concentration) estimated by the statistical model for 1995 when former communist countries and any city-level sampling effects are excluded (that is, a national sample is assumed). For example, the second row of Table 1 shows that in 1995 there were on average 9.3 thefts from car per 100 car-owning households but excluding Bulgaria, Czech Republic, Estonia, Georgia, Hungary, Poland, Russia and Slovenia. The estimated crime rates for these countries can be derived by adding the value listed under the FCC column for former communist countries. That is, the incidence rate for these countries was an average of 14.4 (calculated as 9.3+5.1 where 5.1 is the FCC value in the same line of the table) thefts from car per 100 car owning households. This suggests the incidence (and, following the same calculations,

prevalence) of theft from cars was around 50% greater in former communist countries. With regards to concentration rates former communist countries had significantly less car thefts (78%) than the international average. However, these are exceptions because the average crime rate for former communist countries was not significantly different to the international mean of the other three crimes.[16]

The effect of having a national sample consisting of solely a city or boosted by a larger sample from cities can be quite major. The effect for each one percent over-representation of cities is shown in the fifth numeric column of Table 1. For example, theft from car incidence rises by 0.11 when there is a 1% over-representation of city dwellers (the second row of Table 1). The consequence is that when there is an all-city sample, the incidence rate of theft from car more than doubles from 9.3 to 20.3 (calculated as 9.3+(0.110x100)). Including a booster of city residents in the survey increases the rate of all crime types except assault.[17]

Repeat victimisation, especially for non-contact property crimes (car theft, burglary and theft from car) is increased by over-representation of city residents in the sample. Specifically, if all countries had provided only city samples the 1995 international repeat car theft would have been 1.18 (calculated as 1.095 + 0.087) rather than 1.10 incidents per car-owning household. Similarly, repeat thefts from car and burglaries would have been 1.51 and 1.34 instead of 1.29 and 1.25 events per victimised household, respectively. It should be noted that city has uniform effects across countries and over time. [18]

This discussion of the effects of the city booster samples and former communist countries has a practical value. Most importantly, it should give the reader an indication of why the modelled or adjusted international crime rates (Figures 2 and 4) are somewhat lower than the mean rates derived from the 'raw' data. The unadjusted data do not account for the factors introduced by these variables.

CONCLUSION

This study examined cross–national trends in incidence, prevalence and concentration rates of five crime types for 1988 to 2004 for the 26 countries which participated in at least three of the five ICVS sweeps to date. The cross–national (in reality predominately North American and North European) trend was estimated using multilevel modelling.

The International Crime Victims Survey has both strengths and limitations. The number of years for which data is available is fairly limited when the aim is to examine change in crime over time. There is also variation in the sample of countries available in different years. Yet the ICVS has the unique strength of being the only methodologically standardised international victim survey. Findings derived from ICVS analysis should be viewed with caution. Nevertheless, it is the authors' opinion that the results of the analysis are generally informative with respect to trends and patterns. The findings tend to support those of van Dijk and colleagues (2007) relating to Europe and to extend the analysis to a broader geographical set of countries. The additional array of statistical analyses presented here may also provide insight into crime trends and patterns that in turn provide new angles from which to view the

international crime drop. This, in turn, may lead to research from which policy-relevant lessons can be derived.

Crime rates were found to fall with roughly the same trend across countries from the 1990s. The mean international crime drop appeared to be sharper for theft from car, theft from person and assaults than for burglary and car theft which fell in a more prolonged and linear fashion. The most dramatic crime drops occurred in theft from car and theft from person. The overall decline in assaults seemed to start somewhat later. Burglary rates appeared to fall more sharply in countries outside North America, Europe and Australia, and further exploration of non-Western crime rates may be a fruitful line of enquiry for international crime drop research. There was variation by crime type and over time in the extent to which country-level crime rates varied from the international mean.

For four of the main crime types studied (the exception was car theft), the drop in crime incidence was greater than that in crime prevalence. However, significant repeat victimisation reductions were only observed in theft from car and theft of personal property. Though this finding is preliminary it suggests that, with variation by crime type, repeat victimisation played some role in the crime drops.

The natural extension of this study would be to investigate the common factors cross-nationally which contributed to substantive drops in theft from car and of personal property as well as the country-specific ones which reduced burglary and theft of car. These factors may also account for the noted associations between crime types.

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Table 1: Cross-National Trend Multilevel Models of Crime Incidence, Prevalence and Concentration

Crime Rates	% Explained Variance	Regressors					Extra-Variation[b]	
		Intercept	Time	Time^2	City Booster	FCC[a]	Between Countries	Over Time
Theft from car								
Incidence	50.57	7.596$^{\blacktriangledown}$	-0.414$^{\blacktriangledown}$	-	0.111$^{\blacktriangledown}$	5.808$^{\blacktriangledown}$	15.037§	21.565$^{\blacktriangledown}$
	53.10	9.292$^{\blacktriangledown}$	-0.265$^{\blacktriangledown}{}_{\blacktriangledown}$	-0.059$^{\blacktriangledown}{}_{\blacktriangledown}$	0.110$^{\blacktriangledown}$	5.108$^{\blacktriangledown}$	16.021§	18.707$^{\blacktriangledown}$
Prevalence	50.00	6.014$^{\blacktriangledown}$	-0.252$^{\blacktriangledown}$	-	0.061$^{\blacktriangledown}$	3.426$^{\blacktriangledown}$	5.015§	7.141$^{\blacktriangledown}$
	52.48	6.947$^{\blacktriangledown}$	-0.170$^{\blacktriangledown}{}_{\blacktriangledown}$	-0.032$^{\blacktriangledown}{}_{\blacktriangledown}$	0.060$^{\blacktriangledown}$	3.039$^{\blacktriangledown}$	5.229§	6.303$^{\blacktriangledown}$
Concentration	36.72	1.265$^{\blacktriangledown}$	-0.0038*	-	0.222$^{\blacktriangledown}$	0.063	0.006§	0.013$^{\blacktriangledown}$
	38.03	1.288$^{\blacktriangledown}$	-0.0017$_{*}$	-0.0008$^{*}{}_{*}$	0.220$^{\blacktriangledown}$	0.053	0.006§	0.013$^{\blacktriangledown}$
Theft from person								
Incidence	34.16	5.464$^{\blacktriangledown}$	-0.196$^{\blacktriangledown}$	-	0.065$^{\blacktriangledown}$	0.585	7.406§	13.785$^{\blacktriangledown}$
	38.51	6.546$^{\blacktriangledown}$	-0.099$_{\blacktriangledown}$	-0.038$^{\blacktriangledown}{}_{\blacktriangledown}$	0.064$^{\blacktriangledown}$	0.139	6.816§	13.000$^{\blacktriangledown}$
Prevalence	36.43	4.295$^{\blacktriangledown}$	-0.140$^{\blacktriangledown}$	-	0.044$^{\blacktriangledown}$	0.716	3.057§	5.834$^{\blacktriangledown}$
	40.71	5.030$^{\blacktriangledown}$	-0.075$_{\blacktriangledown}$	-0.025$^{\S}{}_{\blacktriangledown}$	0.044$^{\blacktriangledown}$	0.415	2.866§	5.443$^{\blacktriangledown}$
Concentration	16.06	1.231$^{\blacktriangledown}$	-0.003*	-	0.072§	0.008	0.004§	0.008$^{\blacktriangledown}$
	18.03	1.243$^{\blacktriangledown}$	-0.002	-0.0004	0.073§	0.003	0.004§	0.008$^{\blacktriangledown}$
Car theft								
Incidence	20.22	2.393$^{\blacktriangledown}$	-0.045§	-	0.010§	-0.730	2.816$^{\blacktriangledown}$	1.056$^{\blacktriangledown}$
	22.03	2.525$^{\blacktriangledown}$	-0.032$_{\S}$	-0.005$_{\S}$	0.010§	-0.794	2.739$^{\blacktriangledown}$	1.045$^{\blacktriangledown}$
Prevalence	21.46	2.046$^{\blacktriangledown}$	-0.048$^{\blacktriangledown}$	-	0.009$^{\blacktriangledown}$	-0.533	1.995$^{\blacktriangledown}$	0.710$^{\blacktriangledown}$
	24.22	2.222$^{\blacktriangledown}$	-0.032$^{*}{}_{\blacktriangledown}$	-0.007$^{*}{}_{\blacktriangledown}$	0.010$^{\blacktriangledown}$	-0.616	1.925$^{\blacktriangledown}$	0.685$^{\blacktriangledown}$
Concentration	14.29	1.126$^{\blacktriangledown}$	0.002	-	0.082§	-0.085§	0.002	0.016$^{\blacktriangledown}$
	19.05	1.095$^{\blacktriangledown}$	-0.001$_{*}$	0.001$^{\S}{}_{*}$	0.087§	-0.074§	0.002	0.015$^{\blacktriangledown}$
Burglary								
Incidence	17.67	3.085$^{\blacktriangledown}$	-0.089$^{\blacktriangledown}$	-	0.021$^{\blacktriangledown}$	0.010	4.905$^{\blacktriangledown}$	2.093$^{\blacktriangledown}$
	18.61	3.288$^{\blacktriangledown}$	-0.071$^{\S}{}_{\blacktriangledown}$	-0.008$_{\blacktriangledown}$	0.021$^{\blacktriangledown}$	0.008	4.848$^{\blacktriangledown}$	2.057$^{\blacktriangledown}$
Prevalence	16.43	2.414$^{\blacktriangledown}$	-0.065$^{\blacktriangledown}$	-	0.014$^{\blacktriangledown}$	0.174	2.362$^{\blacktriangledown}$	1.097$^{\blacktriangledown}$
	17.39	2.551$^{\blacktriangledown}$	-0.053$^{\S}{}_{\blacktriangledown}$	-0.005$_{\blacktriangledown}$	0.014$^{\blacktriangledown}$	0.111	2.337$^{\blacktriangledown}$	1.081$^{\blacktriangledown}$
Concentration	7.26	1.24$^{\blacktriangledown}$	0.002	-	0.088§	-0.012	0.004	0.018$^{\blacktriangledown}$
	7.69	1.25$^{\blacktriangledown}$	0.002	-0.0002	0.087§	-0.014	0.004	0.018$^{\blacktriangledown}$
Assault								
Incidence	2.73	6.151$^{\blacktriangledown}$	0.020	-	0.004	-0.935	2.539§	5.376$^{\blacktriangledown}$
	8.48	6.961§	0.092$^{*}{}_{\S}$	-0.028$^{\blacktriangledown}{}_{\S}$	0.003	-1.265	2.698§	4.749$^{\blacktriangledown}$
Prevalence	4.31	3.656$^{\blacktriangledown}$	0.001	-	0.004	-0.662	0.917§	1.838$^{\blacktriangledown}$
	9.93	4.137$^{\blacktriangledown}$	0.044$_{\S}$	-0.017$^{\blacktriangledown}{}_{\S}$	0.004	-0.859	0.980§	1.612$^{\blacktriangledown}$
Concentration	3.17	1.657$^{\blacktriangledown}$	0.007	-	-0.035	0.057	0.000	0.061
	3.81	1.680$^{\blacktriangledown}$	0.009	-0.001	-0.041	0.048	0.000	0.061

[a] FCC = Former Communist Country.

[b] Residual Variances.

* 0.05 < p-value ≤ 0.10; § 0.005 < p-value ≤ 0.05; $^{\blacktriangledown}$ p-value ≤ 0.005;

Superscripts refer to the p-value (level of statistical significance) of individual parameters and subscripts ($_{*}$, $_{\S}$, or $_{\blacktriangledown}$) to the p-value of Deviance for testing the statistical significance of non-linear trend which is chi-square distributed with two degrees of freedom. P-values for variances are based on one-tail critical values of the chi-square statistic.

Total number of observations 99. Non-weighted data.

This table presents an abridged version of the statistical output. A full version is available on request from the corresponding author.

Table 2: Estimated correlations of crime incidence rates based on multivariate multilevel trend (and baseline) model.

	Burglary	Theft from car	Car theft	Assault	Theft from person
	Between - Countries Estimated Correlation ($\hat{\rho}_{si}$) i,s=1,2, …,5				
Burglary	1.00				
Theft from car	0.40 (0.53)♥	1.00			
Car theft	0.64 (0.70)♥	0.44 (0.59)♥	1.00		
Assault	0.58 (0.55)§	0.32 (0.13)*	0.85 (0.72)♥	1.00	
Theft from person	0.92 (0.87)♥	0.51 (0.74)♥	0.51 (0.71)§	0.38 (0.28)♥	1.00
	Between - Years Estimated Correlation ($\hat{\rho}_{si}$) i,s=1,2,…,5				
Burglary	1.00				
Theft from car	0.43 (0.55)♥	1.00			
Car theft	0.30 (0.36)	0.23 (0.31)§	1.00		
Assault & threat	0.44 (0.40)*	0.58 (0.50)♥	0.03 (0.07)	1.00	
Theft from person	0.48 (0.56)♥	0.60 (0.69)♥	0.09 (0.15)	0.45 (0.46)♥	1.00

Notes: Non-weighted data.
Estimated correlation from multivariate multilevel models of crime incidence with linear for burglary and theft of car and non – linear trend for the other three crime types.

* $0.05 <$ p-value ≤ 0.10
§ $0.005 <$ p-value ≤ 0.05
♥ p-value ≤ 0.005

Table 3: Estimated correlations of crime concentration rates based on multivariate multilevel trend (and baseline) model.

	Burglary	Theft from car	Car theft	Assault	Theft from person
	Between - Countries Estimated Correlation $(\hat{\rho}_{si})$ *i,s=1,2, …,5*				
Burglary	1.00				
Theft from car	0.40 (0.59)	1.00			
Car theft	0.14 (0.27)	0.12 (0.21)	1.00		
Assault	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.00	
Theft from person	0.91 (0.92)♥	0.39 (0.72)	-0.04 (0.30)	0.00 (0.00)	1.00
	Between - Years Estimated Correlation $(\hat{\rho}_{si})$ *i,s=1,2,…,5*				
Burglary	1.00				
Theft from car	-0.03 (0.02)	1.00			
Car theft	0.08 (0.10)	-0.09 (-0.06)	1.00		
Assault	0.18 (0.18)	0.16 (0.14)	0.01 (-0.03)	1.00	
Theft from person	0.14 (0.12)	0.03 (0.04)	-0.07 (-0.13)	0.24 (0.22)♥	1.00

Notes: Non-weighted data.
Estimated correlation from multivariate multilevel models of crime concentration with non – linear trends.

* $0.05 <$ p-value ≤ 0.10
§ $0.005 <$ p-value ≤ 0.05
♥ p-value ≤ 0.005

Figure 1: International Trends in Crime Incidence 1988-2004 (model estimates)

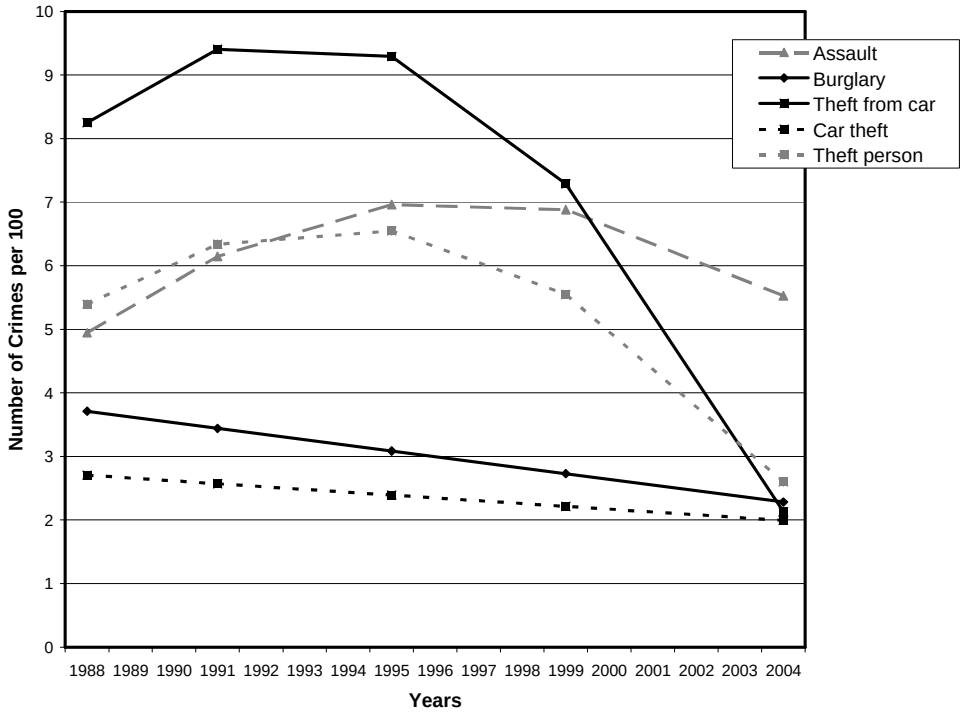


Figure 2: Indexed International Trends in Crime Incidence 1988-2004 (1988 value=100, model estimates)

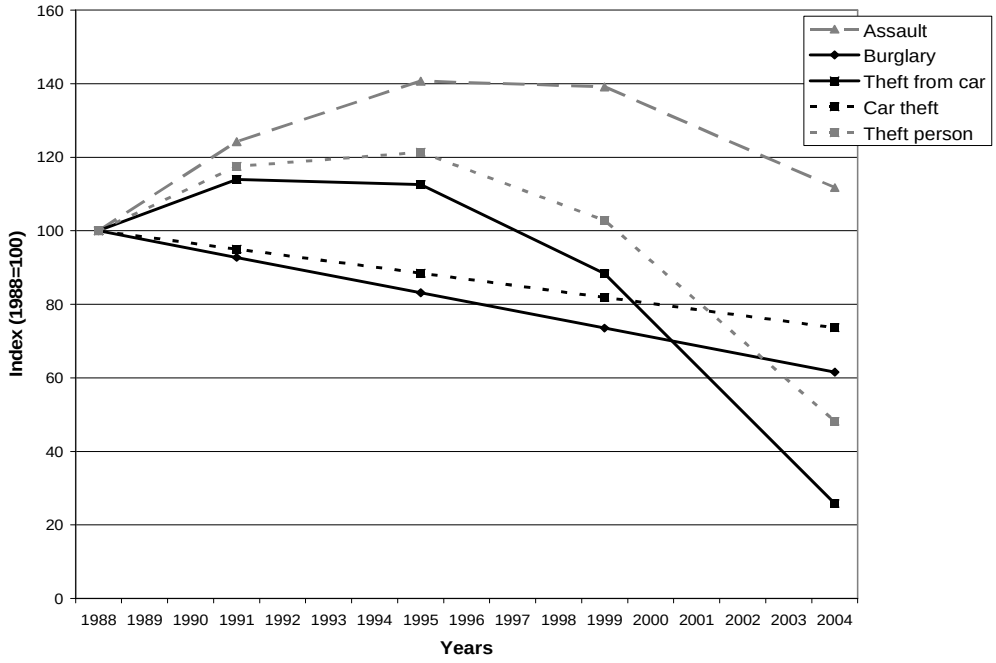


Figure 3: International Crime Falls 1995-2004
(Unadjusted and Adjusted)

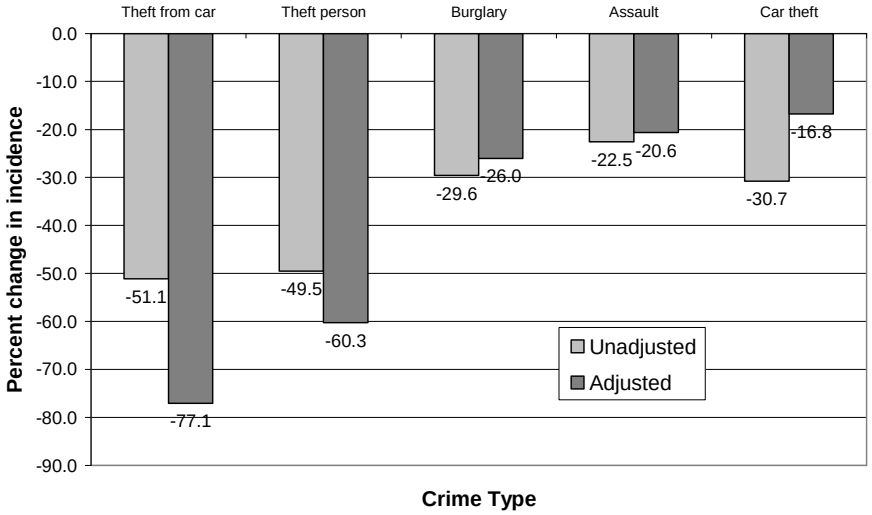
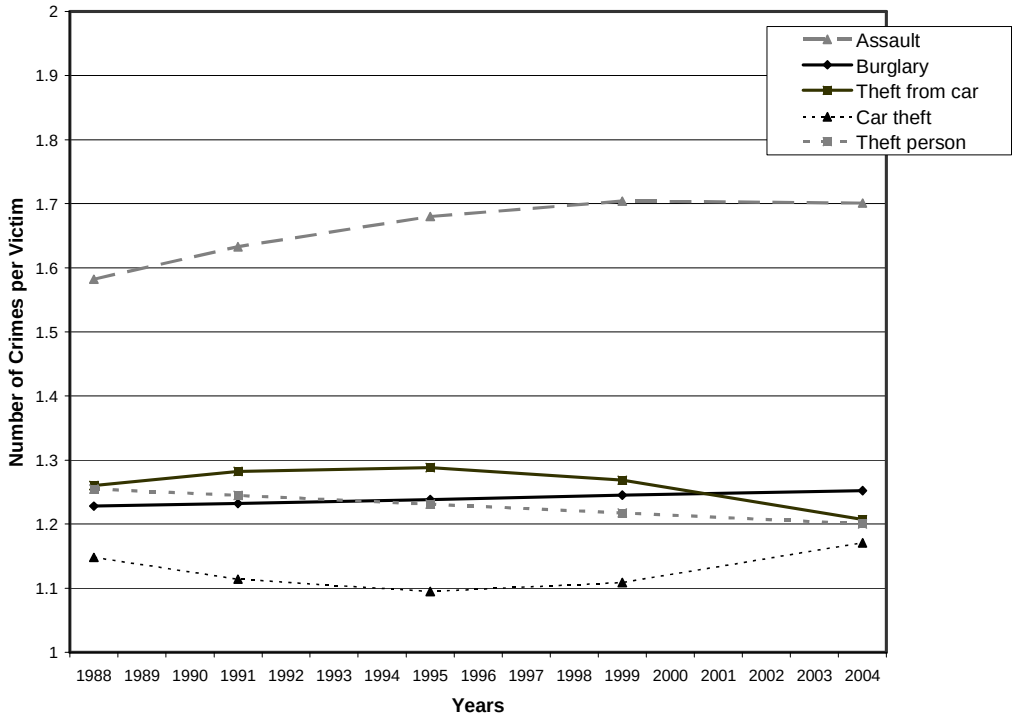


Figure 4: International Trends in Crime Concentration 1988-2004 (model estimates)



Technical Appendix:

Appendix Table 1: Countries meeting criteria for inclusion in the analysis

	ICVS year					Total
Country	1989	1992	1996	2000	2005	
Argentina	0	1	1	1	1	4
Australia	1	1	0	1	1	4
Belgium	1	1	0	1	1	4
Brazil	0	1	1	1	0	3
Bulgaria	0	0	1	1	1	3
Canada	1	1	1	1	1	5
Czech Republic	0	1	1	1	0	3
England & Wales	1	1	1	1	1	5
Estonia	0	1	1	1	1	4
Finland	1	1	1	1	1	5
France	1	0	1	1	1	4
Georgia	0	1	1	1	0	3
Hungary	0	0	1	1	1	3
Netherlands	1	1	1	1	1	5
Northern Ireland	1	0	1	1	1	4
Philippines	0	1	1	1	0	3
Poland	0	1	1	1	1	4
Russia	0	1	1	1	0	3
Scotland	1	0	1	1	1	4
Slovenia	0	1	1	1	0	3
South Africa	0	1	1	1	1	4
Spain	1	1	0	1	1	4
Sweden	0	1	1	1	1	4
Switzerland	1	0	1	1	1	4
Uganda	0	1	1	1	0	3
USA	1	0	1	1	1	4
Total	12	19	23	26	19	99

Appendix Table 2: Description of variables across countries and ICVS sweeps.

	Mean	Min[1]	Max	St. Deviation
Crime Rates				
Incidence (crimes per 100 population)				
Theft from person	7.44	0.00	33.43	5.55
Car theft[2]	2.43	0.00	10.64	2.22
Theft from car	12.34	0.00	44.05	8.51
Burglary	3.66	0.51	18.16	2.84
Assault	6.10	0.65	14.88	2.85
Prevalence (victims per 100 population)				
Theft from person	5.75	0.00	22.71	3.66
Car theft[2]	2.12	0.00	8.06	1.88
Theft from car	8.66	0.00	24.56	4.89
Burglary	2.81	0.34	13.74	1.99
Assault	3.66	0.43	8.40	1.69
Concentration (crimes per victim)				
Theft from person	1.25	1.00	1.82	0.12
Car theft	1.13	1.00	1.67	0.14
Theft from car	1.35	1.00	2.05	0.17
Burglary	1.27	1.00	1.74	0.15
Assault	1.67	1.14	2.65	0.25
Controls				
Percentage of over-sampling from main city	33.01	0.00	100.00	42.19
Former communist country	26.3	-	-	-

[1] Zero rates refer to Switzerland and Georgia (see also Van Dijk et al. 2007). Concentration rates for these countries have been given value 1, that is, the assumption that prevalence and incidence are equal and there is no repeat victimization.

[2] The rate of theft of car for Bulgaria in 2005 is an outlier (0.30) in the dataset and was replaced by the mean rate for the sweep.

Endnotes

[1] The 1992 data for the United States are not included because incidence crime rates were not available.
[2] Appendix 9 by Van Dijk *et al*. (2007) presents rates per 100 respondents by country and year. Car ownership is accounted for in their Figures 6 and 8 (pages 51 and 55) of national car theft and theft from car, respectively, in the main text and Table 9 of Appendix 9. The calculation of incidence and prevalence rates in the ICVS report (Van Dijk *et al*. 2007) differs slightly from ours in two respects: it does not ignore reported incidents outside the calendar year prior to the interview and weights data by population size (see Appendix 7, Van Dijk *et al*. 2007).
[3] The ICVS weights are based on population rather household representativeness (Van Dijk *et al*. 2007: 38-39) and therefore as most of the crimes considered here relate to property they are not appropriate.
[4] The distribution of these crime rates, especially theft of car, is skewed except for assault. No data transformation is however performed as country variability and city booster sample capture the skewness of aggregate rates.
[5] We replaced Bulgaria's seemingly erroneous outlier of 30 car thefts and victims per 100 car owners in 2004 with the cross-national means for sustaining the sample size, leaving South Africa as having the highest car theft in our sample. Models which omitted this case (Bulgaria 2004) showed similar estimates as the ones presented here but higher percentage of explained variance.
[6] Multilevel models (see e.g. Goldstein, 1995; Snijders and Bosker, 1999) have been applied to social research, including longitudinal data analysis. The annual crime rates per country which in our sample are three to five can be thought of as repeated observations within each country as they are expected to be correlated over time. The nature of the data set provides thereby a two level hierarchy and allows estimating the trajectories, namely the trends, of crime rates over the period from 1988 to 2004. MLM techniques are widely used to overcome ecological fallacy when observations are clustered within groups and associations may vary across units at different levels of aggregation (Goldstein 1995). A discussion of the statistical model and it's interpretation with reference to international crime rates may be obtained from the corresponding author. The empirical models below were estimated using the software package MLwiN v.2.0 via IGLS approximation.
[7] The statistical significance of linear trends is based on two-tailed Wald tests, that are χ^2 distributed with one degree of freedom, ($\chi^2(1)$). The statistical significance of non-linear trends is based on joint Wald tests, which are $\chi^2(2)$ distributed. The respective standard errors are not given for economy and they are available upon request.
[8] The multivariate multilevel model estimates the between and within countries (residual) associations across the five crime types by treating the joint dependent variables as a nested structure at the lowest level of the hierarchy (Goldstein 1995). This specification has three levels: the lowest links the five crime types, the second defines the year and the third denotes the country. The fixed effects, i.e. the intercept, trend and controls' estimates of the single – equation multilevel models and the multivariate multilevel model are effectively identical.
[9] The unadjusted correlations are derived from the baseline model whereby only the (random) intercept is fitted. For reasons which become evident in the next section the multivariate multilevel trend model assumes linear trend for burglary and theft of car and non-linear trend for the other three types.
[10] The trends based on the statistical models use the non-linear model for theft from car, theft of personal property and assault but the linear trend for burglary and theft of car. The constant rate of fall in crime per annum is indicated by the respective significant (negative) parameters for Time and non-significant parameters for Time^2.
[11] The modelled trends (Figures 1 and 2) are roughly similar to the changes of the raw mean incidence rates over time. The trends based on the raw data are sharper than their predicted counterparts because, as mentioned, they entail random sampling variation.
[12] The respective trends do not show any significant between-countries random variation (the specific statistical results are available upon request from the corresponding author).
[13] The persistent (residual) country variability of theft of personal property and theft from car is partly due to different ICVS sample types and otherwise (statistically) unexplained differences of crime rates of the former soviet countries. This is manifested by the large reduction of the relative between-countries variance of these two crimes when trend and, especially, the city and former communist country identification are incorporated in the respective models. The respective baseline models are available from the corresponding author.
[14] The zero between-countries variance suggests that the hierarchical specification is unnecessary for modelling assault concentration.

[15] Accounting for city booster reduces the association of theft of personal property with the two car thefts as well as that between burglary and theft from car.
[16] An interaction between trend and former communist country also showed no different trends of crime rates in these countries than elsewhere.
[17] City booster was entered into the incidence and prevalence models in percentage points and the models of crime concentration as sample proportions to ease interpretation of the results.
[18] The respective models with a random city parameter or an interaction between city and trend are available upon request. It is a possibility however lack of random country variation of trend and the other parameters may arise from the marginally adequate (for modeling) number of countries with three or more data points in the ICVS.