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Research Report

Development and validation of scientific indicators of the relationship between criminality, social cohesion and economic performance

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Development and Validation of Scientific Indicators of the Relationship Between Criminality, Social Cohesion and Economic Performance

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Wirtschaftsforschung GmbH

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Preface

The present publication is identical with the final report of the research project "Development and validation of scientific indicators of the relationship between criminality, social cohesion and economic performance" which has been commissioned and financed by the European Commission, Directorate-General Employment and Social Affairs.

The results obtained within the framework of the project do not necessarily represent the opinion of the European Commission nor can the Commission be held responsible for the contents of the study. The aim of launching the research project was to contribute to a better understanding of the interactions between criminality, economic performance, social cohesion and the socio-economic situation of the population. We have tried to achieve this aim by employing adequate multivariate statistical methods to European data from different levels of regional disaggregation. When interpreting our empirical results, it has to be taken into account that the estimated coefficients of some variables might be affected by the use our regional data set. Since the Commission was primarily interested in the use of replicable official data, no individual survey data have been collected. Thus, some results might suffer from unobservable heterogeneity or the omission of relevant (but unavailable) variables. In the project report as well as in the present paper, we have made all potential results of this nature quite clear by hinting at these problems (see, for instance, the interpretation of crimes committed by "foreigners"). In spite of the fact that empirical investigations are performed with great care, it seems advisable to make this note of caution, because otherwise superficial reading might lead to potential misinterpretations. Moreover, it might be important to note that channels of influence are crime-specific. This implies that for types of crime which are not subject of our study, as, for instance, white-collar and organised crime, no conclusions can be drawn.

Non technical summary

According to the European Parliament, unemployment, social disintegration, the lack of an integrative policy, and the worsening of urban services and living conditions cause frustration and despair, especially among economically and socially disadvantaged groups, and constitute unfavourable conditions that might lead to delinquent behaviour. Furthermore increasing poverty and inequality are supposed to be crime-enhancing factors. Based on this view, the European Commission has put out to tender a research project titled "Development and validation of scientific indicators of the relationship between criminality, social cohesion and economic performance" which has been executed by ZEW during the period 1/12/1998 – 29/2/2000. The present publication provides the results obtained from this project.

The study intends to contribute to a better understanding of the interactions between criminality, economic performance and social cohesion. We try to achieve this aim by evaluating the existing economic and criminological research (with a special focus on quantitative research) and by carrying out own empirical investigations on the basis of a panel consisting of national time series from the 15 EU member states, an international cross-section of nations and an unique set of regional panel data originating from eight EU member states.

Our empirical results about causes of crime reveal the crime reducing potential of intact family values. A smaller number of divorces and earlier marriage significantly reduce delinquency. By the same token, less efficient child care as a consequence of lacking family cohesion might explain the crime enhancing effects found for increasing female labour force participation rates. Further evidence supporting the interdependence of crime and the labour market show up in significant parameter estimates for indicators of unemployment, fixed-term contracts and part-time working. Furthermore, we find that higher wealth is associated with higher property crime rates and more drug-related offences, and that in turn drug offences foster the incidence of property crime.

Compared to studies assessing causes of crime, investigations on its consequences are rare. In order to contribute to the closure of this gap, a special focus of our analysis is to investigate the impact of crime on economic performance. Using highly disaggregated regional data we find evidence that employment as well as GDP growth rates are negatively affected by the

incidence of criminality. Interestingly, this result does not show up when the analyses are performed with data from the national level.

Regarding the importance of social cohesion on criminality and the strong evidence of reversal effects of crime on economics, one may conclude that fighting crime should not only be a matter of domestic policy, but also of social policy and of selfish economic interests, i.e. of economic policy.

Development and Validation of Scientific Indicators of the Relationship Between Criminality, Social Cohesion and Economic Performance

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Abstract. The study intends to contribute to a better understanding of the interactions between criminality, economic performance and social cohesion. We try to achieve this aim by evaluating the existing economic and criminological research and by carrying out own empirical investigation on the basis of international panel data sets from different levels of regional aggregation. Our empirical results with respect to the causes of crime clearly reveal the crime reducing potential of family cohesion and the link between crime and the labour market. Furthermore, we find that higher wealth is associated with higher rates of property crime and of drug-related offences. Drug offences themselves turn out to be robust factors of property crimes. Compared to studies assessing the causes of crime, investigations on its consequences are relatively rare. In our analysis, we investigate the impact of crime on economic performance. We find evidence that employment as well as GDP growth rates are negatively affected by the regional incidence of criminality.

Key words: Crime, socio-economic factors, demographics, European panel data
JEL Classification: K42

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Contents

1 Introduction

The present study "Development and validation of scientific indicators of the relationship between criminality, social cohesion and economic performance" is organised in three parts. In the first part (Section 2), the most significant empirical crime research with respect to socio-economic causes, interactions and consequences of crime is first summarised and then condensed to a (large) set of crime-related indicators. This set of scientifically relevant indicators serves as an input for the subsequent parts of the study.

In the second part (Section 3) a parameterised indicator model is specified, which on the one hand allows forecasts of the future incidence of crime and on the other hand enables us to assess the consequences of crime on economic performance. On the basis of the primary indicators identified in Section 2 we are going to derive socio-economic indicators of crime and criminality indicators of economic performance. It is extensively discussed why our approach is based on the multivariate statistical analysis of panel data.

In the third part (Section 4) the parameterised indicator model developed before is validated by means of data from the EU member states. We are going to asses the determinants of criminality as well as the consequences of higher crime rates for GDP and employment growth with respect to variety of criminal offences (e.g. murder, rape, serious assault, robbery, theft of motor cars, fraud and drug offences). In order to reach the highest possible degree of reliability, we consider data from three different levels of regional disaggregation (NUTS 0, NUTS 2 and NUTS 3). Such a proceeding is recommendable in order to check the *robustness* of the findings, since empirical crime research in general and international crime research in particular have to cope with many problems which might negatively affect the quality of the estimation results (e.g. different shares of unreported crimes over time and/ or across regions, omitted variables due to limited data availability, country specific rules of crime registration etc.).

The study concludes with Section 5 where the central results of our research project are briefly summarised.

2 Summary of recent research on socio-economic causes, interactions and consequences of crime, and the presentation of crime related indicators

Empirical crime research employing sophisticated (i.e. multivariate) statistical methods emerged about 25 years ago with the seminal paper "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation" by the economist Isaac Ehrlich (1973). Until today hundreds of multivariate crime studies have been produced by researchers from many different scientific disciplines like sociology, law, psychology, political science and economics which are based on a wide variety of data sets and statistical methods. This variety, however, seems to vanish, once origin and main object of this research are taken into account: The vast majority of contributions to quantitative crime research stems from Anglo-Saxon - especially US-American - researchers and deals with the causes of crime.

Considering origin first, significant quantitative contributions of criminologists from Continental Europe seem to be relatively rare. This can be inferred from a paper by Cohn and Farrington (1994) who have ascertained the most-cited authors (self-citations excluded) in four major criminological journals with a main focus on the causes of crime and the processing of offenders. Among the 20 most cited authors there are 12 Americans, 5 Englishmen, 1 Australian, 1 Canadian and 1 Irishman.[1] Since economists who investigate crime do not normally publish in these exclusively criminological journals which are dominated by sociologists, law professors and psychologist, the influence of their origin is not present in the study of Cohn and Farrington (1994). Unfortunately, US-American economists do even worse in this non-comparison than US-criminologists.[2] The consequence of these facts for the non-present study is that we have to rely mainly on evidence from the United States.

On what concerns the focus of the empirical crime-literature, we must conclude that more than 90 per cent of all studies under investigation deal with questions concerning causes of crime. In contrast to that, the number of studies investigating the consequences of crime and / or its interactions with other variables is rather small. This ongoing specialisation might be

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[1] It should be mentioned, however, that this result is biased in favour of the Non-Americans since the evaluation is not based on the four major criminological journals in the world, which are all US-American, but on one US-American, one Canadian, one British and one Australian journal.

[2] Peculiarly economists remain "economists" even if crime is their main field of research. In contrast to that, academics from other disciplines are called "criminologists" when specialising in research on delinquency.

due to the fact that there is still no full agreement neither on the determinants of crime nor on their relative importance.

By investigating a large number of recent papers in leading criminological, sociological and economic journals and by considering significant monographs and anthologies we do not only hope to identify the most important determinants of crime, but also want to shed some light on the causes of possible ambiguities.[3] As far as the summary of the major contributions on socio-economic interactions and consequences of crime is concerned, the relatively low number of studies enables us to seek completeness.

Since the authors of this report are economists and have already been engaged in crime research for several years, the contributions in leading economic journals (*The Journal of Political Economy*, *The Quarterly Journal of Economics*, *The American Economic Review* etc.) which are related to the topic under investigation can be regarded as fully covered from the onset of economic crime research in the late sixties (see Becker 1968).

Compared with economics, crime research is much more popular among sociologists, psychologists and law professors - at least until today. In order to capture the non-economic contributions adequately, it is advisable to investigate criminological journals, since these bring together the work of crime researchers from all other disciplines. The major criminological journals (see Cohn and Farrington 1994) are *Criminology*, *The Journal of Quantitative Criminology*, *Journal of Research in Crime and Delinquency*, *The Journal of Criminal Law and Criminology* and *British Journal of Criminology*, among which *Criminology* and *The Journal of Quantitative Criminology* have a main focus on quantitative research. These journals have been systematically searched for relevant papers since 1990.

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[3] The diversity in empirical findings stems from theoretical and empirical reasons. The results are influenced by theoretical considerations, because included variables, imposed causality and the structure of estimated equations rely on theory. Since there is a wide variety of more or less distinct crime theories (see Sections 2.1.1-2.1.8) it is a logical consequence that the estimation results will also show a certain variation. In estimation practice, however, "[...] these theories share many of the same independent variables" (Agnew 1995:363). Thus, empirical reasons seem to be more important for the discrimination between possibly conflicting results. Empirical studies might vary with respect to the starting-point of data collection (official institutions, (potential) offenders or victims), the degree of data aggregation (individual or aggregated data), the dimension of the data (panel, cross-sectional or time-series data), the choice of the dependent (different crime categories, initiation or continuation) and independent variables and the statistical method applied to the data. For example, estimation coefficients of unemployment variables seem to be very sensitive with respect to the type of data used. Whereas most theories predict a crime-enhancing impact of unemployment, the results – especially in macro studies - are often inconclusive or even in conflict with intuition.

Since quantitative crime research is a domain of sociologists, many of their contributions are also published in generally oriented sociological journals, among which *American Sociological Review* and *The American Journal of Sociology* are the most important ones. These journals have been searched since 1985.

Apart from the systematic investigation of the leading criminological and sociological journals, we have also closely examined other promising sources obtained from an intensive electronic databank search, and by e-mail and postal questioning of national and international experts in the field of quantitative crime research.

2.1 Summary of recent research activities on causes of crime, and interactions between crime, social cohesion and economic performance

Since today the empirical literature on crime has reached an enormous extent, it is recommendable that a survey is structured in some way. This can be done, for example, with regard to underlying theories. Apart from the aspect of structure, this proceeding contributes to a better insight into the reasons of different empirical specifications and helps us to understand why some empirical studies are carried out on the individual level and others on the aggregate level. Hence, in this section we introduce the most important theories of crime together with major empirical studies building on them. The theories under consideration are the following:

- Social disorganisation theory (Shaw and McKay 1942),
- lifestyle/ routine activity theory (Cohen and Felson 1979),
- economic rational choice theory (Becker 1968, Ehrlich 1973),
- differential association/ social learning theory (Sutherland 1942, Akers 1977),
- social control theory (Hirschi 1969),
- self-control theory (Gottfredson and Hirschi 1990),
- strain theory (Cohen 1955),
- interactional theory (Thornberry 1987).

By far not all empirical crime research relevant to the present study is explicitly testing crime theories, but rather investigating special topics like unemployment, poverty or inequality. In order to provide a reasonable survey of the literature, we have chosen the following additional structuring scheme:

- Wealth, economic growth and economic system,
- poverty and inequality,
- labour market,
- social security,
- family,

- peers and gangs,
- social class,
- mobility and community change,
- age, gender and nationality/ race,
- urbanity,
- law enforcement,
- private crime prevention,
- media,
- religion/ religiosity,
- weather.

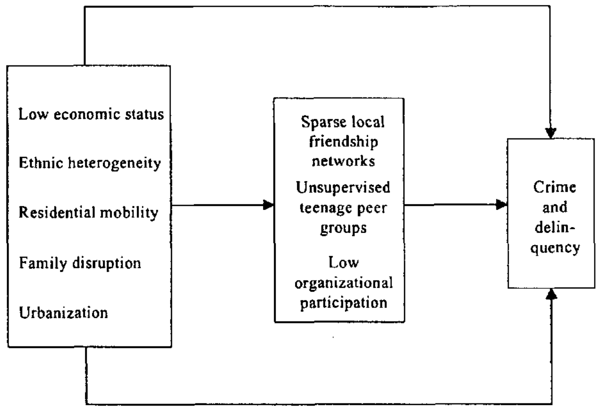
It has to be stressed that for the present study the interactions between crime, social cohesion and economic performance are of special interest. To cope with this task, one of the items mentioned above (interactional theory, see Section 2.1.8) is exclusively devoted to this subject. Provided that relevant studies have been found, interactions are, of course, also considered under the other structuring items.

2.1.1 Social disorganisation theory (Shaw and McKay 1942)

According to Shaw and McKay (1942) " [...] three structural factors – low economic status, ethnic heterogeneity and residential mobility – led to the disruption of community social organisations, which in turn accounted for variations in crime and delinquency rates. [...] The disorganisation approach is grounded in [...] the systemic model, in which the local community is viewed as a complex system of friendship and kinship networks, as well as formal and informal associational ties rooted in family life and ongoing socialization processes [...]. From this view, both social organization and social disorganization are inextricably tied to systemic networks that facilitate or inhibit social control" (Sampson 1997:228). In the meantime the theory has been extended by the factors "family disruption" and "urbanisation". Its updated version can be gathered from Figure 1.

Following this theory, delinquency emerges as a consequence of undesirable developments at the community/ neighbourhood level. Thus, the social disorganisation approach can be considered a macro-theory of crime and is thus predestined to be tested at this level of aggregation. Since in the empirical part of the present report (see Section 4) the macro level will be the relevant one, an important stimulus from the social disorganisation theory can be expected. This leads us to discuss the empirical implications of this theory more specifically.

Figure 1: Causal model of extended version of social disorganisation theory



Source: Sampson and Groves (1989).

The first empirical test of the social organisation theory was performed by Sampson and Groves (1989) using data from 238 localities in Great Britain constructed from a 1982 national survey of 10,905 residents. The authors also provide evidence based on 300 localities of 11,030 residents from a survey of 1984. Their (weighted-least-squares) regression estimates strongly support social disorganisation theory as can be inferred from Table 1 where the results are presented in a simplified form.

The most important factors which foster crime (measured as the community crime rates according to victimisation surveys) are family disruption, urbanisation and peer groups. Significant determinants of crime reduction are organisational participation and the density of friendship. Thus, Sampson and Groves (1989:799) have "[...] demonstrated that social organisation theory has vitality and renewed relevance for explaining macro-level variations in crime rates". Another interesting implication of the results is that estimation quality improves with respect to crime categories: from crime against objects (vandalism) via violence against the person (stranger violence, assault) to property crime (robbery, burglary, auto theft).

Whereas Sampson and Groves (1989) used cross-sectional data for British localities Miethe, Hughes and McDowall (1991) carried out their estimations using cross-sectional time-series (or panel) data from 584 US cities for the years 1960, 1970 and 1980. Another difference lies in the use of official (police) rather than victimisation data and the simultaneous evaluation of social disorganisation and lifestyle/ routine activity theory (the latter will be discussed in Section 2.1.2). It is striking that the disorganisation variables (depicted in bold letters in Table 2) perform perfectly in accordance with theory. Ethnic heterogeneity and the home-overcrowding variable have a positive significant impact on homicide, robbery and burglary rates, whereas institutional control (degree of community supervision and attachment to or involvement in traditional institutions) has the expected negative signs. Residential mobility estimates - with exception of homicide – also support the theory.

Table 1: Simplified representation of estimates from Sampson & Groves (1989)

Dependent variables / Independent variables	1982						1984			
	Mugging/ Street Robbery	Stranger Violence	Total Victimisa-tion	Bur-glary	Auto Theft	Van-dalism	Bur-glary	Van-dalism	Rob bery	As-sault
Socio-economic status	0	0	0	(+)	(-)	-	+	-	0	0
Ethnic heterogeneity	+	0	0	+	0	0	0	0	+	+
Residential stability	0	0	0	0	(-)	-	0	0	0	0
Family disruption	(+)	+	+	+	+	0	(+)	0	+	(+)
Urbanisation	+	0	+	+	+	0	+	0	+	0
Local friendship networks	-	0	-	-	0	0				
Unsupervised peer groups	+	+	+	+	+	+				
Organisational participation	(-)	-	-	-	-	0				
Street corner peer groups							+	+	+	+
Density of friendship							-	0	-	(-)

Source: Sampson and Groves (1989), own representation.
Note: "+" ("-") represents positive (negative) coefficients which are significant at the 5%-level, "(+)" ("(-)") represents positive (negative) coefficients which are significant at the 10%-level, "0" indicates insignificance, empty cells indicate that the corresponding variable was not included in the estimation.

In an additional test Miethe et al. use changes in crime rates as dependent variables. The estimated coefficients still support the disorganisation theory, though significance is somewhat decreasing, a phenomenon often found in empirical research which is due to the elimination of spurious trend factors.

Table 2: Simplified representation of estimates from Miethe et al. (1991)

Dependent variables / Independent variables	Homicide	Robbery	Burglary
Unemployment rate	+	0	(+)
Ethnic heterogeneity	+	+	+
Residential mobility	0	+	+
Institutional control	-	-	-
Female labour-force participation	-	(-)	-
Workers using public transportation	+	+	0
Retail sales from eat/ drink establishments	0	0	+
Median family income	0	0	0
Mean household size	-	-	-
More than one person per room	+	+	+

Source: Miethe, Hughes and McDowall (1991), own representation.
Note: see Table 1.

In another study Warner and Pierce (1993) test the social disorganisation theory by means of 1980 cross-sectional data from 60 Boston neighbourhoods using calls to the police as dependent variable. According to Warner and Pierce (1993:512) calls to the police data have advantages in comparison to victimisation or official data: "Unlike the majority of victimisation data, call data can be easily aggregated to the neighbourhood level and they are not biased by respondents' unwillingness to report certain types of incidents to interviewers. Unlike official data, the call data used here are not influenced by biases introduced by police definitions of, and responses to, crime". In addition to the "classical" variables of the theory measuring low economic status, ethnic heterogeneity and residential mobility as well as family disruption and population density, Warner and Pierce investigate the impact of interaction effects between crucial independent variables. Their results are depicted in Table 3, where columns indicated with "1" contain the starting equations, columns 2 the starting specifications with interaction effects added, and columns 3 the final equations with an additional family disruption and population density variable, but without variables that show insignificance in estimations 2. The results are not as appealing as those from the two studies discussed before. Poverty performs in accordance with theory, but mobility has unexpected negative signs in the regressions for assault and is found insignificant in the burglary estimations. Heterogeneity is only positive and significant for burglary and insignificant otherwise. Likewise, family disruption and population density which are added in specifications 3 remain insignificant. Interaction variables perform badly. They are often insignificant and if not they have unexpected signs.

Table 3: Simplified representation of estimates from Warner and Pierce (1993)

Dependent variables Independent variables	Assault (1)	Assault (2)	Assault (3)	Robbery (1)	Robbery (2)	Robbery (3)	Burglary (1)	Burglary (2)	Burglary (3)
Poverty	+	+	+	+	+	+	+	+	+
Mobility	-	-	-	+	0	0	0	0	
Heterogeneity	0	0	0	0	0		+	+	+
Poverty x Mobility		-	0		-	-		0	
Poverty x Heterogeneity		-	-		0			-	-
Mobility x Heterogeneity		0			0			0	
Per cent female-headed household with children			0			+			+
Structural Density			+			+			0

Source: Warner and Pierce (1993) , own representation.
Note: see, Table 1.

Recently, Sampson (1997) has assessed the social disorganisation theory by means of data collected by the Project on Human Development in Chicago Neighborhoods (PHDCN). This so called "accelerated longitudinal data set" consists of data from 343 Chicago neighbourhood clusters which are initially collected at the individual level. The estimation results presented in Table 4 support theoretical predictions with only one exception (residential stability is found insignificant). Robustness of the results has been checked by introducing the lagged crime rate to the model.

In order to summarise, it can be stated that measures of social disorganisation like ethnic heterogeneity, family disruption and population density/ urbanisation perform well in explaining delinquency. Mobility variables, however, do not always perform as expected - estimates often turn out to be insignificant and in one case even counterintuitive (see Table 3). Weak results for mobility can also be observed in the paper of Smith and Jarjoura (1988). This study is based on cross-sectional victimisation data of 1977, which covers 57 neighbourhoods in three Standard Metropolitan Areas (SMSAs). In their violent crime regression Smith and Jarjoura find the expected sign and significance for poverty and racial heterogeneity but insignificance for mobility.

Nevertheless, social disorganisation seems to be a powerful approach to investigate crime at the macro-level. Collecting evidence from several studies using different data sets has proved to be a suitable way to develop stylised facts about the effects of particular factors of crime. We will follow this strategy throughout the entire study, even though in a less extensive manner.

Table 4: Simplified representation of estimates from Sampson (1997)

Dependent variables / Independent variables	Delinquency	Delinquency
Structural disadvantage	+	+
Ethnicity/ immigration	+	+
Residential stability	0	0
Child social control	-	-
Lagged crime rate		0

Source: Sampson (1997), own representation.
Note: see Table 1.

Finally, some remarks about the effects of crime on social cohesion and economic performance are appropriate. Skogan (1991) provides a list of far-reaching consequences of crime for social and economic organisations:

- Physical and psychological withdrawal from community life,
- weakening of the informal social control processes that inhibit crime,

- decline in the organisational life and mobilisation capacity of the neighbourhood,
- deteriorating business conditions,
- importation and domestic production of delinquency and deviance,
- further dramatic changes in the composition of the population.

Unfortunately, the number of interactional studies – especially at the macro level - is rather small. However, the existing literature provides clear evidence in favour of the assumption that crime and social cohesion are reciprocally related. One of the central findings is that crime generates a fear of strangers and a turning away from participation in community life (Skogan 1986 and 1991 and Rosenbaum 1991). In addition, it has been shown that increasing crime rates and concerns about safety lead to out-migration (see, for instance, Bursik 1986). Skogan (1991) also found that high rates of crime and disorder were associated with higher rates of fear, neighbourhood dissatisfaction, and intentions to move out. Moreover, in a study of Dallas neighbourhoods, Katzman (1980:278) found that the rates of property crime were linked. The aforementioned results are all based on neighbourhood level data, but can also be replicated at the city level. Using data from the 55 largest U.S cities, Sampson and Wooldredge (1986) reported that crime rates were negatively related to the population change from 1970 to 1980. As a general conclusion based on studies assessing the interactions of crime and social cohesion, it can be recorded that "crime itself can lead to simultaneous demographic 'collapse' and a weakening of the informal control structures and mobilization capacity of communities, which in turn fuel[s] further crime" (Sampson 1995:203). Further evidence on the consequences of crime for out-migration from central cities is provided in Sections 2.1.18 and 2.2.3.

2.1.2 Lifestyle/ routine activity theory (Cohen and Felson 1979)

The fundamental axiom of lifestyle/ routine activity theory is that a successful criminal violation involves three essential parts: an offender who is willing to commit a crime, a suitable target (person or property) to be victimised by the offender, and the absence of third parties ("guardians") capable of preventing the violation (Cohen and Felson 1979). Therefore lifestyle aspects like going out in the evening and routine activities which "involve greater or lesser amounts of time spend within the confines of the immediate household" (Messner and Blau 1987:1037) are supposed to have a significant impact on the incidence of crime by altering opportunities in the above mentioned context. Lifestyle/ routine activity theory is not a pure micro or macro theory, thus it can also be tested at either level. More recent tests at the macro-level have been performed by Messner and Blau (1987), Miethe, Hughes and McDowell (1991) and Roncek and Maier (1991). Corresponding micro-evaluations are presented by Miethe, Stafford and Long (1987), Miethe, Stafford and Sloane (1990), Osgood, Wilson, O'Malley, Bachman and Johnston (1996) and Tremblay and Tremblay (1998).

Considering macro-studies first, Messner and Blau (1987) investigate the influence of routine activities on 7 types of crime (homicide, rape, robbery, aggravated assault, burglary, larceny, auto theft) using 1982 cross-sectional data from 124 U.S. Standard Metropolitan Statistical Areas (SMSAs). Their routine activities variables are a nonhousehold index intended to represent the extent of leisure activities (measured by the supply of sports and entertainment establishments) and thus the extent of the exposure to potential risks and a TV viewing index (measured by the populations' mean TV viewing intensity). Apart from these variables, Messner and Blau control for poverty, race, population size, gender and age. In the regression analysis both routine activity variables perform in accordance with the theory, i.e. crime-enhancing effects for the non-household index and crime reducing-effects for the TV viewing index are found. The coefficients are always significant at the 5% level with only two exceptions - TV viewing does not significantly influence homicide and non-household activities have no impact on auto theft.

Another macro study is the one by Miethe, Hughes and McDowall (1991), which has already been introduced in the previous section. Reconsidering Table 2, all variables other than those in bold type can be interpreted in the sense of lifestyle/ routine activity theory: Higher unemployment and mean household size increase guardianship, higher female labour-force participation reduces guardianship and more often exposes women to potential dangers, more workers using public transportation services mean more potential targets in dangerous places, retail sales from eat/ drink establishments say something about the extent of public leisure activities, and median family income represents a measure of attractiveness of targets. Considering estimated coefficients, only mean household size is in accordance with theory for all three crime types. Public transportation performs well for homicide and robbery and is insignificant for burglary, whereas the opposite applies to retail sales. Median family income is always insignificant. Finally, unemployment and female labour participation rather contradict the lifestyle/ routine activity theory.

A very impressive study devoted to the lifestyle/ routine activity theory is that of Roncek and Maier (1991). They use cross-sectional data from 4,396 residential blocks of Cleveland in 1980. "City blocks are the smallest geographical units for which data on population and housing are available" (Roncek and Maier 1991:731). The authors have 10 crime variables and 16 independent variables at their disposal. The independent variable they are most interested in is the number of recreational liquor establishments (i.e. taverns and cocktail lounges) which is presumed to be connected to the lifestyle/ routine activity theory for several reasons. "First, patrons of such businesses are likely to have cash with them and thereby present opportunities for crime, especially if they become intoxicated.[...] Second, the customers of taverns and lounges are likely to have cash on hand and also have desirable goods[. ...] Third, intoxicated individuals may engage in behaviours different from those they exhibit when sober.[...] Forth, [...], these businesses can and do draw individuals to areas in which they may not reside.[...] Finally,[...] these businesses might attract a clientele among whom can be potential offenders" (Roncek and Maier 1991:726). The taverns or lounges variable shows significance in each of the 10 regressions (the dependent variables are murder, rape, robbery, assault, burglary, grand theft, auto theft and the aggregated categories violent crime, property crime, all index crime) even when controlling for 15 other variables. Thus, the lifestyle/ routine activity theory is strongly supported.

The following four studies evaluate the lifestyle/ routine activity theory at the micro-level. Miethe, Stafford and Long (1987) use victimisation data of 107,678 residents in thirteen U.S. cities. Their lifestyle/ routine activity variables are "frequency of night time activity" (dummy variable, which is 1 if the individual goes out late at least once a week and 0 otherwise) and "major daily activity" (dummy variable, which is 1 if the individual is employed or goes to school and 0 otherwise). The dependent variables are violent and property crime victimisation. In the estimation of violent victimisation, the night activity variable is positive and highly significant (i.e. going out at night increases the risk of victimisation). The indicator of daily activity, however, turns out to be insignificant. For property victimisation both lifestyle/ routine activity variables are found to have a highly significant and crime enhancing effect.

Miethe, Stafford and Sloane (1990) use a panel of 33,773 individuals and 19,005 households from two separate National Crime Survey Projects (a survey of eight cities and a survey of the five largest U.S. cities) at two points in time. The panel structure of the data allows them to investigate whether changes in lifestyles are associated with changes in individuals' risks of personal (i.e. assault with theft or a personal larceny) and property victimisation (i.e. attempted or completed burglary). Miethe et al. find that higher daytime and night-time activities outside home as well as decreases in the number of household members are accompanied with an increased risk for both types of victimisation. They also find that individuals who maintain high levels of night-time activities are also more likely to be victims during both time periods. However, Miethe et al. (1990:357) have to admit that "'active' lifestyle changes (increased precautionary actions) did nor have their expected impact on reducing victimization risks, and several other changes over time also were inconsistent with expectations".

Osgood et al. (1996) use a U.S. panel of 1,700 18- to 26-year-old individuals including five waves of data. They investigate the influences of 13 types of lifestyle/ routine activities on 5 types of deviant behaviour. The routine activities are arranged in the three groups "unstructured socialising" (containing "ride for fun", "visit with friends", "go to parties" and "evenings out"), "other activities outside home" ("go on dates", "go to movies", "community affairs", "active sports" and "go shopping") and "at-home activities" ("work around house", "watch TV", "relax alone" and "read book or magazine"). The five types of deviant behaviour (or dependent variables) are "criminal behavior", "heavy alcohol use", "marijuana use", "other drug use" and "dangerous driving". The fixed effects regression results strongly confirm the positive effect of unstructured socialising variables on deviant behaviour of any type – from 20 coefficients (5 dependent times 4 independent variables) 16 carry the right sign and are significant at the 5%-level, only two coefficient estimates are found to be insignificant. For the two other groups of independent variables less significant estimates are found. One exception from this is "work around house" which has a significant negative impact on heavy alcohol use, marijuana use and dangerous driving.

In another paper, using Montreal police data from 1992 and 1993, Tremblay and Tremblay (1998) support the lifestyle/ routine activity theory by showing that public transportation has an important effect on the incidence of interracial violent offences. According to the authors, the explanation of this phenomenon is that public transportation brings together social groups with unequal offending rates who usually are quite segregated. By these means a criminal potential emerges, which otherwise would be absent. Tremblay and Tremblay (1998:295) conclude that "such findings suggest that patterns in the circulation of people and property in social space [should] be added to the limited list of basic antecedent determinants of aggregate crime distributions".

Summarising the results from the empirical assessments of the lifestyle/ routine activity theory, it can be recorded that measures of public leisure activity, at-home staying and circulation of people and property can contribute a great deal to understand the incidence of crime. This applies to micro studies as well as to macro settings. However, not all variables which are potentially related to the lifestyle/ routine activities of individuals are suitable measures in an empirical investigation, because their meaning in terms of other theories might be more important (the unemployment rate might be a good example).

Unlike all other theories which will be discussed subsequently, social disorganisation and lifestyle/ routine activity theory shift the attention away from the personal histories of offenders – but they do this for different reasons. Whereas the social disorganisation theory sees the cause of crime in the decay of social institutions at the community level, the lifestyle/ routine activity theory explains crime by means of opportunities presented by the routine activities of everyday life.

2.1.3 Economic rational choice theory (Becker 1968, Ehrlich 1973)

The economist and noble prize winner of 1991 Gary S. Becker has added a very important and provoking theory to the understanding of crime. According to Becker (1968:176) "a person commits an offense if the expected utility to him exeeds the utility he could get by using his time and other resources at other activities". The innovative element of this assumption is that it can dispense with special theories of anomie, psychological inadequacies or inheritance of special traits. Instead criminals are regarded as normal persons who commit crimes not because their basic motivation differs from that of other persons, but because their benefits and costs differ (Becker 1968:170). It should be mentioned, however, that Becker's major intention was not the development of a new theory of delinquent behaviour but rather a guideline of how to minimise social losses from crime. The obvious prove for this claim is the fact that Becker developed the microeconomic theory of crime in a footnote. Nevertheless, it was this by-product which attracted the great attention of academia and influenced countless subsequent theoretical and empirical papers.

According to Becker's theory, individuals form expectations about the utility that could be gained from committing a crime. The potential offender assesses the potential loot, the probability of being arrested and convicted and the severity of the punishment which would follow the conviction. If he[4] comes to the conclusion, that the expected utility from committing the crime is higher than the known utility from using his time otherwise (e.g. for legal work), the crime will be committed, otherwise the possibility will be rejected. From this calculus Becker derives the so-called supply of offences function which is "relating the number of offenses by any person to his probability of conviction, to his punishment if convicted and to other variables, such as the income available to him in legal and other illegal activities, the frequency of nuisance arrests, and his willingness to commit an illegal act" (Becker 1968:177). The core of the theory is that state authorities may influence individual crime decision, and thus the supply or incidence of crime by increasing the probability of conviction (more police) or the severity of punishment (higher fines, longer terms of jail). Since the probability of conviction and the severity of punishment are negatively related to the expected utility from crime, after a perceived rise in their magnitudes, potential offenders will more often come to the conclusion that crime is not rewarding, since the expected utility of an offence will more often fall short of the utility from other non-delinquent activities.

Becker's theory was very influential, though it has certain shortcomings such as the missing microeconomic link between the crime decision and the supply of offences, the missing long-term considerations, and the neglect of influences on the crime decision other than the probability of conviction and severity of punishment. Further developments of Becker's theory took account of microeconomic time allocation models (Ehrlich 1973, Heinecke 1978, Wolpin 1978 and Schmidt and Witte 1984) and introduced norms and tastes (Block and Heineke 1975, Heineke 1978, Schmidt and Witte 1984, Eide 1994 and Ehrlich 1996).

The most significant contribution following Becker's seminal paper is the one of Ehrlich (1973). He extends the criminal choice model by considering a time allocation model with fixed leisure time in which, at the beginning of a period, the individual splits up his time budget into legal work and illegal activities. By these means, the difference between legal and illegal income opportunities is included into the model. Whereas higher legal income oppor-

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[4] We use "he" since most crimes are committed by males.

tunities (e.g. higher wages) tend to foster legal work/ activities and reduce crime, higher illegal income opportunities (e.g. more valuable targets) make crime more rewarding and thus augment its incidence.

Since the rational choice theory builds on individual decisions, it is a micro theory of crime. Hence, it might be surprising that the large majority of empirical studies is macro-based, with the exception of papers published by Witte (1980) and Trumbull (1989). The explanation of this contradiction is given by Witte (1980:57), who states that "researchers have not used aggregate data by choice but rather have been forced to use it because of the lack of appropriate data for individuals".[5] Nevertheless, macro evaluations of the rational choice theory make sense when individual determinants of crime can be adequately represented at a suitable aggregated level (for example, by using the means of the relevant variables in a community). Micro studies like those from Witte (1980) and Trumbull (1989) have the disadvantage of lacking generality due to their exclusive consideration of ex-prisoners.

A typical empirical specification of the economic crime theory uses three kinds of independent variables in order to explain the supply (individual or aggregate) of offences: deterrence variables, variables that measure legal and illegal income opportunities (wages, gross domestic product, wage and income distribution, unemployment etc.) and a number of control variables like gender, age, race, education, urbanity etc.. From the dozens of econometric investigations of the economic crime model we have selected four for detailed discussion. They are either very famous (Ehrlich 1973, Wolpin 1978), or deal with special data (Witte 1980) or have a close connection to the task of the present EU-study (Entorf and Spengler 1998). The central features of the studies (data and variables) are summarised in Table 5.

Before turning to the discussion of empirical studies we want to stress that there are two important features that distinguish evaluations of the economic rational choice model from empirical tests of other crime theories. The first one is the consistent inclusion of deterrence variables and the emphasis on economic variables like income, inequality and unemployment as

[5] It has to be emphasised that this statement does not apply to criminologists who have - due to their existing research networks and high scale projects (see, for example, Sampson 1997) - a much better access to individual data. Crime research of economists is often limited to few papers and is not long-term orientated. Therefore, easy access to available official crime data - which is exclusively macro-data - is preferred to the expensive collection of individual data. It is up to economists to make an effort in investing in long-term projects in order to receive less aggregated or individual data.

measures of legal and illegal income opportunities. Other independent variables (e.g. age, race etc.) largely correspond to those used in criminological studies. Especially the consideration of inequality makes empirical crime research by economists an important source of evidence.[6]

Ehrlich (1973) was the first who tested the economic model of crime empirically.[7] He investigated 7 types of crimes by using cross sectional data from the U.S. states from 1960 (see Table 5). Illegal income opportunities are measured by the median income of families. It is argued that a higher median income is associated with a higher level of transferable assets (or targets) and thus with higher rewards of illegal activity (i.e. higher illegal income opportunities). Ehrlich uses the percentage of families below one-half of median income as an indicator of legal income opportunities. This is his conclusion: the less families fall below this line (i.e. the less unequal the incomes are) the better are the chances for the lower ends of the income distribution to make their living by legal work (i.e. legal income opportunities are higher), and the smaller are the incentives for these risk groups to commit crimes. Ehrlich admits that the unemployment rate may also be interpreted in the sense of illegal income opportunities. Since a person who is unemployed is per definition excluded from work and from most legal income opportunities, unemployment can be interpreted as a negative measure of legal income opportunities. Therefore the unemployment rate or a related variable should always be present in empirical investigations of the economic crime model.

Ehrlich's estimation results support the economic theory of crime. The deterrence variables always have the expected negative sign and show significance at the 5% level in 10 out of 14 cases. Whereas the coefficients of the probability of conviction variable are significant for all offences, those for the punishment variable exhibit insignificance in the regressions for murder, robbery, auto theft and larceny. As far as property crime is concerned, estimates of the illegal and legal income opportunity variables perform in accordance with the theory. All coefficients show the expected sign and - with the exception of robbery - also significance. A higher median family income rises the number of robbery, burglary, larceny and auto theft by means of more valuable targets, and higher income inequality fosters the incidence of burglary, larceny and auto theft because of reduced legal income opportunities of lower income

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[6] As the European Commission (1998) points out, one major question to be answered is whether the European model of social solidarity bears a crime reducing effect.

groups. A higher income inequality also fosters the violent crimes of murder and assault significantly.

Ehrlich also includes four further independent variables, namely the unemployment rate, the labour force participation of young men, the share of young men in the population, and the share of non-whites in the population. For the unemployment variable he generally finds inconclusive results. The signs are not stable across different regressions and besides insignificant. The labour force participation of young men is significant in some cases but with opposite signs and is thus also not very conclusive. The shares of young men and non-whites in the population, however, always show a positive sign and are significant in most cases.

We now consider the study of Wolpin (1978) which to our knowledge is the investigation with the largest set of deterrence variables (see Table 5). Wolpin uses time-series data from England and Wales covering the long period from 1894-1967. As regards estimated coefficients of the five probability variables devoted to deterrence, it can be stated that each of them has a negative sign in each of the six estimations. However, by far not all coefficients turn out to be significant. The most important probability is the clearance rate (proportion of crimes cleared by the police) with 5 significant coefficients, followed by the imprisonment rate (proportion of the guilty who are imprisoned, 3 significant coefficients). Surprisingly, the punishment variable turns out to be insignificant across all offences. Considering the share of young men in the population and unemployment, the results presented by Ehrlich (1973) are replicated. A higher share of young men leads to higher crime rates and unemployment is again found to be badly performing with only one (positive) significant coefficient for burglary. On the other hand, the proportion of individuals from the age of 15 up and still at school is consistently negatively related to the different types of crime. This might be interpreted in the sense that higher education and regular daily routine have crime decreasing effects. Estimates for urban population and per capita gross domestic product are sometimes positive significant sometimes negative significant and thus inconsistent and the results for the wage variable are as well in conflict with the expectations. Wolpin argues that the implausible results are partly due to the inclusion of a time trend variable in the regressions.

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[7] To our knowledge, Ehrlich's work was also the first rigorous econometric study of the causes of crime to be published in a leading economic, sociological or criminological journal.

Table 5: Selected empirical studies evaluating the rational choice model

Authors	Data set	Dependent variables (crime variables)	Independent variables (determinants of crime)
Ehrlich (1973)	Cross sectional data from U.S. states 1960	*Crimes against the person* Murder Rape Assault *Crimes against property* Robbery Burglary Larceny Auto Theft	*Deterrence variables* Imprisonment rate Average sentence *Economic variables* Median income of families Families below one-half of median income Unemployment rate of civilian urban males aged 14-24 and 35-39 Labour force participation of civilian urban males aged 14-24 *Other variables* Non-whites Males aged 14-24
Wolpin (1978)	Time series data from England and Wales 1894-1967	*Crimes against the person* Malicious wounding Felonious wounding *Crimes against property* Robbery Burglary Larceny Auto Theft	*Deterrence variables* Clearance rate Conviction rate Imprisonment rate Recognisance rate Fine rate Average sentence *Economic variables* Real gross domestic product per capita Unemployment rate Real weekly wage in manufacturing for manual workers *Other variables* Males aged 10-25 Individuals from age 15 onward enrolled in schools Individuals residing in non-rural areas

Witte (1980)	Post-release random sample of 641 men who were in prison in North Carolina in 1969 or 1971	Number of arrests per month free Number of convictions per month free	*Deterrence variables* Conviction rate Imprisonment rate Individual average historical sentence length received prior to release *Economic variables* Accumulated work release funds received after release Number of months until first job after release Hourly wage rate after release *Taste variables* Age at release Age at first arrest Number of arrests and convictions respectively, before incarceration Race Serious alcohol problems Drug use Parole when released Married Number of rule violations during prison term
Entorf and Spengler (1998)	Panel data from German states 1975-1996	*Crimes against the person* Murder and Manslaughter Rape Dangerous and serious assault *Crimes against property* Robbery Theft under aggravating circumstances Theft without aggravating circumstances Fraud Damage to property	*Deterrence Variables* Clearance rate *Economic variables* Real gross domestic product per capita Relative wealth Unemployment rate *Other variables* Foreigners Males aged 10-25 State dummies East/ west dummies

Source: Own representation.

Witte (1980) was the first to test the economic rational choice model with individual data. Her data, however, does not stem from a random sample of the whole population, which would include offenders as well as non-offenders, but from a random sample of ex-offenders who were incarcerated in North Carolina in 1969 or 1971. Witte tries 12 different specifications varying the dependent variables (number of arrests per month free or number of convictions per month free with respect to different crime types) and independent variables (exclusion or inclusion of taste variables). The estimation results only weakly support the economic crime theory. The estimates of the deterrence variables mostly show a negative sign but there is a general lack of significance. Only 5 out of 24 coefficient estimates of the variables measuring certainty of conviction and punishment show significance and one of these has an unexpected sign. Support for the deterrent effect of longer prison terms is only somewhat stronger, with 3 out of 12 coefficients being significantly negative. Turning to economic opportunity variables, implausible estimates with altering signs are obtained for the measure of legal income opportunities (hourly wage rate after release) and a suitable variable representing illegal income opportunities could not be found and is thus excluded from the analysis. Inconsistent results are also found for the expected unemployment rate, which turns out to have a crime reducing effect when it is significant. In contrast to deterrence and economic variables, taste variables generally carry the expected sign and often show significance. Witte's "results point up the need for additional tests of the economic model of crime using individual data. Such tests would be most beneficial if they dealt with groups less committed to criminal activity than former prison inmates" (Witte 1980:82).

In a recent study, Entorf and Spengler (1998) have tested the economic crime model using panel data from the West German states for the period 1975-1996. As deterrence variable they only have the clearance rate at their disposal. Illegal income opportunities are represented by real gross domestic product per capita and legal income opportunities are approximated by a variable that measures the relative difference between real gross domestic product per capita in the particular state and the German average. It is argued that when a state is relatively rich with respect to the federal average, legal activities are supposed to be more rewarding than in relatively poor states. This might be due to higher wages in legal jobs and/ or to a higher probability to find a sufficient job when legal work is desired.

Critics may infer that such a reasoning would rather suggest the unemployment rate (which is also included as a regressor) being the adequate measure of legal income opportunities. We do not want to rule this out, but the following example may explain why relative income is a more appropriate measure: Let us consider the two German states Hamburg and Saarland which had approximately equal unemployment rates in 1996 (11,7 and 12,4 per cent respectively). When using the unemployment rate as a measure for legal income opportunities one would infer that there is no or only a slight difference between the two states. When considering the relative distance to the German average the income in Hamburg is 80 per cent above the mean and the one in Saarland is 20 per cent below the mean. This large difference stems from the fact that Hamburg is a fully industrialised metropolitan area with a wide variety of businesses ranging from a major container terminal over a large consumer good industry to an enormous service sector, whereas Saarland is a declining coal and steal producing area. Therefore we think that *ceteris paribus* a potential offender who intends to find a job and/ or to receive a certain wage would be more successful in Hamburg than in Saarland. Thus, we presume that our relative income measure is a more suitable indicator of legal income opportunities. It has to be stressed that this is no contradiction to the fact that Hamburg has a crime rate which is more than twice as high as that of Saarland. Since crime can only be understood in a multivariate context, there are a lot of other potential influences that may account for this striking difference (see, for instance, the very high absolute income in Hamburg).

Generally speaking, the estimation results in Entorf and Spengler's paper are in accordance with those presented by Ehrlich (1973).[8] The estimated coefficients for the deterrence variable (clearance rate) turn out to be negative in 6 out of 8 cases and show high significance in regressions for the property related crimes of robbery and theft under aggravating circumstances. (Unexpected signs are found in the regressions for fraud and vandalism, however, these estimates are not significant at any usual significance level.) Real gross domestic product per capita, i.e. the measure for illegal income opportunities, performs well in the property crime related regressions with exclusively positive coefficients and significance in 3 out of four cases. In order to provide an example, the authors find that a one per cent increase in real gross domestic product per capita is associated with a two per cent increase in the robbery rate. In accordance with Ehrlich (1973), insignificance of the absolute income variable is found in the regressions for murder and rape. This again indicates that the economic theory of crime is rather applicable to property than to violent crime. The previously discussed relative income variable turns out to be a suitable indicator for legal income opportunities. The expected negative[9] sign is found for all coefficients in the four property crime regressions, with significance in the case of robbery and theft under aggravating circumstances. Again, the results for the unemployment rate are ambigous. Authors find three significant coefficients, two of which are negative. In contrast to that, and also in accordance with Ehrlich (1973), Entorf and Spengler find almost exclusively positive coefficients for the socio-demographic control variables (share of foreigners in the population, share of young men in the population) which show significance in 6 out of 16 cases.

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[8] This is an interesting result since the studies consider different countries (United States vs. Germany) with different data sets (cross sectional vs. panel) at times (1960 vs. 1975-1996).

[9] A negative coefficient means that a higher value of the relative income variable (which is associated with a rise in a states income in comparison to the federal level and therefore with better legal income opportunities) reduces crime.

In order to summarise the key implications of the empirical studies testing economic crime theory for the design of a model based on socio-economic indicators, it can be recorded that deterrence as well as income opportunity variables should be present in such a model. Moreover, the studies suggest the inclusion of socio-demographic variables accounting for ethnic heterogeneity and the age-gender structure of the population. Somewhat surprising are the poor results concerning unemployment. Coefficients are often found to be insignificant or even counterintuitive.

On what concerns interactions of crime with explaining variables, Ehrlich (1973) takes into account that there might exist a bi-directional relation between crime and the probability of conviction. This would be the case if a higher incidence of crime led to lower clearance rates due to the overload of the given and temporarily fixed police staff. Another potential source of interaction lies in the supposed reaction of citizens to rising crime rates. If the shrinking tolerance of the population towards increasing crime leads to the hiring of new police officers (what is not unlikely - at least in advance of elections) and thus to a higher number of clear-ups, the clearance rate would be influenced by changes in the number of crimes. If such reciprocal mechanisms are present and not accounted for in the empirical analysis, the estimates of the supply of offences function will be unreliable. In order to tackle this problem, Ehrlich (1973) uses a two-stage regression procedure, where the conviction rate is determined in the first step by regressing it on the one period lagged crime rate and a set of other relevant variables. In the second step, the crime rate is regressed on the predicted values of the clearance rate from the first step and all other independent variables.[10]

2.1.4 Differential association/ social learning theory (Sutherland 1942/ Akers 1977)

Sutherland (1942) gave the name "differential association" to the process by which persons experience conflicting definitions about appropriate behaviour. Definitions favourable and unfavourable to delinquent or criminal behaviour are learned through interaction (communication) in intimate personal groups (Matsueda 1982:489).Thus, peer and family relations play a central role in this theory. It has to be stressed, however, that the effect of peers and family

[10] It has to be stressed, however, that this procedure can only be successful if the researcher has so-called " instrumental variables" at his disposal. Instrumental variables are variables which have a significant direct effect on the dependent variable of the first stage (clearance rate) but no direct impact on the dependent variable of the second stage (crime rate).

on individual delinquency is expected to be rather indirect (via the definitions concerning crime) than direct. Empirical evaluations of differential association theory face the difficulty that the central explanatory variable "definitions favourable and unfavourable to delinquent behaviour" (DEF) is a "latent" variable i.e. it cannot be observed or measured directly. Therefore – similar to legal and illegal income opportunities in economic crime theory - DEF has to be determined indirectly in terms of one or more observable variables.

A central paper testing the differential association theory is Matsueda (1982). He uses self-reported individual data of 1,140 non-black males stemming from the Richmond Youth project. Employing LISREL[11] he finds - in accordance with the theory - that "definitions favourable to delinquent behaviour" (DEF) is by far the most important variable explaining youthful offending. DEF is measured by age, sex, the degree of parental supervision (SUPER), the intensity of attachment to peers (ATTACHPE), a variable indicating whether any of the individual's friends have ever been picked up by the police (FRPICKUP), a variable which indicates if the individual thinks that young people in his neighbourhood always get into trouble (YOUNGTRO) and a variable indicating if either father or mother do not live with the respondent (BROKHOME). After the inclusion of DEF in the delinquency equation all other variables which have been significant before turn out to be insignificant (YOUNGTRO, SUPER, FRPICKUP, ATTACHPE). This can be interpreted in the sense that family and peer relation do not directly affect youthful delinquency, but that they do it indirectly via DEF. Thus the chain of action which follows from the estimation results of Matsueda (1982) is as follows: Higher levels of YOUNGTRO and FRPICKUP as well as lower levels of SUPER and ATTACHPE lead to more DEF and more definitions favourable to delinquency increase youth delinquency.

Two other micro-studies (Bruinsma 1992 and McCarthy 1996) also support the differential association theory but go even a step further. They argue that people do not only learn about crime predominantly or exclusively through exposure to attitudes and motives that legitimise such a behaviour but also through tutelage in criminal methods. Bruinsma (1992) finds that for explaining the frequency of criminal behaviour the frequency of communication about

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[11] LISREL is a software package especially designed for multivariate analyses with latent variables. The basic idea behind LISREL is to model a latent variable in terms of one or more observable variables and thus inferring its effect on other latent or non-latent variables (i.e. crime variables).

relevant techniques is roughly as important as the definitions of deviant behaviour. McCarthy (1996) finds the tutelage to be a highly significant determinant for drug selling and theft.

In order to summarise the empirical results for the differential association theory, it can be captured that factors like delinquent parents and peers, low parental supervision of youth, disrupted families etc. alter the definitions favourable to delinquency (and the frequency of communication about delinquent techniques) and thus the individual frequency of deviant behaviour. Thus, appropriate peer and family variables should be present in a crime related indicator system. Concerning studies which assess the differential association theory with regard to interactions, we refer to Sections 2.1.8, 2.1.13 and 2.1.14.

2.1.5 Social control theory (Hirschi 1969)

Instead of asking why individuals engage in crime - as do most other theories – the social control theory asks why most persons refrain from criminal behaviour. According to that delinquency is taken for granted; conventional behaviour is problematic (Hirschi 1969:10). Positively seen, the control theory maintains that persons conform to legal codes because they are bonded to society. This bonding can be summarised best by means of the termini "attachment", "committment", "involvement" and "believe". To be more precise the social control theory states that

- the more individuals are *attached* to significant others,
- the more they are *committed* to values of conventional subsystems,
- the better they are *involved* in conventional systems, and
- the more they *believe* in conventional values and norms,

the more conforming and the less delinquent their behaviour will be (Junger-Tas 1992:26). Similar to the differential association theory, the determinants of crime in the social control theory are latent variables which have to be approximated adequately. In his empirical test of the social control theory, Agnew (1991) provides a guideline that helps to assess latent variables of attachment, commitment and believe (see Table 6).

Agnew's (1991) study is based on the first two waves (1976 and 1977) of the National Youth Survey, a longitudinal (i.e. panel) survey of delinquency and drug use conducted by the Behavioral Research Institute (Boulder, Colorado). The survey is based on a national probability sample of youths aged between 11 to 17 and contains 1,725 respondents. Agnew estimates three models, one for general delinquency, one for minor delinquency, and one for serious delinquency. He only reports the results for minor delinquency, since results do not differ much across the models. The innovative element in Agnew's study is the account of interactions between crime and other variables. The findings, however, do not support the social control theory. Neither bonding variables (attachment and commitment) and delinquency nor deviant beliefs and crime are directly related to each other. In contrast to that, delinquent peers (P) and delinquency (D) are involved in a bi-directional relationship: P2 → D2 = 0,26[12] and D2 → P2 = 0,38 (Thornberry 1996:225). This result is rather in favour of the differential association theory, where relations to deviant peers are assumed to be the major sources of own delinquent behaviour.[13] Agnew (1991:150) thus concludes, that "social control variables have a weak effect on the three forms of delinquency examined in this article. Current delinquency is largely a function of prior delinquency and, to a lesser extent of an association with delinquent peers. The analyses in this article correct for many problems previously researched, and for that reason they raise further doubt about the importance contributed to Hirschi's theory as an explanation of general delinquency among adolescents".

Nevertheless, there are other recent studies (e.g. Agnew and White 1992, Agnew 1993, Paternoster and Mazerolle 1994[14], Junger-Tas 1992, Horney, Osgood and Marshall 1995) which support the social control theory. Junger-Tas (1992) uses a random sample of 2500 juveniles from two Dutch cities (The Hague and Venlo) consisting of both self-reported and official data. After having constructed scales of family integration (parental control, communication with parents, family activities, and family climate), school integration (liking school, commitment to school values, school performance, and social behaviour), leisure and peers (nature and involvement in leisure activities, bravado), changes in social integration were measured over a period of 2 years and compared to the impact of official intervention in delinquency cases by police or prosecutors (Junger-Tas 1992:9). In contrast to the economic crime theory Junger-Tas finds no impact of police or prosecutors intervention on later delinquency. On the

[12] This expression can be read as: the causal effect of delinquent peer relations in period 2 on personal delinquency in period 2 is estimated to be 0,26 (Thornberry 1996:212).

[13] Matsueda (1982) in his aforementioned study has explicitly compared differential association and social control theory and finds differential association theory supported over control theory.

[14] These studies will be discussed in Section 2.1.7.

other hand, there seem to be strong and inverse relationships between the changes in social integration (i.e. the attachment to society) and the frequency of offending.

Table 6: Possible measures of latent variables in social control theory

Scale	Item of the National Youth Survey
1. Parental attachment	Family that does lots of things together Have parents that you can talk to about almost everything Get along well with your parents
2. School attachment	Teachers do not call on me in class, even when I raise my hand. I often feel like nobody cares about me at school. I do not feel as if I really belong at school. Even though there are lots of kids around, I often feel lonely at school.
3. Commitment	What is your grade point average? Are you doing well even in difficult subjects? Do you have a high grade point average?
4. Deviant beliefs	How wrong is it for someone of your age to purposely damage or destroy property that does not belong to him or her? ...steal something worth less than $5? ...hit or threaten to hit someone without any reason. ...steal something worth more than $50?
5. Delinquent peers	During the past year how many of your close friends have purposely damaged or destroyed property that did not belong to them? ...stolen something worth less than $5? ...hit or threaten to hit someone without any reason. ...stolen something worth more than $50?

Source: Agnew (1991), own adjustment.

Horney et al. (1995) perform a test of the social control theory on the basis of 658 newly convicted male offenders sentenced to the Nebraska Department of Correctional Services during a nine-month period in 1989-1990. The data set comes from interviews covering inmates' offending/ life histories of the two calendar years preceding the year of arrest. Horney et al. seek to determine whether formal (former probation or parole) and informal mechanisms (going to school, being employed, living with a wife or girlfriend, drinking heavily, using drugs) of social control affect the likelihood of committing nine major offences. In accordance with Junger-Tas (1992), but in contradiction to the economic crime theory, Horney et al. find no significant coefficients for deterrence (former probation or parole). On the other hand, measures of local life circumstances (i.e. social control) perform fairly well. Drug use has an enhancing impact on property crime, assault and drug crime. Heavy drinking fosters property crime and going to school reduces drug crime. Living with a wife has a negative (reducing) effect on assault, whereas living with a girlfriend fosters drug crime. Only the labour variable performs very badly, revealing insignificance in most cases, and if not, an inconclusive sign arises. However, interpreting the results, one should pay attention to the fact that Horney et al. use data on offenders being incarcerated. This data set does not only bear the problem of a selected sample based on offenders, but the authors even use a sample with offenders who are selected (who select themselves) to go to prison. This might seriously restrict general conclusions that could be drawn from the study.

We conclude that the empirical findings for the social control theory are not as clear as those for other theories. Nevertheless, family attachment and school commitment finally turn out to have at least some relevance for a proper understanding of delinquency (see also Section 2.1.7). Somewhat surprising is the insignificance of formal social control (i.e. deterrence) variables. This, however, might be due to the use of offender or inmate samples.

2.1.6 Self-control theory (Gottfredson and Hirschi 1990)

Gottfredson's and Hirschi's (1990) theory explains differences among individuals in criminal and analogous behaviour (e.g. gambling, sexual promiscuity, accidents, excessive alcohol use, heavy smoking etc.)[15] as a product of personal variations in self-control (Gottfredson and Hirschi 1990:97). According to the theory, individuals with low self-control "exhibit a persistent tendency to act in their own short-term self-interest, with little regard for the long-term consequences of their behavior. They are thereby easily seduced into committing acts that require little devotion or commitment, are easy to complete, and provide immediate pleasure" (Paternoster and Brame 1998:634). Since criminal acts generally reveal these characteristics, a key implication of the theory is that persons with low self-control are more likely to commit crimes throughout their life course than those with higher self-control levels. Low self-control itself is assumed to be determined - in the early years of life (prior to age 10) - as a consequence of ineffective childhood socialisation, which in turn is caused by parents who fail to monitor the child's behaviour, do not recognise misbehaviour when it occurs, and neglect to punish the child for it. Because of the contention that the cause of crime and its prevention (i.e. self-control) is set in early childhood, later life experiences are expected to have little impact on delinquency.

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[15] Because of this perceived applicability on all deviant behaviour, the self-control theory is also called "general theory".

In contrast to the economic crime theory, the self-control theory is a micro theory, which can hardly be translated into the macro level, therefore its relevance for the present EU-study is rather minor. Nevertheless, it is appropriate to draw attention to some recent empirical studies investigating this rising theory. Like other theories, the self-control theory has to cope with a latent variable, since self-control cannot be measured directly. Gibbs, Giever and Martin (1998) and Arneklev, Grasmick, Tittle and Bursik (1993) provide large sets of items suitable to measure it. The following list contains some examples:

- I often act on the spur of the moment,
- I seldom pass up an opportunity to have a good time,
- I try to look out for myself first, even if it means making things difficult for other people,
- I frequently try to avoid things that I know will be difficult, etc..

In order to briefly summarise the results of four recent empirical studies (Arneklev et al. 1993, Polakowski 1994, Paternoster and Brame 1998 and Gibbs et al. 1998) testing Gottfredson's and Hirschi's theory one can state that all of them find at least some support for self-control as a relevant determinant of delinquency. However, generality, i.e. the ability of self-control theory to explain all kinds of deviant behaviour (e.g. heavy smoking, gambling etc.), is doubted by three of these four studies.

2.1.7 Strain theory (Merton 1938, Cohen 1955 and Agnew 1992)

According to the traditional strain theory, youth/ individuals are motivated to commit delinquent acts because they have failed to achieve desired goals, such as economic success (Merton 1938) or middle-class status (Cohen 1955). The critical point for empirical investigations of this theory, however, is how to operationalise strain. Most often, researchers have measured strain either as the *gap between aspirations and expectations* or as perceived *blocked opportunities* (Agnew 1987 and Burton and Cullen 1992), though other scholars have proposed that strain might be assessed as *relative deprivation* (Burton, Cullen, Evans and Dunaway 1994:214). Before we turn to the empirical results of Burton et al. (1994) who have tried all three strain indicators, some remarks have to be made about how these indicators might be obtained from the items of a survey or interview. Economic aspirations are conceptualised as the "overall or general" desire individuals feel about "making money" in the future. On the other hand, expectations are the actual chances the individual believes to have to "make a lot of money" in the future (Burton et al. 1994:220/221). Suitable measures to assess the gap between the two concepts could be derived from the items "I would like to make a lot of money in my life" (for aspiration) and "Realistically, I do not think I will make as much money as I would like" (for expectations). Three useful items in order to assess blocked opportunities might be "Every time I try to get ahead, something stops me", "If I had connections, I would have been more successful" and "I have often been frustrated in my efforts to get ahead in life" and suitable measures of relative deprivation can probably be gathered from one (or a combination) of the items "It bothers me that most people have more money to live on than I have", "It is frustrating to see people driving nicer cars and living in nicer homes than I do" and "I get angry when I see people having a lot more money than I do, spending their money on foolish things".

Burton's et al. (1994) empirical test of the traditional strain theories was carried out on the basis of self-reported survey data from 555 individual aged 18 and older[16], residing in a midwestern, urban area of the United States. The dependent variables are "utilitarian" crimes (i.e. crimes providing economic gain) and "non-utilitarian" crimes (i.e. crimes perhaps providing psychic rewards, but not providing material gain). The list of the employed independent variables is evident from the first column of Table 7. A very interesting point of the study by Burton et al. (1994) is that this study does not only assess the strain theory, but at the same time typical variables from three other leading crime theories (social-control, self-control and differential association theory). Considering estimation results, it is striking that non of the strain-variables shows significance neither for utilitarian nor for non-utilitarian crimes. Whereas the importance of the strain theories is rejected, all other theories are supported with respect to at least one of their central variables.

The lacking empirical support for the traditional strain theories found by Burton et al. is not an isolated case. Referring to studies of Reiss and Rhodes (1963), Elliott and Voss (1974), Greenberg (1977), and Agnew (1984), Paternoster and Mazerolle (1994) report that null findings are rather the rule than the exception. In response to that and by assessing that traditional theories are unduly narrow in the conceptualization of the sources of strain, Agnew (1992) further developed the existing theories to what he calls "general strain theory" (GST). The new feature of GST is the assumption that "in addition to the failure to achieve desired goals, strain can also be brought about when others take away from us something we value and when

[16] This is a variation in comparison to former tests of the strain theory, most of which rely on samples exclusively composed of juveniles see Burton and Cullen 1992).

we are confronted with negative or disagreeable circumstances" (Paternoster and Mazerolle 1994:237). According to this, strain is understood as a more general phenomenon than the pure discrepancy between aspirations and expectations.

Table 7: Simplified representation of estimates from Burton et al. (1994)

Dependent variables / Independent variables	Utilitarian crimes			Non-utilitarian crimes		
Strain						
Aspiration/ expectation "gap"	0			0		
Blocked Opportunities		0			0	
Relative deprivation			0			0
Social control						
Married	0	0	0	-	-	-
Attachment to family	0	0	0	0	0	0
Self-control						
Low self-control	+	+	+	+	+	+
Differential association						
Individual definitions toward law	+	+	+	+	+	+
Others' definitions toward law	0	0	0	0	0	0
Criminal friends	0	0	0	+	+	+
Control variables						
Age	0	0	0	-	-	-
Sex	0	0	0	0	0	0
Income	0	0	0	0	0	0

Source: Burton, Cullen, Evans and Dunaway (1994), own representation.
Note: see Table 1.

The first empirical test of GST has been performed by Agnew and White (1992). The study relies upon data from the first wave of the Rutgers Health and Human Development Project (HHDP), a prospective longitudinal study, including 1,380 New Jersey adolescents aged 12, 15, and 18, who were interviewed between 1979 and 1981. The dependent variables cover "delinquency" measured by offences such as fighting, robbery, larceny, burglary, vandalism, running away, truancy etc. and "drug use". The latter measures whether individuals frequently use alcohol, marijuana, and other drugs, such as psychedelics, cocaine etc. The independent variables can be inferred from the first column of Table 8. As a consequence of the broader (and less precise) definition of strain, important life circumstances like "negative relations with adults" and "parental fighting" do enter the model. In the second column of Table 8, we provide the items suggested by Agnew and White in order to operationalise the relevant strain variables. Similar to Burton et al. (1994) indicators from rival theories (social control and differential association theory) are also included in the estimations and, thus, allow to assess the relative importance of GST.

The estimation results based on GST presented in Table 8 are much more in favour of strain as an important cause of crime than the results of traditional strain theories. Eight out of 16 estimated coefficients show significance and the expected sign. "Negative life events", "life hassles" and "parental fighting" turn out to be the most important strain variables. The empirical support for GST found by Agnew and White (1992) is confirmed by other studies (see Agnew 1993, Paternoster and Mazerolle 1994, and Hofman and Miller 1998).

Table 8: Simplified representation of estimates from Agnew and White (1992)

Dependent variables / Independent variables	Item	Delin-quency	Drug use
Strain			
Negative life events	...have experienced negative events that upset them, including assault, death of a friend, serious illness, divorce of parents etc.	+	+
Life hassles	..."very much bothered" by such "concerns and difficulties" as "not having enough time to do all the things I really want to", adults and friends "do not respect my opinions", "my classmates do not like me" etc.	+	+
Negative relations with adults	...teachers embarrass them for not knowing the right answers, parents often complain about them etc.	+	0
Parental fighting	...bothered by the fact that parents often fight or argue with one another	+	+
Neighbourhood problems	...their neighbourhood is unsafe and they are afraid to walk alone in it during the day or night	0	+
Unpopular with opposite sex	..."very bothered" by the fact that they are not good looking and are not popular with the opposite sex	0	0
Occupational strain	..."very unsure" they will get the job they want	0	0
Clothing strain	...parents can never afford to buy them the kind of clothes they want	0	0
Social control			
Parental attachment		-	-
Parental permissiveness		0	0
School attachment		-	-
Peer attachment		+	+
Time spent on homework		-	-
Grades		-	0
Educational goals		-	0
Differential association			
Friends' delinquency		+	+
Control variables			
Age		+	+
Sex		-	0

Source: Agnew and White (1992), own representation.
Note: see Table 1.

After having assessed the seven most popular theories of crime, an interim judgement about the causes of crime seems to be appropriate. Our findings suggest that each of the considered theories has practical relevance. This has the important implication that neither theory might serve as the general theory which renders other theories superfluous. This reasoning particularly applies to the question whether crime should be modelled at the micro or at the macro level. The correct way to cope with the problem of crime is to use both the individual and aggregate levels. Crimes are based on individual decisions which suggests using individual data. On the other hand, individuals' decisions and acts take place in a specific environment, which in turn relies - at least to a certain extent – on macro factors and macro settings (like policies of fighting crime, poverty, unemployment, social problems etc).

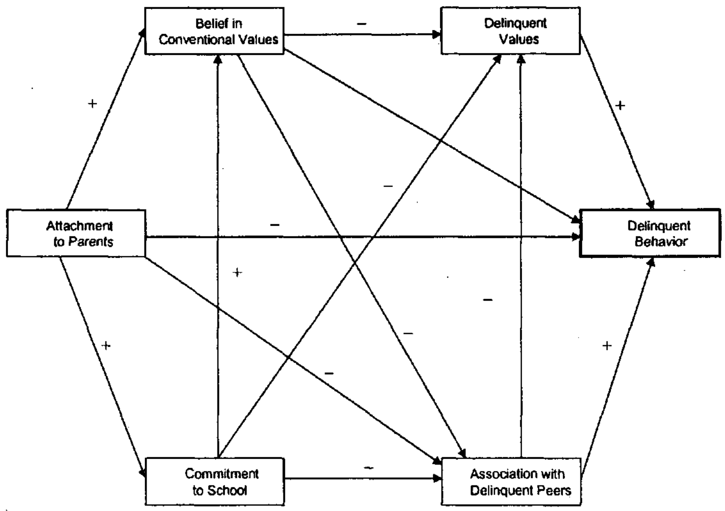
2.1.8 Interactional theory (Thornberry 1987)

The core of the interactional theory can be best explained in the words of the scholar who developed it: "Interactional theory proposes that delinquent behavior develops in a dynamic fashion over the life course. Rather than seeing delinquency as a simple consequence of a set of social processes, an interactional perspective sees delinquency as both cause and consequence, involved in a variety of reciprocal relationships over time" (Thornberry 1996:198). Thus, interactional theory makes two important points – *developmental perspective* and *reciprocal effects* - which are assumed to be essential for a proper understanding of crime but have been virtually ignored in the major theories.

The developmental perspective points to the fact that "crime does not appear to be a permanent trait of the individual". Crime can rather be split up in three clearly distinguishable phases: initiation, maintenance, and termination. This view is consistent with the generally observed incidence of crime in the life course, where offenders start their criminal conduct around the of ages 12 or 13, rapidly increasing their involvement to a peak around the ages of 16 or 17, and then terminating delinquency by the mid 20s (Thornberry 1996:200). In order to account for the developmental aspect of crime longitudinal (i.e. panel) data is needed.

Conventional crime theories are recursive (or unidirectional) by nature, i.e. they treat delinquency as a pure outcome (endogenous) variable out of a large set of socio-economic and psychological factors, but do not consider possible feedback effects (see Figure 2). This view appears to be unrealistic, since it implies that "no matter how prolonged or serious the person's delinquent behavior, it has no causal impact on relationships within the family, selection of peers, success in school or work, and so forth" (Thornberry 1996:202). In contrast to the traditional view, the interactional theory explicitly considers the possibility of reciprocal effects among crime and its explanatory factors. In order to account adequately for reciprocal effects, special statistical techniques have to be employed (e.g. LISREL).

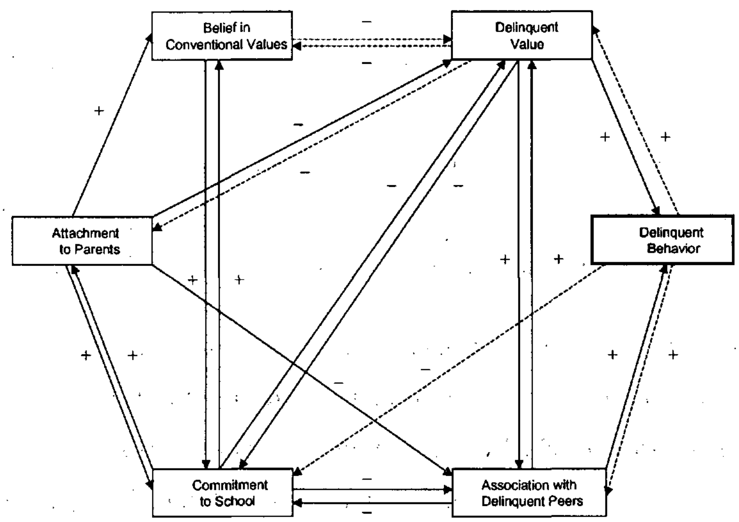
Figure 2: The conventional view of the relations between crime and its explaining variables



Source: Thornberry (1987:202).

Thornberry (1996) provides a discussion of all 17 interactional studies he could identify at the time he prepared his survey. Table 9 contains a short summary of these studies with respect to the origin of the data set used (column 2), the age/ grade (column 3) and sex (column 4) of the individuals under investigation, the wave/ lag structure of the data set (column 5), the delinquency variables (column 6), and the explanatory variables (column 7) for which interactions with delinquency have been examined. The explanatory variables largely stem from two traditional theories – the social control theory (Section 2.1.5) and the differential association/ social learning theory (Section 2.1.4). In order to structure the further discussion, we follow Thornberry (1996), who divides the studies in three clusters according to the theoretical origin of their explanatory variables. Thus, we distinguish studies which exclusively use *variables of attachment* (i.e. from social control theory), studies which exclusively use *learning variables* (i.e. from differential association/ social learning theory) and studies which use both kinds of variables.

Figure 3: The interactional view of the relations between crime and its explaining variables



Source: Thornberry (1996:202).

The studies focusing on the variables of attachment can be found in the works of Agnew (1985), Agnew (1989), Liska and Reed (1985), Matsueda (1989), Minor (1984), Rosenberg, Schooler and Schoenbach (1989) and Thornberry and Christenson (1984). In accordance with the social control theory Liska and Reed (1985) report an effect from parental attachment to delinquency. Apart from this, however, no significant relationships between parental attachment and delinquency could be found. The unidirectional effects from grades, involvement in school and peer attachment to delinquency reported by Agnew (1985) are also in accordance with the social control theory. All other relationships of these variables with crime, however, are either from delinquency to "attachment" or bi-directional and, thus, in conflict with the social control theory. In order to provide an example Liska and Reed (1985) report a reciprocal relationship between school attachment and crime. Further findings in conflict with the unidirectional view are those concerning the relationship between crime and conventional beliefs. Agnew (1985) reports a reciprocal relationship between these two variables, Minor (1984) also reports a reciprocal relationship, but with a stronger impact of beliefs on delinquency than vice versa, and Matsueda (1989) finds an effect of delinquency on conventional beliefs. Finally Thornberry and Christenson (1984) obtain a strong reciprocal connection between unemployment and crime (Thornberry 1996:218/219).

In sum, studies exclusively relying on learning variables (Elliot and Menard 1992, Kandel 1978, Meier, Burkett and Hickman 1984, Menard and Huizinga 1990 and Reed and Rose 1991) provide a strong support of reciprocal relationships between learning variables (delinquent peers etc.) and delinquent behaviour. Thus, unidirectional models leading from differential association through delinquent beliefs to crime seem to provide improper simplifications. Moreover, Elliot and Menard (1992) support the developmental perspective of an interactional theory. They find a unidirectional effect from delinquent peers and from delinquent beliefs on crime in the phase of onset of criminal involvement. In the phase of maintenance, however, these relationships appear to be reciprocal and amplifying (Thornberry 1996:223).

Studies simultaneously considering attachment and learning variables are presented by Agnew (1991), Burkett and Warren (1987), Elliot, Huizinga and Morse (1985), Ginsberg and Greenley (1978) and Paternoster (1988). Holding learning variables constant, Elliot, Huizinga and Morse (1985) and Agnew (1991) neither find unidirectional nor bi-directional relationships between various bonding variables and delinquency. Likewise, Ginsberg and Greenley (1978) do not report any direct impact of commitment and school involvement on marijuana use. On the other hand, Burkett and Warren (1987) and Paternoster (1988) report relationships between some of the variables of attachment and delinquency. Paternoster, for example, reports a moderate reciprocal relationship between parental supervision and delinquency for both marijuana use and petty theft. In contrast to this relatively weak findings, learning variables exhibit a much better performance even if attachment variables are controlled. In all studies associations with delinquent peers and delinquent behaviour turn out to be mutually reinforcing variables, i.e. the association with delinquent peers increases criminal behaviour and delinquency increases with associations to delinquent peers. Paternoster (1988) confirms the existence of a reciprocal relation between delinquent beliefs and delinquent activity (Thornberry 1996:228).

Since 16 out of 17 studies find at least moderate relationships between one of their explanatory variables and delinquent behaviour, it can be concluded that interactional theory provides a valuable approach in order to understand the phenomenon of crime. As regards the relative importance of attachment and learning variables, the results are clearly in favour of the latter.

This is underpinned by the fact that all 9 studies examining the relationship between delinquent peers and delinquent behaviour find strong bi-directional effects. Two implications arise: First, the differential association/ social learning theory seems to be the more suitable approach towards a proper understanding of crime and, second, traditional crime theories should be extended with respect to reciprocal effects between crime and other variables. Of course, this conclusion also applies to the analytical and empirical part of the present report.

Table 9: Studies examining reciprocal causal effects involving delinquent behaviour

Author (1)	Data set (2)	Age/ grade (3)	Sex (4)	Waves/ lag in month (5)	Delinquency variable (6)	Other variables (7)
Agnew (1985)	Youth in Transition	10th to 11th grades	Males	2/18 months	Total delinquency Serious delinquency	Parental attachment Grades Dating index School attachment Involvement Commitment Peer attachment Belief
Agnew (1989)	Youth in Transition	10th to 11th grades	Males	2/18 months	Aggression Theft/ vandalism Escape from school	Negative school attitudes Mean teachers Parental punitiveness
Agnew (1991)	National Youth Survey	Ages 11-17 to 12-18	Males/ females	2/12 months	Minor delinquency General delinquency Serious delinquency	Parental attachment School attachment Commitment Deviant beliefs Delinquent Peers
Burkett & Warren (1987)	Pacific northwest city	10th to 12 grades	Males/ females	3/12 months	Marijuana use	Religious commitment Belief/ sin Peer associations
Elliot, Huizinga & Morse (1985b)	National Youth Survey	Ages 11-17 to 15-21	Males/ females	5/12 months	General delinquency	Normlessness Pro-social roles Involvement Strain Delinquent peers Deviant bonding Family sanctions
Elliot & Menard (1992)	National Youth Survey	Ages 11-17 to 18-24	Males/ females	1-5/12 months 6/36 months	General delinquency Minor delinquency Index delinquency	Delinquent peers
Kandel (1978)	New York State	9th to 12 grades	Males/ females	2/8 months	Marijuana use	Peer associations

Ginsberg & Greenley (1978)	University of Wisconsin Survey	Freshman/ sophomore to junior/ Senior	Males/ females	2/26 months	Marijuana use	Commitment Involvement Psychological stress Peer use
Liska & Reed (1985)	Youth in Transition	10th to 11th grades	Males	2/18 months	Interpersonal violence Theft/ vandalism	Attachment to parents School attachment
Matsueda (1989)	Youth in Transition	10th to 12th grades	Males	1-2/18 months	Minor deviance	Belief in conventional morality
Meier, Burkett & Hickman (1984)	Pacific Northwest city	10th to 12th grades	Males/ females	3/12 months	Marijuana use	Peer associations Perceived certainty of punishment
Menard & Huizinga (1990)	National Youth Survey	Ages 11-17 to 18-24	Males/ females	1-5/12 month 6/36 months	General delinquency Minor delinquency Index delinquency	Delinquent beliefs
Minor (1984)	College students	Median ages 18 to 18.3	Males/ females	2/3 months	Marijuana use Cocaine use Fighting Drunk & disorderly Shoplifting Variety index	Moral evaluations Excuse acceptance
Paternoster (1988)	South-eastern city	10th to 12th grades	Males/ females	3/12 months	Marijuana use	Parental supervision Perceived certainty Deviant beliefs Peer attitudes Peer behaviour
Reed & Rose (1991)	National Youth Survey	Ages 11-17 to 13-19	Males/ females	3/12 months	Serious delinquency	Delinquent peers Delinquent attitudes
Rosenberg, Schooler & Schoenbach (1989)	Youth in Transition	10th to 11th grades	Males	2/18 months	General delinquency	Self-esteem
Thornberry & Christenson (1984)	Philadelphia birth cohort	Ages 21 to 24	Males	4/12 months	Official arrests	Unemployment

Source: Thornberry (1996).

2.1.9 Wealth, economic growth and economic system

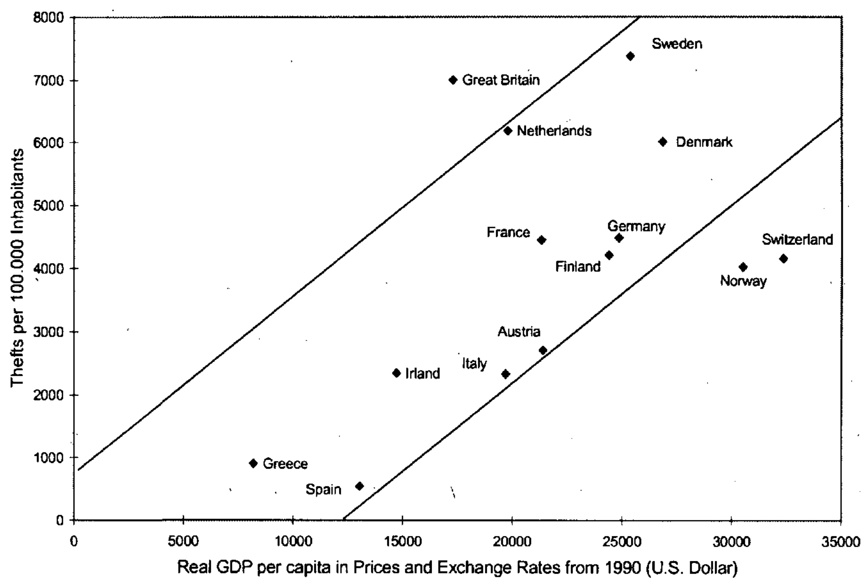
According to the economic crime theory and the routine activity/ lifestyle theory higher wealth measured by gross domestic product per capita or mean family income is associated with more valuable targets for (potential) offenders. Therefore, both theories expect a positive impact of economic growth on property crime.[17] This view is supported by country specific multivariate (see the discussion of the studies by Ehrlich (1973) and Entorf and Spengler (1998) in Section 2.1.3) as well as by international descriptive evidence (see Figure 4). Figure 4 depicts a scatter plot of general wealth against the theft rate based on 12 member states of the European Union plus Norway and Switzerland. It seems that higher wealth is associated with higher levels of theft . Put differently, the more rewarding theft is, the more theft occurs.[18] It has already been pointed out that some researchers interpret absolute wealth rather in terms of higher legal (e.g. higher paid jobs) than higher illegal income opportunities. Figure 4 also provides some evidence in favour of this point of view. Considering Switzerland and Norway, it is striking that these states have relatively low crime rates combined with very high levels of wealth. This phenomenon could probably be explained by the existence of a hypothetical turning point. Beyond a certain level of wealth countries provide sufficiently high legal income opportunities (for example by means of social welfare benefits) to its at-risk groups, so that these are kept away from delinquent behaviour. In spite of this, further evidence for a positive relationship between wealth/ economic growth and crime can be gathered from a before-after reunification analysis of Eastern Germany. In 1987, i.e. three years before unification, the East German general crime rate equalled 690 crimes per 100,000 inhabitants, at the same time the crime rate in Western Germany was more than 10 times higher (7269 crimes/ 100,000 inhabitants). Six years later, i.e. three years after the German unification, the crime rate of the East German States (excluding former East Berlin) has risen to 9,748 and even exceeded the West German rate (8032 crimes/ 100,000 inhabitants). This means a multiplication by 14 within a period of six years. Admittedly, the East German figures of 1987 might by subject to severe underreporting of a socialist regime, however, it is very unlikely that underreporting accounts for the entire difference. To a certain extent (presumably to a large extent)

[17] For violent crimes, however, the impact of higher wealth is not straightforward (see Section 2.1.3).

[18] However, we would like a note of caution. Since our comparison is based on official data it might suffer from differences in the shares of unreported crimes across the countries.

the explosion of the East German crime rate is a result of the ad hoc change from a communist planned economy to a free market economy with all its consequences for law enforcement, social cohesion and, of course, availability of valuable targets. For evidence on crime in the context of changing socio-economic environments see, for example, Borning (1991) and Zvekic (1994).

Figure 4: Theft and Wealth in Western Europe 1994



Source: Spengler (1997).

2.1.10 Poverty and inequality

Sociological theories which conceptualise poverty (e.g. social disorganisation theory, strain theory, opportunity theory etc.) agree about its expected impact on crime. Poverty – so the unanimous opinion – increases crime. However, there is a certain disagreement about how poverty may be measured. There are proponents of the "absolute" poverty concept who claim that "the lack of some fixed level of material goods necessary for survival and minimum well-being causes criminal activity (personal as well as property)" (Patterson 1991:755). Others argue that "relative" poverty (i.e. economic inequality) is a more relevant variable to explain variation in criminal behaviour. Considering the empirical literature, both absolute poverty as well as relative poverty seem to be rather positively related to violent and property crimes. However, results remain uncertain. Many studies find insignificant effects and some even inconclusively negative ones, though the latter case is rather exceptional (for surveys on the poverty/ crime literature see Patterson (1991) and Kovandzic, Vieraitis and Yeisley (1998). An explanation of the relatively weak results may be the fact that criminologists are most interested in the relationship between poverty and violent crimes, like murder. In our opinion, poverty variables are more appropriately used as factors of property crime than for the explanation of violent crime. This view is supported by the fact that statistical tests of the economic theory of crime (see Ehrlich 1973, Entorf and Spengler 1998) find strong significant effects of inequality measures on property crime. Ohlemacher (1995), who provides another example for Germany, uses the ratio of social welfare recipients to total population as a measure of absolute poverty (which might be a problem since eligibility depends on average income). He finds evidence of a positive correlation between absolute poverty and robbery and theft.

2.1.11 Labour market

Most citizens belief that unemployment is the most important cause of crime. From the theoretical point of view this belief seems to be reasonable, since, according to the economic theory of crime, unemployed individuals are per definition excluded from legal income opportunities, and, thus, *ceteris paribus* more likely to commit crimes than people who have a job. Or, put differently, "unemployment will make crime more attractive if the alternative is a life in poverty" (Eide 1997:17). Apart from this exclusively economic argumentation, unemployment might also have psychological consequences that foster delinquency. If, for example, unemployment is perceived as deeply unjust and society is hold responsible for the own misery, a break with social norms and thus a higher propensity of delinquent behaviour might be the consequence. However, there also exists the opposite view (from lifestyle/ routine activity theory) which states that unemployment increases guardianship of home and (deviant) children and thus decreases the time spent in the "unsafe" public (statistically, unemployed spend more time at home than those employed). A third point of view would be that in countries with a distinctive social safety net, criminal behaviour which is motivated by economic reasons (i.e. property crime) could remain largely unaffected due to replacement rates which are equal or only slightly below the ordinary legal income. In order to find out which explanation meets reality best, the empirical evidence of the unemployment/ crime relationship (UCR) has to be taken into account.

We first consider empirical investigations at the individual level, since this is the level where crime decisions are made. Freeman (1995) puts the advantage of micro-level research in the following words: "Studies that compare the economic circumstances of individuals who commit crimes with those who do not commit crimes, or the criminal behavior of the same person in different economic circumstances, potentially offer the best way to assess how the job market affects crime" (Freeman 1995:183). A first impression of the UCR can be derived from a simple descriptive statistics. Holzman (1983) in a U.S. study of habitual robbers and burglars based on the 1974 Survey of Inmates of State Correctional Facilities reports that at the time of their latest offence approximately 25 per cent of offenders were unemployed. This is more than four times the U.S. unemployment rate in the survey year (5.6 per cent). In a recent study Tauchen, Witte and Griesinger (1993) report that adolescents who were employed for a larger percentage of a year are less likely to be arrested than those employed for a shorter percentage.

However, these results may "simply reflect the fact that the criminal population consists of people who are unable to succeed in society because of 'personal characteristics'[which are] the cause of both the poor labor market record and criminal activity" (Freeman 1995:184). Freeman discusses three ways in which researchers can take advantage of micro-data in order to detect the causal effect from unemployment on crime. First, one can look at the same person in different periods. If he commits more crimes in times of unemployment than in times of employment this would suggest that unemployment caused the delinquent behaviour. By doing so Farrington, Gallagher, Morley, Ledger and West (1986) found evidence in favour of a positive UCR. Second, one could employ the unemployment rate of the area where the individual resides. This macro indicator is presumably independent of individual characteristics and thus a suitable variable to assess perceived legal income opportunities. However, three studies which have carried out this approach (Lee 1993, Good, Pirog-Good and Sickles 1986 and Trumbull 1989) have found inconsistent results. Third, one can estimate labour supply relations between criminal participation and legal income opportunities (i.e. actual or predicted wages) and illegal income opportunities (i.e. criminal wages or perceptions of the attractiveness of crime). This way, however, requires highly sophisticated data, which have only been collected once within the 1980 National Bureau of Economic Research Inner City Youth Survey (see Freeman and Holzer 1986). Viscusi (1986), who carried out the estimations, found that "youth who belief that they 'make more on the street than on a legitimate job' were far more likely to engage in crime than others and that estimated differences in income from crime and legitimate work also significantly affected crime behavior" Freeman (1995:185).

Unfortunately, even when data requirements are met, there still remains a potential source of bias, which is "interaction". Using LISREL Thornberry and Christenson (1984) indeed found instantaneous effects from unemployment to crime (U → C) as well as instantaneous and 1- and 2-year-lagged effects from crime to unemployment (C → U). All instantaneous effects from unemployment to crime are significant (U2 → C2 = 0.13[19], U3 → C3 = 0.35, U4 → C4 = 0.48). The effect from crime on unemployment is primarily evident in the lagged coefficients. All five are significant, ranging from C2 → U3 = 0.10 to C1 → U3 = 0.18. Whereas the first two instantaneous effects from crime to unemployment are negligible, the last one is sizable C4 → U4 = 0.36. Thornberry (1996:214/215) concludes, that "overall, it appears that unemployment does increase the chances of criminal behavior and that criminal behavior in turn increases the chances of unemployment."[20] Finally so-called "ethnographic" or "case studies", which are based on qualitative information gathered from potential or real offenders, also provide strong evidence for a labour market interpretation of the decision of young men to engage in crime (see Fargan 1992).

We now turn to the evidence on the UCR based on aggregated data. Chiricos (1987) has carried out a large meta-study which investigates 288 estimates of the UCR stemming from 63 macro studies (no individual level studies are included in the meta-study). Chiricos findings are displayed in Table 10. He reports that 31 per cent of all estimations investigating the UCR found a significant positive coefficient for the unemployment variable and that only 2 per cent got a negative significant result. Ciricos points to what he calls is the "conditional nature of the UCR". This means that the results show a wide variation with respect to the type of crime, the period and structure of the data set. Considering only estimations which use data from the 1970s and after, generally yields higher percentages of significance (exceptions robbery and murder). This is presumably due to the fact that in western countries post-war unemployment rates prior to 1970 were constantly low and thus did not exhibit enough variation for the identification of the UCR. The conditional nature also becomes apparent when looking at different crime categories. Considering estimations based on 1970s data, it can be inferred from the last

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[19] This expression can be read as: the causal effect of unemployment in period 2 on personal delinquency in period 2 is estimated to be 0,13 (Thornberry 1996:212).

[20] In spite of the fact that he concedes the plausibility of Thornberry and Christenson results, Freeman (1995:188) is leery of reading much into it: "Absent knowledge of what in fact influenced the individual's decision, which the data do not provide, any division of the relation between the variables is likely to depend critically on the particular structural model used to make the estimates."

column of the table that 60 per cent of all property crime estimates show positive significance, whereas this is the case for only 30 per cent of the violent crime estimates. This is a reasonable result, since property crime is directly related to legal income opportunities, which have been lost due to unemployment.

Table 10: Central results from Chiricos' (1987) meta-study

	All estimations (70s and earlier)		Estimations using 1970s data	
	Number of estimations	Per cent significant positive/ per cent significant negative	Number of estimations	Per cent significant positive/ per cent significant negative
All Crimes	288	31/2	113	48/1
Property Crimes	125	40/3	55	60/0
Violent Crimes	138	22/2	47	30/2
Burglary	42	52/2	18	78/0
Larceny	32	47/3	16	75/0
Auto Theft	28	21/7	10	40/0
Rape	17	35/0	7	86/0
Robbery	41	22/2	20	20/0
Murder	38	16/5	8	0/0
Assault	25	12/0	7	14/0

Source: Chiricos (1987), own representation.

Different levels of data-aggregation and the dimension of the data set provide further examples for the conditional nature of the UCR (not presented in Table 10). As a rule, estimations relying on lower levels of data aggregation (e.g. city rather than national level data) and/ or rather on cross-sectional than on time-series data, show higher frequencies of positive significance.[21] 14 (36) per cent of the time-series based property crime estimations considered by Chiricos (1987) show negative (positive) significant coefficients, whereas estimations relying on cross-sectional data never exhibit negative significance. Freeman (1995:178) doubts the reliability of time-series based assessments of the UCR, since "all too often, addition of further observations or of another explanatory variable, or choice of statistical technique, substantively changes results". This instability of results in time-series investigations can be demonstrated by referring to the work of Entorf and Spengler (1998). Using a panel from 11 German states and covering a period of 22 years (i.e. with a dominant time-series dimension), two out of eight coefficient estimates of the unemployment rate showed negative significance and only one coefficient turned out to be positive and significant. Later in the paper the

[21] Data-aggregation and data-dimension, however, are not independent, since national level studies are always based on time-series data.

authors tried another panel which has a dominant cross-sectional dimension (16 states, 4 years). The interesting result is that now six out of eight coefficients have turned out to be positive significant, and that no negative estimate remained.

Reconsidering the evidence from micro and macro studies we conclude that unemployment is very likely to be an important cause of crime. On the other hand, however, there is also some evidence that the relationship is not unidirectional, but rather bi-directional.[22]

In spite of the fact that unemployment is an important factor of crime, it cannot account for the majority of delinquent acts. Actually, most crimes are committed by individuals who are still involved in the educational system (pupils, students or apprentices) or who have legal work. Above mentioned figures by Holzman (1983) indicate that the portion of unemployed among offenders under investigation was four times the unemployment rate. But this also means that 75 per cent of the offenders were employed at the time of their last offence. Thus, it is unlikely that for them unemployment was the cause of their delinquent act.[23] This difference becomes even more striking if a less "criminal" or representative sample is considered. Using the 1980 National Longitudinal Survey of Youth, and considering 1,134 youth aged 17-23 who were neither at school nor in the forces, Grogger (1998) reports that only 6 per cent of those who admitted to have gained any income from crime were unemployed in the respective year. This gives raise to the supposition that the labour market may bear further crime-enhancing aspects besides unemployment – for example, wages, wage inequality and labour conditions.

Considering wages first, Grogger (1995) finds by means of a sophisticated theoretical and empirical model that a 10 per cent increase in the wage would lead to a 1.8 percentage point reduction in the crime participation rate. This result is consistent with the economic theory of crime which predicts that *ceteris paribus* higher legal income opportunities (i.e. higher legal wages) lead to a decrease in delinquency. However, in a recent macro study by Willis (1999a)

[22] An extensive discussion of the reciprocal relationship between crime and the labour market can be found in Section 2.2.2.

[23] Ehrlich (1973) provides an argument against this conclusion. According to him, it is possible that unemployment also affects the crime decision of employed individuals. For them, the unemployment rate can be regarded as the average "job-loss probability". Thus, future legal income is no longer certain, but – like illegal income – also subject to uncertainty. As a consequence expected legal income will decrease with higher unemployment rates, what in turn renders delinquency more likely.

who uses panel data on the 50 states covering 1979 to 1992, the evidence in favour of a crime-reducing effect of higher minimal wages is weaker. Trying four minimum wage measures in regressions for three index crimes (burglary, larceny-theft, and auto-theft), only two wage measures turn out to be significant, and both are found in the regressions for auto theft.

Another possible link between the labour market and delinquency might be wage inequality. From a theoretical point of view the effect of inequality[24] on crime is straightforward. According to the economic crime theory higher economic inequality renders crime more rewarding for those at the lower end of the wage/ income distribution. For these groups crime becomes more likely. In the field of criminology, inequality is covered by means of the concept "relative deprivation". "Relative deprivation is based upon the pervasive need for comparison between individuals or groups within a society. Comparison of one's position relative to that of others (or one's past) is a way of assessing how satisfied one is" (Fowles and Merva 1996:164). Despite the positive relationship postulated between economic inequality and crime by theories from different disciplines, empirical research has not so far yielded unambiguous results. In a recent study using panel data from the 28 largest U.S. Metropolitan Statistical Areas covering 1975-1990, Fowles and Merva (1996) find a significant positive impact of inequality on the violent crimes of murder and assault, but no evidence is found linking inequality with robbery and burglary. For larceny/ theft, motor vehicle theft, and forcible rape the results are even counterintuitive. Nevertheless, estimates more often turn out to be conclusive than inconclusive. Fowles and Merva (1996) provide a summary of seven studies testing the inequality/ crime effect. 18 out of 20 estimates have the expected (positive) sign, and 11 show significance. The two inconclusive negative estimates are not significant at the 5 per cent level.

Finally, there might be a relation between job quality and crime. Using state-level data from 1977-1988, compiled from raw arrest data of the FBI's Uniform Crime Reports and from the Census Bureau's annual March Current Population Survey, Allan and Steffensmeier (1989) investigate the effects of job availability and job quality (e.g., inadequate pay and hours) on the arrest rates of juveniles and young people. They find that inadequate pay and working

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[24] In the course of the present study the authors will not distinguish wage from income inequality. We are aware of the fact that wage inequality and income inequality are not the same. However, in crime research a differentiation would be of minor importance, since the arguments put forward in order to explain the link between both kinds of inequality and crime are identical.

hours are associated with high arrest rates for young adults for all four crime categories under consideration (robbery, burglary, larceny and auto theft). In another study using data from 121 Seattle census tracts from 1979-1981, Crutchfield (1989) could not find any significance for the "full time work" variable in the regressions for murder, assault, rape, and robbery.

2.1.12 Social security

Since social security is financed by social welfare contributions and taxes which in turn may disturb the optimal allocation of resources, many economists demand cutting back the welfare state. Such reductions do not necessarily have solely wanted effects. Predictions based on the economic theory of crime suggest that a certain number of disadvantaged people who have benefited from the welfare state, may now find delinquency a more tempting option. Moreover, the absence of social welfare payments leads to a higher inequality so that people who are at the lower ends of the income distribution will have less chances to find legal income opportunities (see 2.1.3). Thus, for high-risk groups incentives of committing a crime increase. There are four recent papers assessing this interesting trade-off, two of which are solely theoretical (Demougin and Schwager 1998 and Sala-I-Martin 1997a) and two of which are mainly empirical (DeFronzo 1997 and Zhang 1997). Using cross-sectional U.S. state data of 1987, Zhang (1997) investigates the impact of eight different welfare measures on property and violent crime. Zhang employs indicators which are related to concrete welfare programs as well as general welfare variables:

<u>Individual welfare program measures:</u>

- Aid to Families with Dependent Children payments and recipients (AFDC)[25],
- Medicaid payments (Medicaid),
- National School Lunch Program payments (School Lunch),
- Public Housing Assistance expenditures (Public Housing).

<u>General welfare:</u>

- Sum of all welfare payments divided by state population (W1),
- number of recipients of all welfare programs divided by state population (W2),
- ratio of maximum AFDC benefit over AFDC need standard for a three-person family (W3),
- sum of all welfare payments divided by state population (W4).

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[25] AFDC is a program administered and funded by Federal and State governments of the United States to provide financial assistance to needy families.

Zhang finds that property crime can be reduced by increasing per capita welfare payments (W1), recipient-population ratio (W2) or maximum benefits (W3) in a state. Moreover he states that individual programs available to both genders (e.g. public housing) have a larger effect on crime than programs primarily directed towards women (like AFDC). Concerning violent crimes, Zhang could not find any significant impact of welfare programs. In contrast to that, DeFronzo (1997) finds in his study based on 141 U.S. cities an independent, direct negative impact of AFDC on homicide rates and a separate indirect negative relationship to homicide rates through AFDCs association with household status.

2.1.13 Family

In the discussion of the social disorganisation and social control theory (see Sections 2.1.1 and 2.1.5), factors based on family attachments have already been revealed to be an important factor of crime. As regards the empirical literature specialised in the family/ crime relation, studies in this field of research are almost exclusively concerned with the families' impact on child delinquency. Loeber and Stouthamer-Loeber (1986) provide an enormous survey of the literature. They identify three categories of family failure which are central to the understanding of child delinquency. "The neglect paradigm focuses on measures of supervision and the amount of interaction between parent and child.[...] The conflict paradigm deals with the adequacy of parental discipline or punishment and mutual rejection of parent and child. [Finally, the deviant behaviour and attitudes paradigm] focuses on parental behavior that encourages delinquency by positive example or by the failure to respond negatively to clearly deviant behaviour of the child" (Hirschi 1995:125/126). However, there are also a few studies which are concerned with other consequences of family failure than child delinquency. In two recent papers the consequences of marital status and social isolation on homicides are investigated. Using data from the 1992 U.S. Mortality Detail File, Breault and Kposowa (1997:217) find that divorced females were 55.3 per cent more likely to be homicide victims than married females. But single women did not differ from married women with respect to homicide risk, and widowed women were significantly less likely to be homicide victims than married women. In a similar study Kposowa, Singh and Breault (1994) investigate the effects of marital status and social isolation on male adult homicide. Kposowa et al. (1994:227) report that "single persons were 1.9 times, and divorced, separated or widowed persons were 1.7

times more likely to die from homicide than married persons. Socially isolated persons were 1.6 times more likely to become homicide victims".

2.1.14 Peers and gangs

The importance of delinquent peer relations for one's criminal behaviour has already been stressed in the discussion of differential association and interactional theory (see Sections 2.1.4 and 2.1.8). As regards the influence of peers, researchers agree that delinquent peers do increase delinquent behaviour. Meanwhile, it is also accepted that delinquent peer relations and own delinquency are reciprocally related. Using data from the National Youth Survey and estimating a cross-lagged panel model, Matsueda and Anderson (1998) find that "delinquent peer associations and delinquent behavior are reciprocally related, but the effect of delinquency on peer associations is [even] larger than that of peer associations on delinquency (Matsueda and Anderson 1998:269). By means of the Rochester Youth Development Study data, Thornberry, Lizotte, Krohn, Farnworth and Joon Jang (1994:47) detect a further reciprocal relationship between delinquent peers and delinquency. "Association with delinquent peers leads to increases in delinquency via the reinforcing environment of the peer network. Engaging in delinquency, in turn, leads to increases in associations with delinquent peers". Employing the same data set, Thornberry, Krohn, Lizotte and Chard-Wierschem (1993) find that entering a gang reinforces crime and leaving the gang reduces delinquency. However, if one considers peer relations other than delinquent ones ("good" friendships), the effect on criminal behaviour is expected to have the opposite direction. Particularly social control theory (see 2.1.5) stresses the crime reducing effect of "attachment" (see also the significant negative impact of "density of friendship" in Table 1).

2.1.15 Social class

Social class or socio-economic status (SES) is generally determined in terms of income and/ or education of the individuals under investigation. In the case of youth, crime research usually applies the SES of parents. Among scholars who are engaged in research on the SES/ delinquency relation, there is disagreement about the relevant SES scale. "Some [...] have proposed that it is only at the very lowest point on SES continuum that differences in delinquency can be found. They argue that research using gradational measures, which array respondents on a continuum, are inappropriate for examining the SES/ delinquency relationship, and they propose instead a two category measurement that delineates 'underclass' from all others" (Tittle and Meier 1990:273). The empirical literature about the influence of the socio-economic status (SES) of individuals on crime reveals ambiguous results. In their survey of the SES/ delinquency literature, Tittle and Meier (1990:271) conclude that "the results do not support any of the conditional hypotheses about SES and delinquency, and they again challenge the idea that a negative SES/ delinquency relationship is general and pervasive". In the opinion of the authors of the present EU-study, this view is somewhat biased, as the clear majority of the presented studies produced negative SES/ crime estimates (i.e. the higher the social class of an individual is the lower is his delinquency). Tittle and Meier, however, often declared these results to be invalid because of methodological shortcomings.

2.1.16 Mobility and Community Change

A high rate of mobility is expected to increase institutional disruption and weaken community controls. Therefore, mobility is one of the central variables employed in tests of the social disorganisation theory (see Section 2.1.1). Contrary to expected effects, mobility showed the worst performance among all social disorganisation variables. Therefore, it is appropriate to consider further empirical studies which employed mobility as an explanatory variable of crime. We do this by borrowing from Sampson's (1995:195) survey: "Block (1979), for example, reports large negative correlations between residential stability and the violent crimes of homicide, robbery, and aggravated assault. Victimisation data from the National Crime Survey also show that residential mobility has significant positive effects on rates of violent crime (Sampson 1985). Even after adjusting for other neighbourhood-level factors, rates of violent victimisation for residents of high mobility neighbourhoods are at least double those of residents in low mobility areas (Sampson 1985:30, 1986:44)". From this additional evidence one can conclude that the use of a mobility indicator in empirical studies of crime is advisable.

2.1.17 Age, gender and nationality / race

If one considers the distribution of a population with respect to age, gender and nationality / race, and if one compares these distributions with the respective distributions of suspects of crime, striking differences emerge. To give an example, in Germany (in 1996) the share of men in the population was 49 per cent, but the share of male offenders was larger than 75 per cent; the share of citizens aged 6-24 in the population was 21 per cent, but 40 per cent of all offenders belonged to this age group; one forth of the suspects of crime were foreigners, whereas their population share equalled only 9 per cent. These figures do not represent German peculiarities, but can be observed in a similar manner across all western countries. One might suspect that this strong relation between age, gender, nationality and crime is simply spurious evidence which will presumably vanish in a multivariate context. However, this objection is not correct. Most multivariate studies which use age, gender and nationality or combinations of them as explanatory variables find highly significant coefficients with expected signs (see for example Ehrlich 1973, Entorf and Spengler 1998). Since consistent explanations of the direct effects of age, gender and nationality/ race are lacking, the robust finding of significance for these variables in crime regressions must be due to the absorption of unobservable heterogeneity and the omission of correlated relevant (observable) variables. Thus, age, gender and nationality/ race are useful control variables which should be included in crime regressions. On the other hand, there also exists U.S. evidence for a reciprocal relationship between crime and racial composition of the urban population. Whereas racial composition strongly affects the change in violent-crime rates, robbery rates appear to play a significant role in the white urban flight from central cities (Liska and Bellair 1995).

2.1.18 Urbanity

What has been said about age, gender and nationality/ race in some respect also holds true for urbanity. Measures which account for urbanity, like population density, often turn out to have a significant positive effect on crime. But it is not obvious why urbanity *per se* should directly affect crime. Glaeser and Sacerdote (1996) report that 27 per cent of the urban crime effect (i.e. the difference between rural and urban crime rates) in the United States is due to higher pecuniary benefits for crime in cities, 20 per cent is explained by lower arrest probabilities and lower probabilities of recognition, and the remaining 45-60 per cent of the effect can be related to observable characteristics of individuals in cities. Thus, according to Glaeser and Sacerdote the whole urban crime effect can be explained by other variables than by urbanity itself. However, Roncek (1981) provides an explanation of how urbanity (i.e. high population density) may directly affect crime. If the population density increases, the number of residents who do not know each other but share common living space becomes higher, and thus, residents are less able to recognise their neighbours, to be concerned about them or to engage in guardianship behaviours (Roncek 1981:88). There also exists evidence for a reciprocal relationship between crime and urbanity (see the papers of Burnell 1988, Bursik 1986, Cullen and Levitt 1999, Frey 1979, Grubb 1982, Liska and Bellair 1995 and Sampson and Wooldredge 1986). According to this studies higher crime rates are an important cause of (white) population flight from central cities in the U.S..

2.1.19 Law enforcement

Law enforcement or deterrence variables have been introduced to crime research by economists. Variables/ indicators representing law enforcement are covered by probabilities of arrest, clearance, conviction and conviction given arrest, and by the number of police. Further examples are the variables related to type and severity of punishment. Empirical research on law enforcement started with the seminal paper of Ehrlich (1973) and did not lose its importance until today (see for example Levitt 1997). Since today the empirical literature has reached an enormous size, it is reasonable to rely on the excellent survey of Eide (1997) in order to assess the importance of deterrence variables for variations in crime. Eide (1997:16) concludes that "as a whole, criminometric studies clearly indicate a negative association between crime and the probability and severity of punishment". But he also points to the fact that few studies find insignificant (see for example Witte 1980) or even inconsistent positive effects. The latter, however, might by the result of potential interactions between deterrence and crime variables (see the discussion in Section 2.1.3). Levitt (1997) has presented a widely discussed paper that takes into account potential simultaneous interactions between the number of police and the crime rate. Based on a panel of large U.S. cities, he tackles the interaction problem by applying econometric instrumental variable techniques. Relating variations in police size and electoral cycles, he comes to the conclusion that more police significantly reduce crime. A considerable number of earlier papers has missed to show this relation – presumably because estimates have been corrupted as a consequence of ignored interactional relations.

2.1.20 Private crime prevention

Compared to empirical assessments of the law enforcement/ crime relation, the impact of private security measures on crime has been neglected. Presumably, this is rather a consequence of lacking access to appropriate data than an indication for the minor relevance of this sector. For the United States Philipson and Posner (1996) estimate that private expenditures to reduce crime are $300 milliard annually. If this figure represents a reasonable estimate, it would equal three times the amount the government spent for criminal justice in 1995 which was almost $100 milliard. Two recent empirical studies on private security (Ayres and Levitt 1998 and Miethe 1991) find significant crime reducing effects of private security measures. Ayres and Levitt (1998) investigate the impact of a new electronic car retrieval system ("Lojack") which is invisibly hidden in the car. They report that the availability of Lojack (Lojack was subsequently introduced in the United States) is associated with a sharp fall in auto theft and extraordinarily high positive externalities. According to Ayres and Levitt, the marginal social benefit of an additional unit of Lojack exceeds the marginal social costs in high crime areas by a factor 15. Miethe (1991) investigates the crime-reduction benefits of safety precautions and whether either displacement (i.e. other people get victimised instead of those who protect themselves) or positive externalities characterise how the target-hardening activities of immediate neighbours influence risks of burglary, property theft, and vandalism. Miethe finds that only the personal risk of burglary victimisation were significantly reduced by protection activities. No externalities were found i.e. neighbours did neither suffer nor profit from the protection measures.

2.1.21 Media

There is a substantial body of empirical research by psychologists investigating the relationship between television (and video) violence and aggressive behaviour (for a survey of the literature see Donnerstein and Linz (1995)). This literature has been analysed by three large U.S. meta-studies in three different decades (Surgeon General's Scientific Advisory Committee on Television and Social Behavior 1972, National Institute of Mental Health 1982, American Psychological Association 1993). The central core of the results across the three meta-studies can be summarised as follows: "High levels of television viewing are correlated with aggressive behavior and the acceptance of aggressive attitudes. Furthermore, these correlations are fairly stable over time, place, and demographics. An examination of hundreds of experimental and longitudinal studies supported the position that viewing violence in the mass media is causally related to aggressive behavior. More important, naturalistic field studies and cross-national studies supported the position that the viewing of televised aggression leads to increases in subsequent aggression and that such behavior can become part of a behavioral pattern that lasts well into adulthood" (Donnerstein and Linz 1995:248). In order to provide a concrete example, Phillips and Hensley (1984) examined the patterns of more than 140,000 U.S. homicides from 1973 to 1979 before and after publicity about prizefights, murder acquitals, life sentences and executions. Using daily data and regression analysis Philips and Hensley report that the number of homicides show a significant increase several days after the fight. Phillips (1983) replicates and refines these results by finding that this increase primarily occurs in the population belonging to the race of the defeated prizefighter. Further findings reported by Phillips and Hensley (1984) are that the number of homicides taking place after publicised stories about death sentences, life sentences, and executions was lower for several days following these events. There is also some macro-evidence of the impact of television violence on homicide rates stemming from a comparison of the United States, Canada and South Africa. Whereas in the two American countries television was introduced in the early 1950s, South Africans had to wait until 1975, and, thus, were excluded from the exposure to television (violence) for approximately 25 years. Centerwall (1989) puts forward the hypothesis that this difference in the exposure to media might be reflected in the homicide rates of the three countries. And indeed, from 1945 to 1974, the white homicide rate in the United States and Canada increased by 93 and 92 per cent respectively, whereas that of South Africa declined by 7 per cent. In order to strengthen his results Centerwall accounted for several other factors (civil unrest, antiwar and civil rights activity, age distribution, urbanisation, alcohol consumption, capital punishment, and the availability of firearms) that could drive the results, but came to the conclusion that none of these provides a viable explanation of the phenomenon. Nevertheless, Centerwall can be criticised for several reasons. It might be questioned whether the United States, Canada, and South Africa are comparable countries after all (for a discussion of the suitability of international crime data see Lynch (1995)). Finally, in order to be complete, one has to recognise that there is also a different view of the influence of television exposure on criminal behaviour. In this context we want to recall the routine activity/ lifestyle theory (Section 2.1.2) according to which watching TV is regarded as a crime-reducing at-home activity.

2.1.22 Religion/ Religiosity

Advanced empirical research on the impacts of religion on crime started with the study "Hellfire and Delinquency" by Hirschi and Stark (1969). In contrast to common beliefs, Hirschi and Stark found that frequent church attenders and students who believe in the Devil after death do not differ significantly in their delinquent behaviour from students who do not believe in a supernatural world (Hirshi and Stark 1969:210). Subsequent research (Higgins and Albrecht 1977, Jensen and Erickson 1979 and Rohrbaugh and Jessor 1975), however, has indeed found an effect of religion on various forms of deviant behaviour, including crime. The results of this earlier research might be best summarised in the words of Grasmick, Bursik and Cochran (1991:251): "Sociologists have concluded that at least some aspects of religion inhabit at least some kinds of illegal behavior at least under some conditions". This assessment seems to be also appropriate when recent contributions are taken into account (see for example Benda 1997, Cochran, Wood and Arneklev 1994 and Evans, Cullen, Dunaway and Burton 1995). Using self-report data from a sample of approximately 1,600 high school students in Oklahoma, Cochran et al. investigate the effect of 3 religion variables (religious participation, religious salience and Protestant fundamentalism) on 6 types of deviant behaviour (interpersonal delinquencies, property-theft delinquencies, property-damage delinquencies, illicit drug use, use of legalised drugs, and truancy). As additional explaining variables, Cochran et al. use the common control variables (age, race, gender and urbanity), six variables stemming from social control theory and three so-called arousal-variables. The regression results provide only weak evidence for a crime-reducing effect of religiosity. Only three out of 18 coefficients turn out to be significant - Protestant fundamentalism reduces illicit drug use, religious participation has an negative impact on the use of legalised drugs, and religious salience negatively effects truancy. Evans et al. (1995) investigate the effect of three religiosity variables (denominational conservatism, religious networks and personal religiosity, where the latter is a joint measure of religious activities, hellfire beliefs and religious salience) on general delinquency. They test four different model specifications and find that two out of 12 coefficients are significantly different from zero. The central result of the study is that personal religiosity only affects general crime when the former is measured by religious activities alone. In contrast to all other studies about religion and deviance, Benda (1997) also takes interactional relationships into account. Benda reports significant bi-directional relations between religiosity and drug use and between religiosity and crime. The relationship between religiosity and alcohol use, however turned out to be unidirectional (from alcohol use to religiosity). To our opinion, if available, religion indicators should not be omitted from empirical investigations of crime, though the significance of religion in criminometric studies might arise from unobserved heterogeneity rather than from true religious differences.

2.1.23 Weather

Considering weather as a potential factor of crime is not as bizarre as it might appear at first glance, because from a routine activity/ lifestyle perspective (Section 2.1.2) weather is a variable that might influence decisions on time allocation: time could either be spent at "unsafe" public places or at "safe" home. According to Cheatwood (1995:51) of all weather variables which have been under investigation, temperature turns out to be the most important. An increase in temperature has been found to correlate with an increase in assault (see for example Anderson 1989, Harries 1990, Lab and Hirschel 1988), homicide (Kohfeld and Sprague 1991), violent crime in general (Cotton 1986), rape (Michael and Zumpe 1983) and police calls for service (Cohn 1991, LeBeau and Langworthy 1986). The relationship between temperature and crime seems to hold across time and space. Cheatwood (1995:53) provides examples for correlations between alternative weather variables and crime: Pakiam and Lim (1984) found that robbery decreases in Singapore during periods of rain, but increased cloud cover seems to be positively associated with assault (Lab and Hirschel 1987) and general criminal violence in Korea (Chang 1972). McFarland (1983) also suggests that severe cold reduces homicide. In a recent study on England and Wales, Field (1992) finds that temperature has a positive effect on most types of property and violent crime, because higher temperatures cause people to spend more time outside (save) home. It has to be emphasised, however, that there are other studies which do not find significant relations between weather variables and crime (see LaRoche and Tillery 1956, Pokorny and Davis 1964 and Olsson and Wikström 1984).

2.2 Summary of research on the negative impact of crime on economic performance

2.2.1 On the importance of bi-directional crime models

Traditional modelling of crime sought to understand how economic variables can lead to crime. The most recent development of criminological and economic literature, however, considers ways in which crime itself might lead to economic problems. The overwhelming majority of studies focuses on labour market performance. Section 2.2.2 presents a survey. Given its obvious importance for economics there is surprisingly little evidence on how location decisions of firms and households might be affected by crime and criminal neighbourhood. Recent articles by Cullen and Levitt (1999) and Willis (1999b) provide remarkable exceptions (see Section 2.2.3). Estimating the costs of crime is important for the efficient use of public policy. Section 2.2.4 provides more details. Among the costs of crime, illegal drug use plays a prominent role. Illegal drug use causes about 20 per cent of the total crime costs in the U.S. and might cause poverty (see Section 2.2.5). Finally, we draw attention to the consequences of corruption and organised crime, though little empirical evidence apart from anecdotal evidence is available (Section 2.2.6).

2.2.2 Labour market outcomes

2.2.2.1 Loss of future employment: Three obvious reasons

It has become increasingly clear that employment and crime relate to each other in several ways. For instance, Freeman (1991, 1995) presents evidence that a prison record has a substantial quantitative adverse effect on future employment. Using U.S. data of the National Longitudinal Survey of Youth (NLSY), it turned out that a young man incarcerated in 1979 worked about 25 per cent less in the ensuing eight years than a young man who has not been in prison. What might be the reasons for this massive loss of future employment? Freeman (1991) decomposes the effect into three possible effects. The first is recidivism. For the U.S., Freeman mentions a recidivism rate in the order of two-thirds of state prisoners aged 18-34 that have been re-arrested within three years. Persons who have been in jail are more likely to be in jail in later years as well. The same holds for European data. German data, for instance, reveal that 27 per cent of all releases on probation ending in 1994 ended because of recidivism (Statistisches Bundesamt 1998).

The second possibility is that persons who went to jail reject work in favour of crime after their release. Sviridoff and Thompson (1983), who interviewed 61 adult male misdemeanants before and after their release, report a typical quotation that supports the economists' claim that crime is based on rational choice and on the weighing of the relative merits of risky crime and working life: *"They were making $200 a day in the street, $150 a day, gambling, stealing. And now they gonna work, ten hours a day, seven days a week for $125?" (Sviridoff and Thompson 1983:210).* According to Sviridoff and Thompson, the problem with ex-offenders who were involved in property crime is that they seem to be particularly aware of crime and employment as competing alternatives. The problem is reinforced by the recent improvement of criminal skills at the expense of legitimate skills. Thus, employment must be good enough to be accepted. According to Sviridoff and Thompson (1983), this kind of calculus gives rise to alternation between employment and crime. They consider this behaviour as the prevalent model for high-risk youths.

The third possibility is that employers are unwilling to hire ex-offenders. Sampson and Laub (1997) claim that formal labelling by the criminal justice system in adulthood will directly cause employers to exclude ex-offenders from employment opportunities. As can be seen from a survey by Bushway (1998:455), such exclusion is associated with job instability, which has shown to increase offending (see e.g. Cook 1975, Farrington et al. 1986, Needels 1996, Sampson and Laub 1993).

A distinction has to be made between labelling and signalling. Employers can make use of a criminal record as a signal about the qualification of a job (Jensen and Giegold 1976, Bushway 1998). Examples of using a criminal history as a signal rather than a label include restricting convicted drunk drivers from jobs as a truck driver or restricting an individual arrested multiple times for child molestation from working in a child care centre.

2.2.2.2 Reasons for job instability: Criminality, conviction or third factors?

Evidently, employers label potential employees on the basis of their criminal record. However, the existence of labelling does not prove to be the true source of significant job instability (see Bushway 1998, for a recent survey of the criminological literature and many of the following arguments). A delinquent youth might have problems maintaining a stable employment anyway (see Gottfredson and Hirschi 1990). Or, as Hagan (1993) notes, problems with job stability following an arrest could actually be the result of the criminal activity itself. A process which he calls "social or criminal embeddedness" leaves delinquent youths without human and social capital that would be necessary to start a regular career job. This reasoning is obvious according to the definition of "social capital". Social capital consists of three components (Coleman 1988, see Williams and Sickles 1997, for an application in economics): Networks for disseminating and obtaining information (e.g. about job opportunities), a reward and punishment system, and a system of reciprocal debts and obligations. Hagan (1993) found support for his hypothesis using Farrington's London data (Farrington et al. 1986). He controlled for individual heterogeneity with a long list of observed measures of individual behaviour. Nevertheless, self-reported delinquency at the ages of 18 and 19 had an impact on the probability of experiencing a spell of unemployment at the ages of 21 and 22. Hagan (1993:482) interprets his result to mean that the "embeddedness in youth crime more than official convictions [...] is influencing unemployment at this stage".

However, Hagan (1993) seems to be the only well known study that has found that offending rather than contacting with the criminal justice system leads to employment problems. For instance, Sampson and Laub (1993) using U.S. data (1000 boys from Boston) conclude (after controlling for excessive drinking, gender, age, race and delinquency) that the length of incarceration as a juvenile has a significant impact on job stability. Contrary to Hagan (1993), Sampson and Laub (1993) have not found any significant effect of self-reported delinquency. This result is consistent with the hypothesis that official (serious) contact with the criminal justice system has a negative impact on future employment and job stability. Freeman (1991), Nagin and Waldfogel (1995) and Bushway (1998) are further examples confirming the latter view of the link between crime and job instability.

Latest developments in the field of criminology are characterised by attempts to control for unobserved individual heterogeneity using panel data (see Grogger 1995, Nagin and Waldfogel 1995, Bushway 1998). This is the most recent stage in terms of adequate statistical techniques. During the eighties, researchers were primarily concerned about simultaneity and overestimating causal effects due to a potential simultaneous equation bias. For instance, Liska and Reed (1985) using LISREL and individual data on youths in transition questioned the traditional model assuming a recursive causal structure of social attachment on delinquency. Their results suggest that, with the exception of blacks, parental attachment affects delinquency, but that likewise delinquency affects school attachment, and that school attachment affects parental attachment. Using data of the birth cohort of 1945 and also using LISREL, Thornberry and Christenson (1984) found simultaneity between crime and unemployment (see also Sections 2.1.8 and 2.1.11).

Despite the progress made with respect to generalising simple unidirectional modelling, the problem may arise that causal effects are not the only means by which correlation between labour market measures and arrest records can be judged. An individual's probability to commit a crime may be correlated with unobservable "third factors" which likewise might cause employment opportunities (see, for instance, Albrecht (1988) for a conjecture of this kind). Grogger (1995:66) gives a stylised example. Suppose that schooling, which is highly correlated with labour market productivity, is missing in the data. People with little schooling will receive low wage offers. Thus, they might find it more attractive to spend their time committing crime. Over time, this would leave them to have a spotty employment record and many arrests, but the correlation arises from unobserved schooling rather than from any causal effect of the arrests. Such problems of "unobserved individual heterogeneity" can be tackled by using panel data and methods like fixed-effect modelling (Grogger 1995) or "differences in differences" (Nagin and Waldfogel 1995, Bushway 1998). Coming back to the question "conviction versus criminality", Sampson and Laub (1993), Nagin and Waldfogel (1995) and Bushway (1998) show that arrests lead to job instability even when controls for unobserved heterogeneity are included in the model. The solely study in favour of criminality (Hagen 1993) only has controls for *observed* heterogeneity.

2.2.2.3 On magnitude, sign and durability of crime effects.

There is no doubt that persons whose criminal behaviour has brought them into prison have a significantly lower employment rate and a higher job instability in the future than those who do not commit crimes. Freeman (1991, 1995) estimates a reduction of employment of about 25 per cent within eight years after incarceration (see above). According to Bushway's (1998) model of differences in differences, arrest decreased the longest time spent at a job by 10.78 weeks a year. This is large compared with the 1986 average for the sample of 41.89 weeks worked for a major job. This results in a reduction of 25.73 per cent which is comparable with Freeman's study as well as with estimates presented by Nagin and Waldfogel (1995), who report a reduction of 32.8 per cent for 19-year-old youth.

In contrast to most studies on the effect of crime and conviction on *income,* Nagin and Waldfogel (1995) find that conviction might have a *positive* effect on the legitimate income of young offenders. The authors explain the surprising results appealing to a human capital explanation of workers' pay. Two types of jobs are available for young entrants to the labour market: spot market jobs and career jobs. Career jobs require an apprenticeship and certain skills. The human-capital theory predicts rising wage profiles and the prospect of long-term employment. Wages will start from a low level and the individuals will receive part of their compensation as training and pay for tenure and work experience. However, only spot market jobs are offered to young offenders. They work as labourers, their job does not require training and will tend to have flat wage profiles. The human capital theory suggests that job stability is lower for spot market jobs. Spot market job dismissal for poor performance is easier and less costly to the firm, since loosing them does not imply significant losses of previous investment in firm-specific human capital.

An important question for the future performance of western societies is whether involvement with the criminal justice system has long-term effects or whether there are only short-lasting deviations from the behaviour of non-criminals. Freeman (1991) and Sampson and Laub (1997) conclude that incarceration had substantial long-term effects on earning and employment. Grogger (1995:70), however, finds that the effects of arrests on employment and earnings are "moderate in magnitude and rather short-lived". His analysis suggests that most of the negative correlation between arrest records and labour market success stems from unobservable characteristics (which he controls for by using fixed effects). Freeman (1995:189) summarises his own previous research by noting that probation might be considered as a "critical" measure that might be used to discriminate between long-run and short-run effects: "In the NLSY and two other data sets I found that anything short of probation has no discernible effects on the future employment of youths".

Though there is clear evidence of negative effects of crime on job stability, it has to be stressed that crime and employment are no mutually exclusive activities. In other words, working does not exclude simultaneous activities in the illegal sector. Freeman (1995:188) reports that in the NLSY of 1979 and 1980, 59 per cent of those who were out of school and unemployed said they had committed a crime, compared with 53 per cent of those out of school and employed. Thus, there is only a small difference. These findings confirm Sviridoff and Thompson (1983:201-203), who have drawn special attention to respondents of their qualitative study for whom work is a way of expanding and enhancing criminal activities. Furthermore, results by Ploeger (1997) suggest that employment, not unemployment, is responsible for the exposure to delinquent peers, so that employment and crime are positively correlated.

2.2.2.4 What is the aggregate effect?

All studies mentioned above are based on individual data. The massive loss of individual employment probabilities can only translate into discernible aggregate effects when a significant proportion of the population has a criminal history. There are only a few studies that test bi-directional causality between unemployment and criminality (Freeman 1983, Corman, Joyce and Lovitch 1987, Yamada et al. 1991, Reilly and Witt 1992). All studies confirm a unidirectional causality of unemployment on crime.

It has to be questioned, however, whether this result will hold in future. Given the massive increase of prison population in western societies during the most recent years, there will be an unprecedented share of ex-prisoners in society. Freeman (1995:172) reports that for U.S. men aged 18 to 34, the ratio of those incarcerated to the labour force was 3.1 per cent in 1993. The corresponding ratio of those under supervision of the criminal justice system was 11 per cent. These figures come close to or even exceed the unemployment rates. For minorities the ratios are much larger. For black men aged 18 to 34 the ratios to the workforce are 12.7 per cent incarcerated and 36.7 per cent under supervision (Freeman 1995:172). Time series analysis that has to rely on historical data cannot fully reflect these unprecedented developments, so that forecasts based on previous studies will be of limited use only.[26] Thus, to summarise aggregate effects, we are sceptical of reading much into previous findings. In respect of forecasting future developments, individual studies are likewise important. They present reasonable pathways of influence that might also be found in future aggregate data.

2.2.3 Location decisions and crime

A further disadvantage of highly aggregate studies is that they do not cover the economic situation of particular regions, urban areas and special industries which might be subject to substantial crime distortions. It is natural to think that urban crime and job losses of cities are related. In fact, city crime rates have risen steadily while jobs have moved to the suburbs. However, rigorous statistical investigations on the hypothesis that crime actually drives out jobs are rare. Cullen and Levitt (1999) use data of 137 U.S. cities from 1976 till 1993 to analyse the relationship between crime and "urban flight". They find that each additional reported crime in a central city is associated with a net decline of about one resident. The economic consequence is reinforced by the drain of high income households: These households are five times more responsive than those of the poor, and the households with children are twice as responsive as those without children. Where do those people leaving central cities go? The

[26] This problem is well known to economists as the so-called Lucas-critique, and also addressed in the criminological literature by Chiricos (1987), who pointed at the "conditional" nature of the unemployment-crime relationship (see Section 2.1.11).

analysis by Cullen and Levitt (1999) shows that 70 per cent remain within the metropolitan area. Further studies investigating the impact of crime on (white) population flight from central cities which find similar results are Burnell (1988), Bursik (1986), Frey (1979), Grubb (1982), Liska and Bellair (1995) and Sampson and Wooldredge (1986).

Willis (1999b) provides evidence at a high level of spatial detail. He estimates employment density as a function of violent and property crime for a sample of 629 neighbourhoods (municipalities) in the city of Los Angeles. Controlling for fixed neighbourhood effects and simultaneity between employment and crime, he finds that violent crime is negatively related to employment. Specifically, an increase of one per cent violent crime is associated with a decrease of 14 jobs per square mile. Two of these 14 jobs are lost in the relatively attractive manufacturing sector and nine are lost in services and other employment. One of each group is lost in wholesale trade and public utilities. The employment in retail trade and in construction seems to be insensitive to crime.

Willis (1999b) uses crime measured as crimes per square mile. The traditionally used crime rate (crimes per inhabitant) may be inappropriate at this level of spatial detail, since the resident population matches poorly with the pool of potential victims. Using the density measure property crime seems to be statistically unrelated to employment. However, in robustness checks Willis (1999b) applied the traditional crime rate rather than the crime density. The results suggest that also property crimes may indeed have an important role in explaining job location.

Though the idea that crime may drive business away is not new (see, for instance, Polumbo and Hutton 1987 and Gottlieb 1995), Willis paper gives many new insights in this field. For instance, he draws attention to the fact that the theoretically expected sign of the relationship between firm location and crime is ambiguous. Since rents are negatively correlated with crime, "firms will choose to locate where the marginal damage from crime equals the marginal saving in rent" (Willis 1999b:3). Thus, location decisions are expected to differ by the factor intensity. Land-intensive firms would experience greater relative gains than labour-intensive firms do. Moreover, firms carrying expensive inventory (e.g. jewellery stores) are naturally very vulnerable to crime.

Further evidence on firms' attitude towards crime is extremely scarce. Sampson (1995) mentions a study of 62 manufacturing firms that moved from New York City to New Jersey (Interface 1985). Many of the surveyed firms perceived safety concerns. For example, 9 per cent said that crime was the most important reason for moving, and 21 per cent cited crime as one reason among several others. 19 per cent mentioned less crime as one of the factors that increase the attractiveness of New Jersey rather than the outer boroughs of New York City. Comparing the urban flight of residents and firms, Sampson (1995:204) concludes that "...business decisions appear to be less sensitive to crime rates than do residential ones, they are not immune from the social disorganization, fear, and social incivilities associated with street violence".

Seitz and Pohl (1997) provide some evidence on the crime burden perceived by German firms. The study is based on a survey containing 541 responding firms in two cities and one municipality of the state Saarland (Saarlouis, 40,000 inhabitants, Neunkirchen, 54,000 inhabitants and Freisen, 9400 inhabitants). About 10 to 14 per cent of firms consider crime as a major handicap for their workaday routine, whereas about 50 to 60 per cent consider crime of being only of marginal importance.[27] The survey also contains information about pecuniary damages of businesses due to crime per year (average of the years 1994 and 1995). The average damage is DM 100 per worker, which would result in the rough estimate of about 1 per cent of German GDP (with the proviso of uncertain representativity).

Besides damages which have to be covered by firms, further general economic consequences of urban flight are falling property values (see also Buck, Hakim and Spiegel 1991) and the reduction of city taxes. Thus, in order to fund a given level of city services, crime does not only imposes costs on victims but on all city residents as well.

2.2.4 Costs of crime

The assessment of the overall economic impact of crime is an essential basis for policy and decision making. From one perspective, costs of crime are simply part of the overhead of running a modern society. A certain amount of costs is unavoidable, since the society spends just enough so that, in a social optimum, the marginal Euro spent for crime control equals the

[27] It has to be noted, however, that used data cannot be considered as a representative sample of all German firms. Firms in larger cities are expected to have more serious problems.

marginal revenue from reduced crime (Becker 1968). From another perspective, however, spending money on crime is pure waste.

In order to calculate the burden of crime, a comparison could be made with an ideal state in which there is no occurrence of criminal behaviour defined by existing law. "Economic costs of crime arise when crime causes society to divert time, energy and resources from more productive resources" (Walker 1997:2). However, estimates of costs of crime are difficult to make. Costs of crime do not only include property losses, medical costs and pay losses due to injury. They also include costs of public and private efforts made to prevent and reduce future crime rates, as well as costs of the criminal justice system. Moreover, there are intangible costs such as those resulting from shattered lives and from a lack of full participation in life because of fear of crime.

Despite these difficulties, estimating the costs of crime is indispensable. Cost estimates are closer to the truth than official statistics. Official crime statistics simply count monetary values of "lost" property . Crime policy based on official statistics would be misleading, since costs such as those for child abuse and rape, for instance, would be measured as zero.

Estimates are based on victim surveys and on certain assumptions. The latter are necessary to calculate intangible costs. For instance, the lost quality of live is the largest cost component for crimes of violence. This cost component is also subject to most uncertainty. Miller, Cohen and Wirsema (1996) estimate the cost of a murder victim by $1.9 million. This does not mean that anyone would give his life away for $1.9 million. The number is arrived at by estimating the incremental amount that individuals are willing to pay for a reduced *risk of death*, not death itself: "If 100,000 people would collectively pay $30 each to reduce their risk of dying from 1/100,000 to 0, one would say that this values the 'statistical life" that is likely to be saved by $3 million ($30 x 100,000 people)" (Miller, Cohen and Wirsema 1996:15).

According to Miller, Cohen and Wirsema (1996) the cost of crime to victims amount to $ 450 milliard annually, which is about 6 per cent of GDP in the US (1995). Not included are costs of reducing the risk of becoming a victim (prevention), costs of operating the criminal justice system and opportunity costs. The latter include the loss of potential worker's productivity of individuals held in jail. The most comprehensive bill for tangible and intangible costs has been presented by Anderson (1999). Beyond expenses of the legal system, victim losses and crime-prevention agencies, the burden of crime includes the opportunity costs of victims', criminals', and prisoners' time, the fear of being victimised, and the cost of private deterrence. Anderson's (1999) estimate for the annual burden of the U.S. society is $ 1.1 billion. This would be equivalent to 13 per cent of GDP!

Sound estimates of the costs of crime are also available for France (Palle and Godefroy 1998) and for Australia (Walker 1997). According to Walker's estimate, it appears that crime costs Australians at least $18 milliard per annum, or 4 per cent of GDP. Freeman (1996), too, presents figures which amount to 4 per cent of the GDP of USA (2 per cent lost to crime and 2 per cent spent on controlling crime). Even Becker (1968) gave a rough estimate of about 4 per cent for the US, though this estimate is based on much lesser crime rates of the sixties.

2.2.5 Drug abuse

Besides "value of lost life" (439,880 million) and "occupational fraud" ($ 203,952 million), "drug trafficking" ($ 160,584 million) is the third biggest single item in Anderson's (1999) cost bill. With the cost of prenatal drug exposure and federal, state, and local drug control efforts, the combined cost of drug-related activities is about $ 200 milliard. Moreover, there is conventional wisdom that (illegal) drug use causes poverty. Empirical evidence supporting this view is given by Kaestner (1998). He also gives pathways of influence, where deterioration of human capital plays a central role. Poverty also arises via the loss of family attachments (marriage and fertility).

Kaestner's analysis is based on two US samples of young adults (National Household Survey of Drug Abuse, and NLSY). The author has obtained a variety of estimates of the effect of marijuana and cocaine use on poverty. Drug users have lower family incomes and are more likely to participate in public-assistance programs than non-users. Including family background measures into the regressions had little influence on the effect of drug use on poverty. This result is surprising since disadvantaged family backgrounds are often associated with both drug use and poverty. In terms of mediating factors, the effect of drugs on female poverty mainly works through the effect on marriage and fertility (once included in the regression, the residual effect of drug use was insignificant). Among males, marriage and fertility had no significant effect. Here, education played a more important rule. As a note of caution (added by the author himself), there might be empirical limitations on general conclusions from Kaestner's article. Since the analysis is based on a cross-section, measurement error and unobserved heterogeneity may have confounded the effect of drug use on poverty.

2.2.6 Corruption and organised crime

Corruption and organised crime have important economic consequences. However, for obvious reasons empirical evidence escapes detection. Thus, not surprisingly, the discussion is mostly theoretical and anecdotal. There are two recent exceptions carried out by IMF staff members (Mauro 1998, Tanzi and Davoodi 1997). Both studies use the "corruption index" of the "International Country Risk Guide", covering the 1982-95 period for more than 100 countries, published annually by Business International and Political Risk Services, Inc.. Mauro (1998) presents evidence of a negative, significant, and robust relationship between corruption and government expenditure on education. This is a reason for concern since education is known as a main factor of long-run economic growth (see, for instance, Levine and Renelt 1992).

Mauro's (1998) analysis provides the first cross-country evidence that corruption does indeed prevent the optimal allocation of government expenditures. The negatively associated relationship between government expenditure on education and corruption is robust to a number of changes in the specification. For instance, controlling for the ratio of population aged between 5 and 20 to total population (indicator for the need of education) raises the coefficient on corruption by around one third. Moreover, the association is rather unaffected by including an indicator of political stability. Finally, it is worth noting that the association broadly remains the same when estimated in sub-samples of developed or developing countries.

As a possible interpretation of the correlation, Mauro (1998) argues that his results are consistent with the hypothesis that education provides more limited opportunities for rent-seeking (Krueger 1974) than other items do. Large bribes are available in markets where the degree of competition is low, and where corrupt officials will choose goods whose exact value is difficult to monitor (Mauro 1998:264). Thus, specialised high-technology goods (Shleifer and Vishny 1993) and international trade in aircraft (Hines 1995) will be particularly sought after. Education might not be free from patronage, but, as Mauro (1998:264) puts it "... it will be easier to collect substantial bribes on large infrastructure projects or highly sophisticated defense equipment than on textbooks and teachers' salaries".

Tanzi and Davoodi (1997) show how corruption in public investment hurts growth. The authors test and confirm the following hypotheses using regression analysis: Other things being equal, corruption can reduce growth by increasing public investment while reducing its productivity, high corruption is associated with low government revenue, corruption can reduce growth by reducing the quality of the existing infrastructure, and high corruption is associated with low operation and maintenance expenditure.

2.3 Summary of crime related indicators

In this section we provide a tabular summary of our survey with special regard to the indicators proposed in our literature (see Table 11). The table is organised as follows: Column 1 contains variables which are of central importance to empirical crime research. The expected impact of the respective variable on crime based on theoretical and empirical knowledge is depicted in column 2, where "+" ("-") means that a higher value of the variable is expected to increase (decrease) crime. The same logic applies to column 3, where the feedback effect of higher crime on the respective variable is considered. Apart from "+" and "-" , the cells of columns 2 and 3 may also be empty (an effect does not exist), or they may be filled with a "?" (no evidence could be derived from our literature). In cases in which the cells contain a combination of + and - , crime theories provide ambiguous predictions. In such cases we put those effects first which are more likely according to empirical findings. (Example: Routine activity theory expects a negative sign of the impact of unemployment on crime. Economic and other theories expect a positive sign. Looking through empirical results there are mainly positive effects. Thus, in Table 11 we code the effect of unemployment on crime with "+/-"). Column 4 contains measures which are generally used as indicators of theoretically motivated variables. When a cell remains empty, measuring this variable is straightforward (e.g. unemployment). Column 5 gives a general characterisation of the type of variable. Finally, in column 6, we refer to the corresponding discussions in the subsections of Section 2.1.

It has to be stressed that our list of indicators is organised according to the demanded macro focus of the present EU-study. In the project description (European Commission 1998) it is emphasised that empirical research has to be carried out using data from official statistics. Thus, indicators which are explicitly tied to the individual level (for examples, see Sections 2.1.4-2.1.7) are not included in Table 11.

Table 11: Summary of crime related indicators proposed in the literature

Variable (1)	I→C (2)	C→I (3)	Indicator proposed in the literature (4)	Variable type (5)	Relevant sections (6)
Wealth (absolute)	+/-	-	Median family income, Gross domestic product per capita etc.	Economic	2.1.2, 2.1.3, 2.1.9
Poverty	+	+	Percentage of population below the poverty line Percentage of families below half of median family income Share of social welfare recipients in the population Infant mortality rate Percentage of individuals aged 25 with less than five years of education Percentage of individuals below 18 years of age living with one parent Unemployment Female headed households etc.	Economic	2.1.2, 2.1.3, 2.1.10
Inequality	+	+	Gini coefficient Ratio of the percentage of total income received by the top 20 per cent of families to the percentage received by the lowest 20 per cent of families Share of income received by the top 20 per cent etc.	Economic	2.1.2, 2.1.3, 2.1.10, 2.1.11
Social Security	-	?	Sum of all welfare payments divided by state population Number of recipients of all welfare programs divided by state population Sum of all welfare payments divided by state population etc.	Economic	2.1.3, 2.1.12
Wages (in general)	+/-	-/+	Mean wage in the population etc.	Labour market	2.1.2, 2.1.3, 2.1.11
Youth wages	-	-/+	Mean youth wage etc.	Labour market	2.1.3, 2.1.11
Minimum wages	-	?	Mean wage for low skilled workers etc.	Labour market	2.1.3, 2.1.11
Job quality	-	-	Wages Working hours per day etc.	Labour market	2.1.3, 2.1.11
Unemployment rate	+/-	?		Labour market	2.1.3, 2.1.11
Educational attainment	-	-	Share of the college educated in the population Share of illiterate individuals in population Share of school dropouts in the population etc.	Labour market	2.1.1, 2.1.15

Occupational status of residents	-	-	Share of individuals in professional and managerial positions etc.	Labour market	2.1.1, 2.1.15
Female labour force participation	+/-	?	Percentage of the female civilian labour force	Labour market	2.1.2, 2.1.3, 2.1.5, 2.1.11
Clear-up rate	-	-/+	Proportion of crimes cleared by the police	Deterrence	2.1.3, 2.1.19
Conviction rate	-	-/+	Proportion of those arrested who either plead guilty or are convicted	Deterrence	2.1.3, 2.1.19
Imprisonment rate	-	?	Proportion of the guilty persons who are imprisoned	Deterrence	2.1.3, 2.1.19
Recognisance rate	-	?	Proportion of the guilty persons who are placed on recognisance	Deterrence	2.1.3, 2.1.19
Fine rate	-	?	Proportion of the guilty persons who are fined	Deterrence	2.1.3, 2.1.19
Average sentence	-	?	Average length of the court imprisonment sentence for those imprisoned	Deterrence	2.1.3, 2.1.19
Private crime prevention	-	+	Turnover of private security firms per capita Employees of private security sector per x inhabitants	Deterrence	2.1.3, 2.1.20
Mobility of residents	+	+	Influx Move Percentage of residents brought up in the area where they currently live Percentage of households that have been in the area for less than three years etc.	Demographic/ Social cohesion	2.1.1, 2.1.16
Ethnicity	+	?	Share of foreigners in the population Probability that two randomly selected individuals of an area would be members of different ethnic groups Nationality dummies Black/ white dummies etc.	Demographic/ Social cohesion	2.1.1, 2.1.17
Family disruption	+	+	Proportion of divorced and separated adults among those who have ever married Percentage of households with single parents with children Number of children etc.	Demographic/ Social cohesion	2.1.1, 2.1.5, 2.1.13
Household size/ crowding	+/-	?	Mean household size Persons per room etc.	Demographic/ Social cohesion	2.1.1, 2.1.2
Urbanity	+	-	Population per square kilometre Share of population living in big cities Share of multiplex dwellings in all dwellings etc.	Demographic/ Social cohesion	2.1.1, 2.1.18
Friendship network (not delinquent)	-	?	Number of friends who reside in the local community	Social cohesion	2.1.1, 2.1.5
Organisational participation	-/+	-	Percentage of residents who participated in meetings of committees and clubs	Social cohesion	2.1.1, 2.1.2

			Number of committees and clubs per x inhabitants		
Institutional control	-	-	Percentage of population that attends high school or college Percentage of population in the civilian labour force Number of families per city population etc.	Social cohesion	2.1.1, 2.1.5
Religiosity	-	-	Share of members of a church in the population etc.	Social cohesion	2.1.22
Public transportation	+	-	Per cent of the employees who use public transportation Expenditure on public transportation Presence of subways etc.	Infrastructure	2.1.2
Public leisure activities	+	-	Average sales of eating and drinking establishments per resident Concentration of Taverns and Lounges Supply (absolute or relative) of sports and entertainment establishments Number of sports clubs etc.	Infrastructure	2.1.2
Weather (the better, the more crime)	+		Average temperature (on a monthly or quarterly basis) Total rainfall (on a monthly or quarterly basis) Total sunshine (on a monthly or quarterly basis etc.)	Environment	2.1.2, 2.1.23
Number of dark hours during a day	+			Environment	2.1.2, 2.1.23
Media consumption	+/-	?	Populations' mean TV viewing intensity etc.	Techno-economic	2.1.2, 2.1.21
Age	-			Demographic/ control	2.1.17
Gender (male)	+		Share of males in the population Male/ Female dummies	Demographic/ control	2.1.17
Young male population	+		Share of the young aged 15-25 in the population	Demographic/ control	2.1.17

Source: Own representation.

3 Development of the parameterised model

3.1 The Methodology

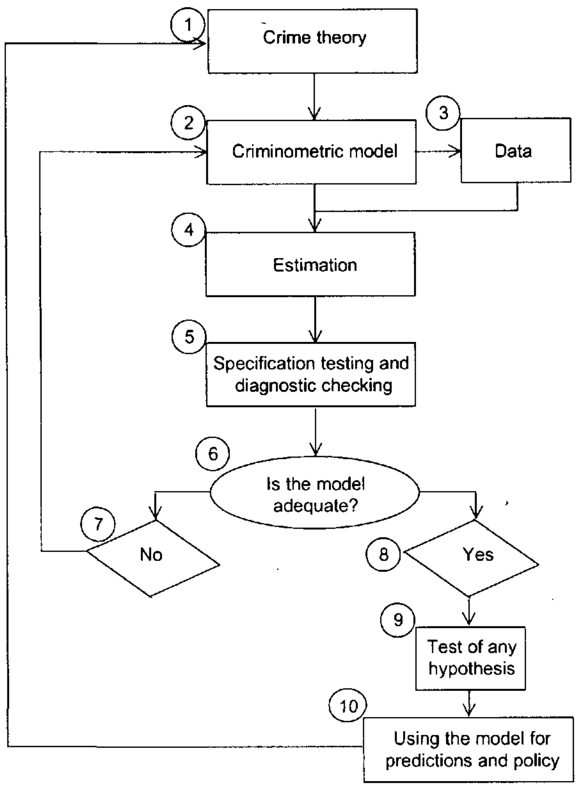
3.1.1 Criminometrics

The terminus "criminometrics" has first been introduced by Eide (1994). In accordance to the definition of econometrics provided by Maddala (1988:1), criminometrics can be defined as the application of statistical and mathematical methods to the analysis of crime data, with the purpose of giving empirical content to criminological theories and verifying them or refuting them.

The nature of criminometrics can be even better understood with the help of the schematic description depicted in Figure 5. Analogous to econometrics which is based on economic theory, criminometrics builds on crime theory. How do we get from Box 1 to Box 2? This can be best explained with the help of an example. As we have already expounded in Section 2.1.3, the economic crime theory states that the number of crimes committed in a society is negatively related to the level of deterrence. It is argued that ceteris paribus higher probabilities of conviction and more severe punishments reduce the expected utility of illegal activities for potential offenders. Consequently, illegal activity becomes less attractive in comparison with legal work and, thus, individuals reduce their involvement in delinquent behaviour and the crime rate falls. The formal representation of this connection can be written as follows: $O = O(p, f, U)$ with $O_p = \frac{\partial O}{\partial p} < 0$ and $O_f = \frac{\partial O}{\partial f} < 0$, where O - the "supply" or number of offences in society - is a function of the probability of conviction (p), the money equivalent of the punishment (f) and a vector of other factors (U). O_p and O_f are the partial derivatives of the supply of offences function with respect to p and f, which express mathematically the negative relationship between higher deterrence (i.e. higher values of p or f) and the number of offences. One possible criminometric representation of the theoretical statement above is $O = \alpha + \beta_1 p + \beta_2 f + \gamma' U + \varepsilon$, where α is a constant term always included in estimations, β_1 and β_2 are the coefficients of p and f, γ' is the vector of coefficients belonging to U and ε is the error term. After having translated the theoretical model in a criminometric specification the coefficients of the latter have to be estimated using adequate data.

In our example the estimation requires data about p, f and U. If such data is not available it should be collected in future (arrow from Box 2 to Box 3).

Figure 5: Schematic description of the steps involved in a criminometric analysis of crime models



Source: Adapted from Maddala (1988:6).

Provided the required data is at our disposal, we are ready for the estimation (Box 4), which will be carried out with a computer using suitable software packages[28]. After having run the estimation one has to check whether the criminometric model is well-specified. There are several sources of misspecification which may, for instance, concern the validity of the assumptions made about the error term or the choice of the explanatory variables.[29] Now there are two possibilities: If our tests indicate misspecification, we have to return to Box 2 and specify a new model, which has to be estimated and tested again. If, on the other hand, our model is

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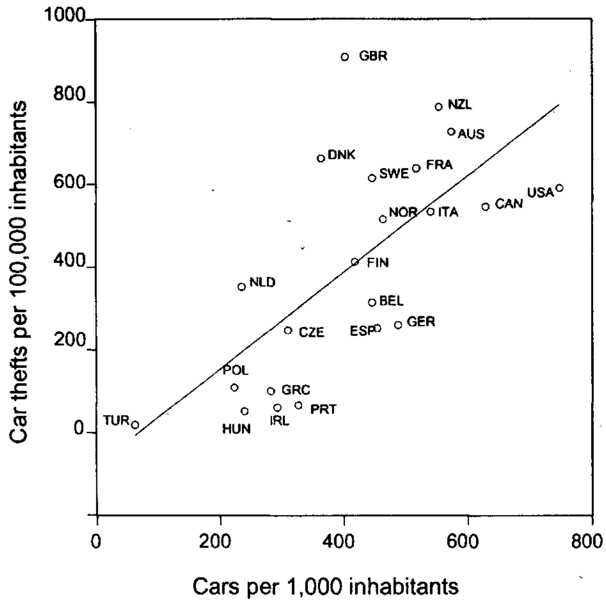
[28] The most popular software packages for econometrics/ criminometrics are (in alphabetical order) EViews, Gauss, Limdep, SAS, SPSS, Stata and TSP.

[29] An intuition for some of these problems is provided further below, an extensive discussion, however, would go beyond the scope of this report. An excellent econometric textbook which discusses the types and sources of misspecification is Maddala (1988).

well-specified, we can use it to perform tests of any hypotheses. Usually tested hypotheses follow directly from the theory under consideration. For instance, the central hypothesis of the economic crime theory is that the signs of β_1 and β_2 are expected to be negative. Another interesting hypothesis to be tested is the theoretical finding according to which the crime reducing effect of a percentage increase in the probability of conviction is higher than that of an equal percentage increase in the severity of punishment (see Becker 1968). If these hypotheses are confirmed, the theory seems to be appropriate, otherwise, it should possibly be revised (arrow between Box 10 and Box 1). Other testable hypotheses concern the predictive power of the model. The quality of the predictive power of a model hinges on its ability to produce estimates of the dependent variable which are as close as possible to actual values. Depending on whether the aim of the prediction is to reproduce past realisations or forecast future values of the variable of interest, we speak about ex-post or ex-ante-prediction. Note that it is possible to test the ex-ante-forecasts of a model solely on the basis of the ex-post-data. Provided we are interested in the ex-ante-prediction of the theft rate and that we dispose of crime data from 1975 to 1998. We can now estimate our model using data from 1975 to 1996 and then forecast theft for the years 1997 and 1998 on the basis of the estimated coefficients. Since actual values of theft in 1997 and 1998 are known, they can be used as the benchmark for the ex-ante-predictive power of the model.

The most commonly used tool in criminometric/ econometric research is regression analysis. "Regression analysis is concerned with describing and evaluating the relationship between a given variable (often called the explained, or dependent variable) and one or more other variables (often called the explanatory, or independent variables" (Maddala 1988:27/28). Figure 6 contains an example of a simple regression of car thefts per 100,000 inhabitants (dependent variable) on cars per 1,000 inhabitants (independent variable) based on 1994 cross-sectional data from 22 OECD countries. The estimated relationship which is also depicted in the figure as regression line is $\textit{car thefts} = -79.8 + 1.17 * \textit{cars}$. This implies that one additional car per 1,000 inhabitants augments the car theft rate by 1.17. The advantage of regression analysis is straightforward. It condenses information of many observations (note that 22 could just as well be 100, 1,000 or more) to one coefficient, which - provided the model is correctly specified - represents the partial effect of the particular independent variable on the dependent variable. This is one important reason why the indicator system to be developed below will be based on regression analysis.

Figure 6: Car thefts and the number of cars in the population



Source: Interpol, World Bank (1998), own representation.
Note: Data is from 1994 (the last year available at the time of preparation of this report for which the number of cars is reported by the World Bank). Car thefts contain cases of "taking and driving away". For Iceland, Korea, Mexico and Switzerland at least one of our data sources contains no information. Japan and Austria have been excluded from the analysis because of different definitions of car thefts (cases of taking and driving away are not included), Luxembourg has been excluded because of its small population size.

However, in almost every empirical analysis and especially in crime research simple bivariate examinations will not properly account for the complexity of the dependent variable. Thus, the above analysis probably suffers from biases induced by the omission of relevant variables. It is, for example, reasonable to assume that not only the quantity of cars has an effect on the number of car thefts, but also the quality of the vehicles. On the other hand quantity and quality of cars in a society are very likely to be related. Omitting one of these (relevant) variables in the analysis would lead to a bias in the estimated coefficient of the other variable, since the included variable would take over the impact of the excluded variable.

As the problem of an omitted variable bias is a very important one in criminometrics/ econometrics, it is advisable to consider it in more detail. For this purpose we have constructed a fictitious example with simulated data. In order to illustrate crucial points, it might be helpful to interpret simulated variables of this example as property crime, unemployment and income (per capita). We have constructed these variables under the assumption that property crime only depends on two variables (unemployment and average per capita income) and that higher values of both variables lead to a higher incidence of property crime. We further assumed that the correlation between unemployment and income is highly negative. As a logical consequence of this data generating process, in a regression for property crime, both explanatory variables show a highly significant positive sign (Table 12, regression 1). What happens if we would omit the income variable? If we run a regression of property crime on the unemployment rate alone (Table 12, regression 2), we obtain a coefficient with an implausible negative significant sign, implying that higher unemployment reduces property crime. How could this dramatic change happen? The reason is that the unemployment rate would take over the effect of the income variable. Since both the correlation between the unemployment rate and the average income and the impact of the average income on property crime are (per assumption) very large, the coefficient of the unemployment rate would not only change its magnitude but would also change its sign. We can summarise that the higher the influence of the omitted variable on the explained variable and the higher the correlation between the included and the excluded variable are, the higher will be the omitted variable bias of the estimated coefficient of the included variable.

Table 12: Bias as a result of the omission of relevant variables (a fictitious example)

Dependent variable Independent variables	Property crime rate (1)	Property crime rate (2)
Constant	0.12 (1.71)	-0.08 (-0.64)
Unemployment rate	1.17 (4.45)	-3.22 (-14.5)
Per capita income	3.09 (19.31)	-
Adjusted R-squared	0.83	0.51

Source: Own calculations based on simulated data, number of observations is 200.

Do omitted variables always disturb coefficient estimates? This must not necessarily be the case. Coefficient estimates remain unaffected by the influence of omitted variables if the latter do not correlate with other explanatory variables in the model. Nevertheless, omitted variables have a negative effect in any case, because they will enlarge the error term, and larger error terms, in turn, negatively affect the predictive power of the model. Since the major task of the present study is the development of an indicator model suitable for predictions of crime and its consequences, the omission of relevant variables has to be avoided as far as possible. At this point it should also be mentioned that the inclusion of irrelevant variables (variables without any impact on the dependent variable) in a regression does not negatively affect the coefficients of the relevant explaining variables. But the inclusion of irrelevant variables also comes at a cost, because it augments the standard errors of the relevant coefficients[30] and it also diminishes the forecasting power of estimated models. It has to be stressed, however, that compared with the omission of relevant variables the inclusion of irrelevant regressors is of minor importance.

Unfortunately, in practise it is rarely the case that all relevant variables are at the researchers disposal. Omitted variables are rather the rule than the exception. Variables may not be included due to a lack of measurement or oversight whereas the former reason is by far the more frequent one. A special case of omitted variables which is due to a lack of measurement is that of "unobserved heterogeneity". This problem is most virulent in analyses based on data sets with a cross-sectional component.[31] Imagine that we want to investigate factors of theft on the basis of a data set from EU member states. Now, we have to cope with the situation that between countries such as Sweden and Spain there are very large differences in the volume of reported crime. According to Interpol (1996) the official theft rate in Spain equalled 1,869 cases per 100,000 inhabitants in 1996, whereas that of Sweden was approximately 4 times higher (7,865 thefts/ 100,000 inhabitants). These descriptive statistics give raise to the suspicion that there might be differences in the general attitude towards (property) crime (including the populations' propensity to report (property) crimes to the police) across countries which cannot be fully explained by discrepancies in GDP, unemployment, demography or deterrence. Presumably a part of this variation can be attributed to different norms and tastes of the Spanish and Swedish society. Since a reliable measurement is hardly possible, norms and tastes can be regarded as an important source of unobserved heterogeneity. As unobservable factors can be correlated with explanatory variables, estimation results might be biased. Fortunately, empirical researchers are not powerless in the face of this threat. Having panel data at our disposal and applying appropriate estimation techniques, we can fully account for time constant components of unobservable heterogeneity. Technically speaking, this is done by

[30] Econometrically speaking the inclusion of irrelevant variables produces unbiased but inefficient estimates.

[31] In contrast to time-series which consider one observational unit (individual, firm, region etc.) at several points in time, cross-sections deal with several units at one point in time. Panels or longitudinal data sets combine both dimensions when considering several units at several points in time.

including country specific constants - so-called fixed effects - in the estimation.[32] Again, properties and benefits of fixed effects can be best explained with the help of a (fictitious) simulated example.

For illustrative reasons, we start by assuming that we were interested in the effect of the social welfare system on property crime. Motivated by this idea, we have simulated a 10-periods (years) panel of three (hypothetical) countries. We compare two different ways of looking at the data (see Figure 7). First we run a simple regression of (a fictitious) property crime variable on (likewise fictitious) social benefits per capita, ignoring the fact that data come from different countries. This estimation produces a positive significant coefficient of the explanatory variable, indicating that a more pronounced welfare system causes higher levels of property crime (see the thin regression line in Figure 7). This implausible result is obviously an artefact of not having accounted for country specific unobserved heterogeneity.[33] If we include fixed effects and if we also allow for country specific coefficients of the explaining variable, the result changes substantially. The three bold regression lines which represent fixed effect-estimation (with country-specific slopes) all show the expected negative slope and thus confirm the hypothesis according to which higher legal income opportunities (especially for the economically disadvantaged) ceteris paribus reduce the incidence of property crime.

One may object that the problem of unobservable heterogeneity across statistical units is a problem which can be easily avoided by carrying out the investigations on the basis of time series of homogeneous units (as Figure 7 suggests) rather than on cross sections or panels. However, there is a fundamental problem with time series analysis. Because of a lack in measurement in the past or due to changes in definitions or registration modalities in the course of time, the number of observations in time series is often small, which in turn may preclude the use of regression analysis. If we were, for example, interested in investigating the factors of crime in East German districts ("Kreise"), a multivariate time-series analysis for one

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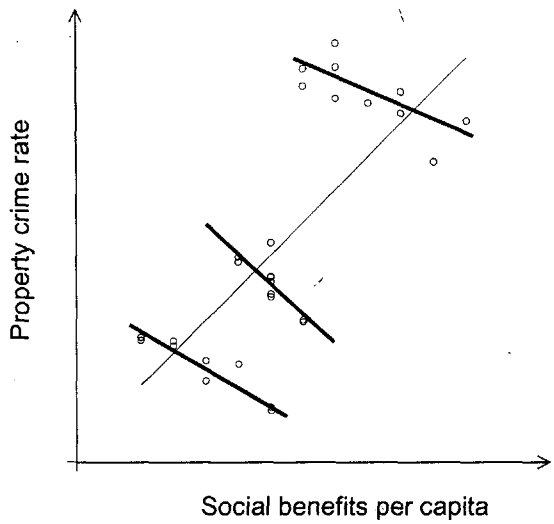
[32] Note that fixed effects cannot be used in pure cross-sectional data sets. Introducing fixed effects in a cross section would result in a perfect prediction of the dependent variable. Each country constant would exactly adjust to the value of the respective realisation of the dependent variable. Thus, we would have a perfectly predicting but meaningless model, since the coefficients of all explaining variables would be set to zero by the software package.

[33] Note that our example is based on simulated data and only aimed at demonstrational purposes. In reality a bivariate model like the one presented in Figure 7 would of course not only suffer from unobservable heterogeneity but also from the omission of observable variables.

particular district would fail because reliable crime data is only available for 6 years.[34] On the other hand, if we used a panel containing all 111 East German districts, we would have 666 observations at our disposal and a multivariate analysis could be performed. Apart from the fact that time series are often simply too short, they may also be inappropriate for the topic under investigation. When assessing the impact of, say, religion on crime, it is mainly the cross sectional dimension and not the time dimension from which deeper insights might be expected. To sum up, neither pure time-series nor pure cross sections are appropriate for criminometric investigations. It is the appropriate use of panel data that copes with problems arising in empirical crime research. For a report like this it might be important to know that the authors have documented their previous experience in the field of panel econometrics by articles in scientific journals of international standing (see, for instance Entorf (1997) for a theoretical paper on potential misinterpretations due to spurious panel regressions, and Entorf and Kramarz (1997), Entorf, Gollac and Kramarz (1999) as well as Entorf and Spengler (1998) for empirical work).

Figure 7: The benefits of fixed effects (a fictitious example)



Source: Own representation based on simulated data

[34] The first post-reunification year for which reliable data for East Germany is available is 1993.

3.1.2 A real-world example using data from EU member states

In order to finish our methodological discussion with a practical example, we have performed estimations based on a panel of five EU member states from 1977 to 1996. The countries included in the analysis are Austria, France, the Netherlands, Spain and Sweden (data from the Netherlands are available since 1979). Note that the choice of countries is not made randomly, but rather motivated by the hope of benefiting from the heterogeneity of northern, southern, central and western European experiences and by the need of constructing a coherent cross section of time series.[35] In a first step (see regression 1, Table 13), we ignore the panel structure of the data and simply regress the theft rate on the unemployment rate. We obtain an inconclusive negative coefficient for the explanatory variable implying that higher unemployment reduces crime. This result is obviously subject to a misspecification of the regression model. We have seen above that one source of misspecification stems from the lacking consideration of (time constant) unobservable heterogeneity. For that reason we add fixed effects to our specification (see regression 2).[36] As expected, all country specific constants turn out to be significant, thus, indicating that unobservable heterogeneity exists.[37] The more striking result, however, concerns the coefficient of the unemployment rate. Just as in the simulated example presented above (see Figure 7) the introduction of fixed effects changes the sign of the coefficient of the explanatory variable.[38] Finally, in regression 3, where further explanatory variables (GDP per capita, female labour force participation, clear-up rate) are added to the model, the other source of misspecification previously discussed becomes apparent. Obviously the coefficient of the unemployment rate in regression 2 (0.36) is subject to an omitted

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[35] A persistent shortcoming of international crime data sets is the erratic reporting behaviour of most countries to the supranational institutions. Even most of the five countries under consideration in our criminometric analysis show some gaps in their time series of theft (the exception is Austria). This gaps, however, where rather rare and small (two years at most) and could therefore be closed by means of interpolation.

[36] It is common in econometrics/ criminometrics to leave out the fixed effect for one country and to use a general constant term instead. This approach has the appealing property that all included country effects can be interpreted relatively to the left out country which thus, serves as a reference. Our reference country is Sweden because it has the highest theft rate of all countries. The fact that all the fixed effects turn out to be significantly negative implies that Sweden will still have a higher theft rate when the effect of unemployment on theft is eliminated.

[37] Note that the country specific effects at this early stage of the analysis in which only one explaining variable is included do not only measure unobservable heterogeneity but also the effect of observable variables which are not yet included.

[38] This implies that our simulated example, where the switching sign was intended for the purpose of demonstration, was not simply an artefact but has indeed a high practical relevance.

variable bias, because it substantially differs from the respective coefficient in the more complete specification (0.10 in regression 3). The reason for this supposition may be the following: As the unemployment rate (UR) and the female labour force participation rate (FLFPR) are positively correlated and because both variables have a positive impact on theft (see regression 3), the omission of FLFPR from regression 2 causes the UR to (partly) take over the effect of FLFPR on the theft rate. As a consequence the coefficient of UR in regression 2 is biased upwards. It should be noted that regression 3 is still far away from being perfect with respect to all wanted indicators (see Table 11). Nevertheless, the explanatory power of this small illustrative example is quite high, as can be seen from the so called "R-squared statistic".

The R-squared statistic is shown in the last row of Table 13. The R-squared statistic must be between 0 and 1, and it measures the proportion of the total variation in the endogenous variable that is accounted for by the variation in the explaining variables. It takes the value of zero if all estimated coefficients (except the constant term) are zero. In this case the "explaining" variables do not have any explanatory power. In a bivariate regression $R^2 = 0$ produces a horizontal regression line. The other extreme ($R^2 = 1$) occurs if the variation in the independent variables perfectly explains the variation in the dependent variable. Then the error term is a zero vector and - as far as the bivariate case is concerned - all value pairs of the dependent and independent variable lie exactly on the regression line (Greene 1997:252/253). In order to sum up, we may conclude that the R-squared can be understood as an indicator which tells us how well the regression model predicts the movements in the dependent variable, or to express it more plainly, how well the model fits reality.

Whereas the R-squared expresses the fit of a regression in terms of a number, it is also possible to investigate the predictive power of a model graphically. In Figure 8 we present the relevant information which is necessary for such a graphical analysis. Dashed lines represent actual values of the dependent variable, dotted lines depict predicted values of the dependent variable, and the solid lines below portray the prediction error i.e. the difference between actual and predicted values of the dependent variable. Note that Figure 8 is based on the estimations presented in Table 13 and that each vertically separated section in the graphs contains yearly information about the respective country running from 1977 to 1996 (the only exception is the Netherlands for which the considered period is 1979 to 1996). For regression 1 we now see from the low R-squared of 0.14 in Table 13 and from the large difference between the actual and fitted values of the dependent variable in Figure 8 that the model virtually has no predictive power and obviously suffers from severe misspecification. Adding fixed effects to the model significantly improves the fit. The R-squared increases to 0.84 and the dotted lines have approached the dashed lines.

Table 13: Different criminometric specifications based on data from five EU member states

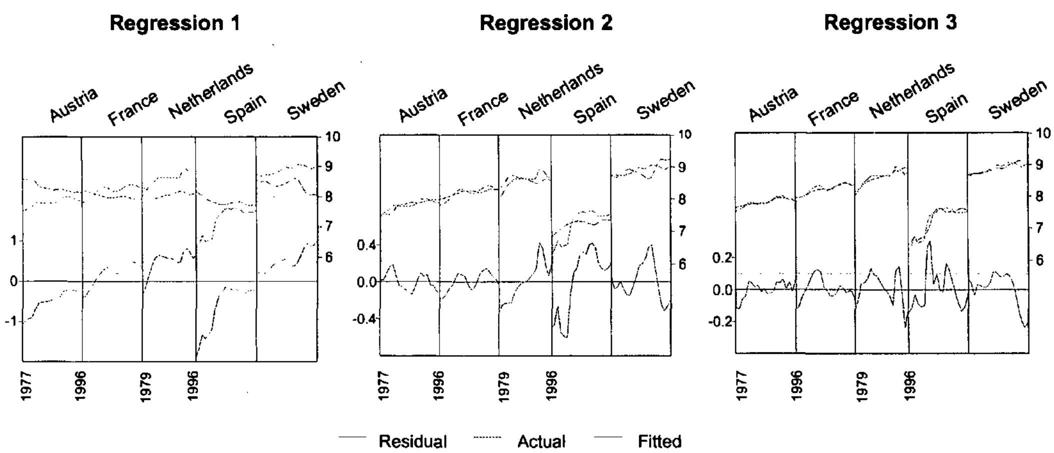
Dependent variable Independent variables	Log(theft rate) (1)	log(theft rate) (2)	log(theft rate) (3)
Constant	8.74 (51.98)	8.49 (109.74)	5.61 (3.78)
Austria		-1.15 (-16.34)	-0.54 (-10.30)
France	-	-1.06 (-11.86)	-0.63 (-12.51)
The Netherlands	-	-0.59 (-7.09)	-0.02 (-0.23)
Spain	-	-2.26 (-20.35)	-1.24 (-11.70)
log(unemployment rate)	-0.33 (-3.88)	0.36 (6.71)	0.10 (3.70)
log(GDP per capita)	-	-	-0.17 (-1.05)
log(female labour force participation)	-	-	1.71 (6.50)
log(clear-up ratio)	-	-	-0.64 (-8.32)
Adjusted R-squared	0.14	0.89	0.98

Source: Own estimations based on OECD and processed Interpol data. Number of observations is 98.

However, a single explanatory variable seems to be insufficient to fit the curvature of the read line. Therefore, in regression 3, additional explaining variables are included. Since this larger set of regressors is able to explain a higher fraction of the variation in the dependent variable, the dashed and dotted lines are now roughly congruent and the R-squared has risen to 0.98. Therefore, we have found numerical - as well as graphical - evidence for the good predictive power of regression 3.

Before turning to the development of the parameterised model a brief summary of our methodological discussion is appropriate. At the beginning we have stated that regression analysis - as the major tool of criminometrics - is a powerful tool in order to condense complex data. With the help of regression analysis it is possible to reduce extensive (time-series, cross-sectional or panel) information about variables to explicit relationships expressing the impact of changes in the explanatory or independent variables on the change of an explained or dependent variable. In particular we have shown that crime - and the same holds also true for the consequences of crime[39] - can only by adequately investigated in a multivariate context using a large set of explaining variables. Therefore, bivariate considerations should only be used in the preparatory stage of the analysis, because they are very likely to suffer from severe omitted variable biases. We have also pointed out that empirical crime research should be carried out on the basis of panel data, since panel data analysis benefits from both time series and cross sectional information. In contrast to cross sectional data, panel data allows us to control for (time invariant) unobserved heterogeneity. Finally, we have expounded how the predictive power of criminometric estimations may be assessed.

Figure 8: (Ex-post) Predictive power of different criminometric specifications based on data from five EU member states



Source: Own representation based on OECD and processed Interpol data.

3.2 The parameterised model

Simple crime indicators have already been identified in the first project phase. The central results are summarised in Table 11. Since many factors are relevant for a proper understanding of crime, we need to condense this information in order to yield general indicators of

[39] It has to be stressed at this point that even when our examples exclusively used measures of crime as the dependent variable the presented methodology is no less relevant when crime is used as a explaining variable in regressions explaining indicators of economic performance.

crime and economic performance. Using the methodology described above, we are going to construct

- Factors of Regional Criminality,
- Leading Criminality Indicators, and,
- Criminality Indicators of Economic Performance.

3.2.1 General framework

Our approach starts with the parameterisation of the criminometric model, which will take into consideration known results drawn from previous research on the interactions among social cohesion, criminality and economic performance. However, the scientific literature is silent about the time delay of causes and effects. The time lag of crime with respect to economic causes is unknown. It has to be estimated with our data and needs to be implemented in our model. Presumably, the effect of economics on crime can be observed in a relatively short run (about 0 to 2 years, depending on crime categories and economic variables under consideration), whereas the feedback from crime to economic performance might happen in a somewhat longer run. Thus, the model should be based on multivariate methods and gestation lags.

The description of the problem leads to the following stylised version of the parameterised model:

Equation 1 **(Crime)**

$$C_t = \alpha + \sum_{\tau} \beta'_{\tau} X_{t-\tau} + \varepsilon_t ,$$

Equation 2 **(Feedback)**

$$Y_t = \gamma + \sum_{\varpi} \delta'_{\varpi} C_{t-\varpi} + \sum_{\varpi} \theta'_{\varpi} Z_{t-\varpi} + v_t ,$$

where

C	=	"crime",
Y	=	"economic performance",
X	=	(vector of) explanatory variables, containing economic factors, factors of social cohesion, demographic variables, deterrence etc.,
Z	=	(non-crime) factors explaining economic performance,
t	=	time index,
τ	=	lag of crime with respect to X,
ω	=	lag of economic performance with respect to C and Z
α, γ	=	constants,
ε_t, v_t	=	residuals (at time t),

$\beta = (\beta_1,...,\beta_K)', \delta = (\delta_1,...,\delta_L)', \theta = (\theta_1,...,\theta_M)'$ = parameters of the model, factor weights.

Equation 1 and Equation 2 will be used as linear regression models. In the following this model will be specified in more detail according to the objectives and restrictions to be followed in the present project. Equation 1 will be the basis for the quantification of the main factors of crime, i.e. *Indicators of Criminality.* We will employ the feedback Equation 2 in order to evaluate the link from crime to economic performance and to identify *Criminality Indicators of Economic Performance.*

3.2.2 Construction of Factors of Regional Criminality and of Leading Criminality Indicators

Prior to the construction of crime indicators, relevant explanatory variables have been identified (which has been done in Section 2), they have to be implemented in the model, and the model has to be estimated. Panel econometrics (see above) will produce numerical parameter values of the following more detailed version of Equation 1:

Equation 3

$$C_{it} = \alpha_i + \sum_{\tau} \beta_{1,\tau} x_{1,i,t-\tau} + \sum_{\tau} \beta_{2,\tau} x_{2,i,t-\tau} + \ldots + \sum_{\tau} \beta_{K,\tau} x_{K,i,t-\tau} + \varepsilon_{it},$$

where (in addition to the previous notation)

i = region, $i = 1,...,I$,
C_{it} = crime in region i at time t,
ε_{it} = residual (error term) of region i at time t,
α_i = region-specific factor of crime (unobserved heterogeneity),
x_k, $k = 1,...,K$ = explanatory variables (see above), number of factors = K,
β_k, $k = 1,...,K$ = parameters of the model, to be estimated.

Using the estimation results from Equation 3, relevant (i.e. statistically significant) factors of crime can be identified. Moreover, when optimising the validity of the model (i.e. maximising the adjusted R-squared), some of the relevant factors of crime will show up with a nonzero lead τ so that we are able to identify leading criminality indicators. These are the indicators sought-after which anticipate crime in region i at time $t+\tau$, i.e. $C_{i,t+\tau}$.

It is important to note the following points:

- Crime, here generally denoted as C_{it}, is measured by the most common types of crime (robbery, theft under aggravating circumstances, fraud, murder, rape, assault, drug offences etc.).
- The lead-lag structure (concerning both τ and ω) could be generalised by forming factor-specific leads (since, for instance, the lead of output over crime might differ from that of unemployment).
- Region-specific constants α_i cover unobservable heterogeneity. Since we are dealing with official data sources by restriction, the presence of α_i is indispensable in order to cover different shares of unreported crimes among regions. From an econometric point of view this fact requires the use of fixed-effect panel estimation techniques.

Despite considering region-specific factors, the aggregate estimation of Equation 3 might be too rigid to cover differences given by nationality, culture or other grouping criteria, or simply because relevant data for all regions and all time periods of the model are not available. Therefore, instead of performing a single aggregate estimate using all regions, we will estimate the model nation by nation. This allows the estimation of more flexible weights β_k:

Equation 4 $$C_{it}^j = \alpha_i^j + \sum_{\tau} \beta_1^j x_{1,i,t-\tau}^j + \sum_{\tau} \beta_2^j x_{2,i,t-\tau}^j + \ldots + \sum_{\tau} \beta_k^j x_{k,i,t-\tau}^j + \varepsilon_{it}^j \quad ,$$

where $j = 1,\ldots,J$. J is the number of nations.

It should be noted that it would be very difficult to estimate the crime equation for each disaggregate region i separately. Since there were only few observations in many cases, it would be impossible to implement the large number of factors x_k of crime found in the literature. Statistically speaking, there would be a lack of degrees of freedom.

3.2.3 Identification of Criminality Indicators of Economic Performance

The feedback from crime to economic performance is modelled by Equation 2. "Economic performance" will be measured by economic growth, and (under the proviso of data availability) it could be replaced by employment, (youth) unemployment, (net) migration of workers, number of new firms (location decisions) etc. Z represents standard factors of economic growth (known from the economic theory of (endogenous) growth), and previous levels of economic performance (i.e. lagged endogenous variables, justified by "habit persistence" of economic development). Since "crime" is measured by N types of crime, Equation 2 will be extended in order to identify Criminality Indicators of Economic Performance, i.e. those categories of crime which are most important for future economic perspectives, given known economic factors of growth:

Equation 5 $$\hat{Y}_{i,t+\omega} = \hat{\gamma} + \hat{\theta}' + \hat{\delta}_1 C_{1,i,t} + \ldots + \hat{\delta}_N C_{N,i,t},$$

where

$\hat{Y}_{i,t+\omega}$	=	Future output growth (likewise unemployment, number of new firms' patents, migration of workforce, etc.),
$Z_{i,t}$	=	other explanatory variables, lagged endogenous variables,
C_n, $n = 1,\ldots,N$	=	types of crime.

Thus, the approach is suitable to provide the following results:

- Forecasts of (various types) of "economic performance" depending on (various types of) crime,
- Identification of crime categories responsible for the deterioration of economic performance at regional levels.

4 Validation of the parameterised model

4.1 Data availability

Before turning to the empirical results, a discussion about the availability of adequate data is appropriate. As crimes are committed by individuals, it would be obvious to carry out empirical investigations at exactly this level. However, collecting individual crime data of a suitable quantity is very expensive, and its reliability is still questionable, as it is based on the self-reporting of potential criminals. On the other hand, with social disorganisation theory (see Section 2.1.1), there also exists a major criminological theory that suggests the use of disaggregated macro levels (e.g. neighbourhoods, communities etc.) for a proper understanding of criminality. Thus, performing the subsequent analysis by means of disaggregated macro data is more than only a second-best solution.

Since it is aspired to perform the empirical analysis of the causes and consequences of crime both for the highest possible number of EU member states, and on the highest degree of regional disaggregation, the availability of supranational data sources would significantly simplify the process of data acquisition. On what concerns regional crime data, unfortunately, no such database does exist. As a consequence, these data had to be collected directly from the member states. Regarding the needed socio-economic[40] information, the situation is more encouraging, since the Eurostat New Cronos database is an extensive source of statistical information about the EU member states, which also contains variables on three different levels of regional disaggregation. However, there is a trade-off between the number of variables available, and the degree of regional disaggreagtion, i.e., the lower the regional level is, the less variables are available. We try to face this problem by not solely performing estimations on the lowest regional level (Section 4.3), but by also considering the national level (Section 4.2), for which we can fall back to a rather extensive set of socio-economic variables.

[40] In this study we use the terminus "socio-economic" in order to distinguish non-crime variables from crime variables. We are aware of the fact that crime variables may also be considered as "socio-economic" variables.

4.1.1 Socio-economic data

Apart from crime data, the third project phase also requires information on a large set of socio-economic and demographic variables (see Table 11). There are two different (not mutually exclusive) strategies to obtain such data. On the one hand, one might directly contact the national (and regional) statistical offices of the relevant countries. On the other hand, it is possible to rely on databases from supranational sources like IMF, OECD, World Bank and EU. Using data from supranational sources has the great advantage that the researcher can benefit from the efforts made by the respective organisations, which have assembled information from different countries, and which have produced comparability by removing national peculiarities[41] (including the sheer language problem). Further advantages of databases from supranational sources are their relatively moderate prices and the fact that, nowadays, they are all available in electronic form. The shortcomings in comparison with the national sources are the much smaller number of available variables and the considerable lack of regionally disaggregated information.

4.1.1.1 Regional data

To our knowledge, the solely supranational source which contains highly disaggregated socio-economic information on the EU-member states is the Eurostat New Cronos Regio database.[42] The database is built on the following 8 subject areas: agriculture and forestry, demographic statistics, economic accounts, energy statistics, community labour force survey, research and development and patents, tourism statistics, transport statistics and unemployment.

The lowest regional level for which data is available is the so called NUTS[43] 3 level. The NUTS 3 level corresponds, for instance, to the German “Kreise”, the French “Dèpartements”

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[41] Here, the authors spontaneously think about the peculiar way the German unemployment rate is calculated. Whereas all other countries calculate the unemployment rate by dividing the unemployed by the overall labour force, the Federal German Employment Office employs the civilian dependent labour force in the denominator.

[42] Eurostat New Cronos Regio is one part of the Eurostat New Cronos database, which is a very informative and monthly updated database for the EU member states. It is split up into 9 themes (General statistics (theme 1), economy and finance (theme 2), population and social conditions (theme 3), energy and industry (theme 4), agriculture and fishery (theme 5), external trade (theme 6), trade, services and traffic (theme 7), environment (theme 8) and research and development (theme 9)), whereas, the Regio part is contained in theme 1.

[43] NUTS is a spatial structuring scheme for the EU member states established by Eurostat. The abbreviation stands for "Nomenclature des Unités Territoriales Statistiques".

and the British "Counties". A summary of the whole structuring scheme is presented in Table 14. From the last two columns of the table one might infer the mean size of the respective NUTS 3 units with regard to population and land area. According to the large differences in the indicators, some countries seem to be more suitable for the analysis of criminality than others. For example, Belgian "Arrondissements" and German "Kreise" turn out to be more compact (i.e. have a lower average population and land area) and, thus, are presumably more homogeneous than Spanish "Provincias" and French "Départements".

As already mentioned, the use of NUTS 3 level data comes at a cost, since there exists a trade-off between the number of available variables on the one hand, and the degree of regional dis-aggreagtion on the other hand. At the beginning of the project we intended to complete the Eurostat variables with data from national sources in order to obtain as much of the indicators from Table 11 as possible. However, some requests directed to national statistical offices quickly revealed that this strategy was not compatible with the budget and running time constraints of the project. Thus, our empirical investigations in Section 4.3 exclusively rely on data from the Eurostat New Cronos Regio database.

Table 14: NUTS structure of the EU member states

NUTS 0	NUTS 1		NUTS 2		NUTS 3		Population / # NUTS 3	Land area / # NUTS 3
Belgium	Régions	3	Provinces	11	Arrondissements	43	236,209	763
Denmark	-	1	-	1	Amter	15	350,800	2,829
Germany	Bundesländer	16	Regierungsbezirke	40	Kreise	440	186,084	794
Greece	Group of Development Regions*	4	Development Regions	13	Nomoi	51	205,196	2,527
Spain	Agrupacion de comunidades autonomas*	7	Comunidades autonomas + Ceuta y Melilla	17+1	Provincias + Ceuta y Melilla	50+2	755,192	9,605
France	Z.E.A.T. + Départements d'outre mer	8+1	Régions + DOM	22+4	Départements + DOM	96+4	583,800	5,501
Ireland	-	1	-	1	Regional Authority Regions	8	452,625	8,611
Italy	Gruppi di regioni*	11	Regioni	20	Provincie	103	557,990	2,855
Luxembourg	-	1	-	1	-	1	418,000	2,586
The Netherlands	Landsdelen	4	Provincies	12	COROP-Regio's	40	387,350	848
Austria	Gruppen von Bundesländern*	3	Bundesländer	9	Gruppen von Politischen Bezirken*	35	230,286	2,364
Portugal	Continente + Regioes Autonomas	1+2	Comissaoes de Coordenaçao Regional + Regioes Autonamas	5+2	Grupos de Concelhos + Regioes Autonamas	28+2	331,167	3,065
Finland	Manner-Suomi/ Ahvenanmaa	2	Suuralueet	6	Maakunnat	20	256,250	15,230
Sweden	-	1	Riksområden	8	Län	21	423,857	19,601
UK	Standard Regions	12	Counties, Groups of counties*	36	Counties/ Local authority regions	133	441,970	1,817
EU 15		75+3		202+7		1084+8	341,777	2,871

Source: Own representation based on Eurostat (1999).
Note: If NUTS 0, NUTS 1 or NUTS 2 categories have no sub-categories they are also counted on the deeper levels (see for example Luxemburg).
* put together for the purpose of Eurostat REGIO.

4.1.1.2 National data

There is a great variety of national level statistics provided by supranational and academic organisations. Most of these statistics are even obtainable free of charge on the Internet. This applies, for instance, to the Freedom House data on political rights, civil liberties and freedom status, to the IMF statistics on government finance, to the Penn World Tables on national accounts, to the UNESCO data on education and to the World Bank's Global Development Finance & World Development Indicators. Furthermore, there are extensive databases from Eurostat (New Cronos) and from the OECD (Statistical compendium) which do not cover all but only a selected group (EU and OECD respectively) of nations.[44] Because of its focus on the EU member states and because of our need for detailed labour market variables and indicators of social cohesion (see Table 11), which are rather rare in most other international data sets, Eurostat New Cronos revealed to be by far the most suitable basis for our empirical investigations on the "Europe of Nations" (Section 4.2). The most relevant indicators for the present research, which are contained in New Cronos, can be gathered from Table 17. However, in Section 4.2.3, where we are going to reconsider the effect of crime on economic performance by means of a larger cross-section of nations, an exclusively European database, like New Cronos, is not sufficient. There, the socio-economic information stems from the Global Development Network Growth Database. The latter has been designed within the context of the Economic Growth Project of the World Bank's Research Group, and is intended for investigations on the relationship between national policies and economic growth. The Global Development Network Growth Database brings together more than 130 variables from different subjects[45] and different sources (e.g. IMF, Penn World Tables, World Bank etc.). The database is available free of charge from the World Bank's Web site.

[44] In contrast to the databases mentioned above, the EU and OECD data is not free of charge but also available in electronic form.

[45] The database contains general macro indicators (GDP, investment, population etc.), government finance indicators (taxes, public revenues and expenditures), social indicators (school enrollment, life expectancy, telephone mainlines, general strikes, revolutions etc.) and a variety of fixed factors (regional and income level dummies, dummies about ethnic fractionalisation etc.).

4.1.2 Crime data

4.1.2.1 Regional data

As no common source for European regional crime data does exist, we had to contact each member state directly.[46] Before doing so two fundamental points had to be carefully considered: the choice of the crime categories and the regional level for which this information is requested. As regards the first point, we borrowed from Interpol (see also Section 4.1.2.2 below), when selecting the following crime categories:[47]

1. Murder
2. Sex offences (including 2.1)
   2.1 Rape
3. Serious assault
4. Theft (all kinds of theft i.e. 4.1+4.2+4.3)
   4.1 Aggravated theft (4.1.1+4.1.2)
      4.1.1 Robbery and violent theft
      4.1.2 Breaking and entering
   4.2 Theft of motor cars
   4.3 Other thefts
5. Fraud
6. Counterfeit currency offences (not requested)
7. Drug offences
8. Total offences

As regards the suitable level of regional disaggregation, it has to be taken into account that crime data and socio-economic data can only be linked meaningfully if they are available for identical observational units. As already mentioned, the lowest regional level for which socio-economic statistics are available from official sources is the NUTS 3 level. It was straightforward to request crime data for exactly this level.

After having settled these crucial questions we sent a letter to the crime data collecting institutions[48] of all EU member states excluding Luxembourg[49]. A general form of this letter can

[46] For Germany the case was even more complicated, because due to the fact that - with the exception of organised crime and terrorism - police falls almost exclusively in the responsibility of the states ("Länder"), we had to contact 16 State Criminal Police Offices.

[47] At the time of our data request, we were not aware of the existence of the European Sourcebook on Crime and Criminal Justice Statistics (CDPC 1999). Otherwise we would rather have chosen the categories of the Sourcebook. However, the problem of incompatible national offence definitions, which might severely distort investigations on the international level, is less serious when country specific analyses are carried out by means of regional data.

[48] Contact persons (with addresses) are listed in Table 51 in the Appendix.

be gathered from the Appendix (Letter 2). Our requests were kindly supported by a covering letter (see Letter 1 in the Appendix) from the German Federal Criminal Police Office (Bundeskriminalamt, BKA), which did not fail to have the desired effect, since the majority of member states submitted their data. The results of the data acquisition process are summarised in Table 15.

Column 2 of Table 15 shows whether there exists any regional crime data in the respective EU member state at all. This is the case for all states except Ireland.[50] Column 3 informs about those countries for which regional crime data of any kind were made available to us. These are Belgium, Denmark, Germany, Greece, Spain, Italy, the Netherlands, Portugal, Finland, Sweden[51] and the United Kingdom[52]. Columns 4-6 contain information on the form, period and suitability of the submitted data. Finally, for those countries which did not meet our request (France and Austria), column 7 reports our (fruitless) efforts concerning communications and co-operation with respective national institutions.

Unfortunately, the crime data submitted by Belgium and Portugal are not utilisable for our empirical investigations. For both countries disaggregated police statistics are only available for areas which are incompatible with the NUTS regions. To a lesser extent this problem also exists for the UK; here we could only use part of the submitted crime data. In Belgium regional crime data are collected for 28 judicial "Arrondissements" which, according to our correspondent, can not be exactly matched with the 43 administrative "Arrondissements" constituting the Belgian NUTS 3 level (see Table 14). Furthermore, regional crime statistics for Belgium are still in the start-up phase. 1995 is the first year for which reliable data is available. The regional crime data from Portugal is based on 13 police directions/ inspections,

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[49] For Luxembourg there is no other NUTS level than the NUTS 0 level (see Table 14). National data for Luxembourg are included in the international data sets mentioned above (see Table 16).

[50] Until today, Ireland did not collect regional crime data. However, after the ongoing change of the statistical system has been finished, regional data will be available.

[51] In order to be precise, our Swedish correspondents did not submit their data but, instead, pointed to the Internet site (http://www.brottsforebygganderadet.se/extra/statistics/extra_index?lang=se) where the requested data can be downloaded. By the way, Sweden is the only country which offers such a service.

[52] There are no common crime statistics for the United Kingdom. Instead, analogous to the police sovereignty, crime statistics fall in the responsibility of England & Wales, Northern Ireland and Scotland. In order to ensure consistency of the crime categories between the NUTS regions we decided to solely consider/ request data from England & Wales. Thus, throughout the present study the use of both country names "United Kingdom" and "England & Wales" is based on data from England & Wales.

whereas the Portuguese NUTS 3 level consists of 28 "Groupos de Concelhos" (see Table 14). We directed an inquiry to our correspondent in order to clarify whether the NUTS 3 regions might possibly be aggregated, so that they match the police directions. Since this request remained unanswered, we infer that this is rather not the case. In the UK regional crime statistics are generated for 43 police force areas. Thus, there are much less police force areas than NUTS 3 regions (133), and slightly more police force areas than NUTS 2 units (36, see Table 14). However, in contrast to Belgium and Portugal, we were able to use some of the British data, since most police force areas are identical with counties which, in turn, constitute the majority of the NUTS 2 regions. Precisely speaking, there are 19 exact matches between NUTS 2 regions and police force areas usable for criminometric investigations. Finally, the regional crime data from Greece could not be used in the project since it arrived after the submission of the first draft of the present report.

Concerning Spain, we obtained provincial data on crime from the national police (Cuerpo Nacional de Policía, CNP). However, according to the notes of our correspondent, the crimes registered by the CNP represent only a fraction of the entire Spanish crime picture, since there are two further police organisations (Guardia Civil and Policías Autonómicas), which are not obliged to report offences within their responsibility to the CNP. Furthermore, the CNP data only covers the reported crimes from provincial capitals and cities with at least 20,000 inhabitants. In order to get a rough impression of the underreporting by the CNP, we compared the sum of the crime categories across all regions with the national figures for Spain provided by Interpol and found that on average the CNP data accounts for approximately 75% of all crimes registered in Spain.[53] When interpreting estimation results for Spain, these shortcomings should always be kept in mind. Especially, if the share of crimes reported to the CNP by the two other police forces is not constant over time, our empirical analysis would yield unreliable (i.e. biased) results.[54]

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[53] The Interpol data is more likely to contain all reported crimes in Spain, since the figures for the respective crime categories are always larger than the sums across the provinces based on the CNP data alone.

[54] According to our correspondent, there are at least four provinces for which the requirement of time-invariant reporting shares is not met. The affected provinces (Alava, Guipúzoco, Vizcaya and Gerona) were, of course, excluded from the analyses in Section 4.

Finally, some remarks on German data are necessary. As a consequence of the police sovereignty of the states, crime data had to be collected directly from the 16 State Criminal Police Offices. With one exception, all states could provide NUTS 3 level data.[55] Further information on the submitted data (period and form of submission) can be gathered from the footnote to Table 15. We decided to base our estimations on an exclusively West German data set, because reliable data for the East German regions are not available for the years prior to 1993, and because time series of some important socio-economic variables (e.g. GDP) currently ended in 1996. This would imply only 3 observations per East German region. If, as in Section 4.3.1, first and second order lags were used in our criminometric analysis, there would have been only one observation per region.[56] Moreover, we excluded Berlin because of obvious structural breaks in its evolution of crime and socio-economic time series.

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[55] The State of Thuringia does not collect crime data on the NUTS 3 level. For some Bavarian regions the time series for some crime categories are incomplete due to mainframe problems of the Bavarian Criminal Police Office.

[56] The state of Saxony-Anhalt, which disposes of regional crime data only since 1997 (see note of Table 15), could not be included at all.

Table 15: Availability of regional crime data from the EU member states

Country	Does the country collect regional crime data?	Did the country deliver regional crime data on request?	Data were delivered in which form?	Available period	Could provided data be used in the analyses?	Remarks concerning the non-availability of data
Belgium	Yes	Yes	Electronically	1994-1998	No	
Denmark	Yes	Yes	Hard copy	1982-1998	Yes	
Germany	Yes	Yes	Irregular*	Irregular*	Yes	
Greece	Yes	Yes	Hard copy	1991-1998	No	
Spain	Yes	Yes	Electronically	1980-1998	Yes	
France	Yes	No	---	---	---	First NUTS 3 level data was promised and also announced; this data did never arrive; after several inquiries NUTS 3 level data was refused, and NUTS 2 level data was promised instead; until today no data has arrived.
Ireland	No	---	---	---	---	Until today Ireland has not collected regional crime data; regional data will be available after finishing the present change of the statistical system.
Italy	Yes	Yes	Electronically	1983-1998	Yes	
The Netherlands	Yes	Yes	Electronically	1983-1998	Yes	
Austria	Yes	No	---	---	---	NUTS 3 and NUTS 2 level data was refused and NUTS 1 level data was promised; no data has arrived until today.
Portugal	Yes	Yes	Hard copy	1984-1998	No	
Finland	Yes	Yes	Electronically	1980-1998	Yes	
Sweden	Yes	Yes	Electronically	1988-1998	Yes	
UK	Yes	Yes	Hard copy	1982-1997	Partly	

Note: *With respect to the form and covered period the data delivered from the respective German states can be summarised as follows: Baden-Württemberg (electronically, 1984-1998), Bavaria (electr., 1983-1998), Berlin (electr., 1980-1998), Brandenburg (hard copy, 1995-1998), Bremen (electr., 1980-1998), Hamburg (hard copy, 1989-1998), Hessen (electr., 1984-1998), Mecklenburg-Vorpommern (hard copy, 1993-1998), Northrhine-Westfalia (electr., 1980/81-1998), Lower Saxony (hard copy, 1980-1998), Rhineland-Palatinate (hard copy, 1994-1998), Saarland (electr., 1980-1998), Saxony-Anhalt (electr., 1997-1998), Schleswig-Holstein (electr., 1980-1998), Thuringia (electr., 1993-1998).

4.1.2.2 National data

Currently only four independent sources of international statistics on crime and criminal justice, which regularly include a large number of countries over an extended period of time, do exist. These data sources are Interpol, the United Nations, the World Health Organization, and the European Committee on Crime Problems (CDPC).[57] Table 16 summarises these data sets with respect to their most important characteristics. It turns out that each data set uses different definitions and procedures. The most important difference, however, is the lack of quality control in three out of four data sets. Solely CDPC (1999:9) proves to be aware of the absolute necessity of a thorough check of data delivered by the national sources: "Validation is often the most important and in many cases the most forgotten stage of the data collection process. As a first step the Group identified and discussed obvious problems relating to this process. It then produced a series of check-tables to assist further validation. [...] This procedure resulted in the need to go back to many national correspondents for clarification and additional cross-checking".

Data inconsistencies, however, are only one of several potential distortions when generating an international crime database. Other problems concern incompatible national offence definitions and, thus, incomparability of national crime levels. These problems reflect the fact that "... nations differ widely in the way they organise their police and court systems, the way they define their legal concepts, and the way they collect and present their statistics" (CDPC 1999:11).

On what concerns the tackling of incompatibility and incomparability problems, it is also the CDPC which has made the most effort. "The group adopted the following procedure: For all offences included in the Sourcebook, a standard definition was used and countries were invited to follow the standard definition where possible". Countries which were not able to meet this definition entirely are listed in the Sourcebook with reference to the affected definitions (European Committee on Crime Problems 1999:6/7).

[57] There also exist two other international crime data sets, which have been generated by academics (Gurr 1977 and Archer and Gartner 1984). However, both databases end in the 70s and are, thus, not further considered (for more information on these sources see Bennett and Lynch 1990).

Table 16: Comparison of cross-national data sets by selected factors

	Data set			
Attributes	Interpol	WHO	UN[a]	CDPC
Scope	Murder, sex offences, rape, serious assault, total theft, aggravated theft, robbery and violent theft, breaking and entering, theft of motor cars, fraud, counterfeiting, drug offences	Homicide	Intentional homicide, non-intentional homicide, assault (total and major), drug crimes (total, drug trafficking, drug possession), rape, robbery, theft (total and major), burglary, fraud, embezzlement, bribery[b]	Intentional homicide (total, completed and as recorded in health statistics), assault, rape, robbery (total and armed), theft (total), theft of motor vehicles, bicycle theft, burglary (total and domestic), drug offences (total, drug trafficking, serious drug trafficking)
Definitions	Broad classes defined by Interpol	Causes of death as defined by WHO	Broad classes defined by UN	Broad classes defined by the CDPC
Quality Control	None	Minimal post facto edits	None	Various consistency checks, queries with national correspondents and corrective actions if necessary
Source	Official police agency	Death certificates	Official police agency	Country correspondents
Coverage[c]	73 to 116 countries	42 to 78 countries	51 to 123 countries	36 European countries including all EU member states
Period	1977[d]-present	1921-present	1970-1975 (1st wave) 1975-1980 (2nd wave) 1980-1985 (3rd wave) 1986-1990 (4th wave) 1990-1994 (5th wave) 1995-1997 (6th wave)[e]	1990-1996

Source: Adapted from Bennett and Lynch (1990), own modifications and updates.
Notes: [a] The UN data is downloadable from the Internet at http://www.uncjin.org/Statistics/WCTS/wcts.html. [b] Scope of 1990-1994 survey. [c] Northern-Ireland, Scotland and England and Wales counted separately. [d] Interpol's International Crime Statistics exist since 1950, but crime was first split up in more precise components in 1977. [e] Sixth wave not yet completed.

It is obvious that among all sources presented in Table 16 the CDPC data is by far the most reliable. For that reason we base most of our analyses in Section 4.2 ("The Europe of Nations") on these data. The only exception is Section 4.2.3, where we investigate the consequences of crime not only by means of a European sample, but also by employing a much broader cross-section of nations containing countries from all continents.[58] For this purpose we decided to rely on Interpol data. Whereas the WHO data does only contain one crime category (homicide), our experience of using UN data, based on an earlier investigation (Spengler 1997), turned out rather unsatisfactory. It appears that the UN data even more severely suffer

[58] Using such samples is the common practise in growth research (see Section 4.2.3.1 for references).

from data inconsistencies than the Interpol data.[59] However, one disadvantage of the Interpol data is that they have to be fed into the computer by hand, whereas UN data are available from the Internet[60].

4.2 Empirical results based on national data ("The Europe of Nations")

4.2.1 Causes of crime: Evidence from panel data of the EU member states

4.2.1.1 Data

The following estimation results are based on data of the "Draft European Sourcebook of Crime and Criminal Justice Statistics" (CDPC 1999) and the "New Cronos Database" (Eurostat 1999). These data sets cover national time series from the 15 EU member states of the period 1990 to 1996. Using national data from the nineties allows us to include a rich variety of socio-economic, demographic, cultural and crime data, which are close to the definitions of crime related variables presented in the survey of the scientific literature (see Table 11). The evidence from this data set contrasts with the disaggregate data set used in Section 4.3, where we analyse longer time series and regional data at the NUTS 3 and NUTS 2 level to enable the identification of regularities within the "Europe of Regions". The analysis of the present section takes a global view, and we try to identify crime related indicators which hold for the "Europe of Nations". The complete picture emerges when putting both parts, i.e., the local and the global view, together.

The following crime related variables have been tested, and they are measured by the following indicators (descriptive statistics of these variables are presented in Table 17):

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59 However, in their comparative study Bennett and Lynch (1990:153) find that "for studies seeking aggregate descriptions of world crime or analytic explanations of cross-national crime rates, differences in the data sets do not make a difference in the results". It should be added that the WHO and the Archer and Gartner databases are also included in this statement.

60 http://www.uncjin.org/Statistics/WCTS/wcts.html

Table 17: Descriptive statistics

Indicator	Mean	Maximum	Minimum	Stand. Dev.	Observa-tions
Real GDP p.c.	14547	24173	8537	3316	104
Unemployment rate	9.0	24.1	1.7	4.7	105
Youth unemployment rate	18.5	45.0	3.2	10.1	102
Share of long-term unemployed (> 12 months)	44.2	68.9	16.7	13.1	90
Male labour force participation rate, 15-64	78.1	87.1	71.3	4.0	89
Female labour force participation rate, 15-64	54.6	82.4	57.3	7.0	89
Labour force participation rate, 15-24	49.7	73.8	32.8	11.7	89
Male labour force participation rate, 15-24	52.7	77.0	35.6	11.6	89
Share of female workers with fixed-term contracts	12.8	39.1	3.1	8.0	88
Share of male workers with fixed-term contracts	9.7	33.2	2.0	7.0	88
Share of female workers working part-time	26.3	68.5	7.2	15.5	89
Share of male workers working part-time	5.1	17.0	1.0	4.0	89
Ratio of high qualified to low qualified labour force	74.7	195.4	17.8	55.2	66
Share of foreigners, 15-24	7.3	42.6	0.1	10.2	81
Age of males at time of first marriage	28.6	32.0	26.0	1.36	98
Divorces per 100 marriages	34.8	68.1	7.9	16.1	98
Net reproduction rate	76.2	101.0	54.0	11.6	104
Age of women at childbirth	28.7	30.2	27.2	0.82	105
Ratio of social security payments to GDP	25.3	36.6	13.6	5.0	86
Total theft	4060.5	8627.0	431.0	2617.4	90
Theft of motor vehicles	474.5	1163.0	68.0	310.2	97
Burglary	1266.6	3272.0	265.0	862.4	91
Robbery	82.9	283.0	11.0	52.1	94
Assault	237.4	616.0	15.0	172.2	98
Intentional homicide	5.9	22.5	0.5	4.6	93
Drug offences	146.8	467.0	15.0	108.8	84

Note: Shares, fractions and ratios are measured as percentages. Crime is measured as number of offences per 100,000 inhabitants.

- Wealth: Gross Domestic Product per capita (in national prices of 1990 and purchasing power standards, i.e. transformed to ECU by assuming purchasing power parity).
- Social cohesion (poverty, labour market): a) Unemployment rates, b) youth unemployment rates, c) long-term unemployment as percentage of total unemployment, labour force participation (male and female) of population aged 15 – 24 and 15 – 64, d) Share of male (female) workers working part-time, e) share of male (female) workers with fixed-term contracts.
- Inequality: Ratio of high qualified labour force to low qualified labour force.
- Social security: Ratio of total social security payments to GDP.
- Job quality: a) Share of male (female) workers working part-time, b) share of male (female) workers with fixed-term contracts.
- Educational attainment, occupational status of residents: Ratio of high (low) qualified labour force to total labour force.
- Female labour force participation: a) Share of women aged 15-64 participating in the labour market, b) share of female workers working part time, c) share of female workers with fixed-term contracts.
- Ethnicity: Share of foreigners in total population.

- Family disruption, social control: a) Divorces per 100 marriages, b) share of extramarital births, c) net reproduction rate, d) mean age of men at the time of first marriage, e) mean age of women at childbirth.
- Demographics: Share of young men (15 – 24) in the population.
- Drug related crime: Number of drug offences per 100,000 inhabitants.

4.2.1.2 Estimation strategy

All results are based on fixed-effect panel estimation. As explained in Section 3.1, introducing country-specific effects is a "conditio sine qua non" of criminometric studies, since they allow us to control for unobserved heterogeneity. This heterogeneity mainly arises because of different shares of crime reported to the police, and due to slightly different definitions of crime categories among EU member states.

Including all potential variables at once turned out to be an unsuccessful way of testing the contribution of single variables, because we ran into problems of multicollinearity. Therefore we followed a sequential testing procedure, and we only present significant (and sometimes weakly significant) results as well as selective results if they show the performance of competing theories. Thus, if variables mentioned above do not show up in the following tables, it can be concluded that they are not confirmed as significant indicator of the crime category under investigation.

Not all of the variables presented in Table 17 are available for all countries (for instance, data on foreigners are missing for Italy, and the number of drug offences are lacking for Spain, England and Wales), so please note that different model specifications in Table 18 to Table 24 imply different samples. Our estimations are based on unbalanced panels. The reasons for deviating samples are explained in table notes. However, it has to be stressed at the outset that the presented results turn out to be robust, irrespective of sample settings.

4.2.1.3 Estimation results

4.2.1.3.1 Interpretation of results

In Table 18 to Table 24 we present our criminometric estimation results. Conventional t-values are given in parentheses. The share of variance explained by the statistical estimate is shown as "R-squared" statistic (which is adjusted for the number of explanatory variables involved in the estimation equation). Please note that for expository reasons all ratios, rates and shares are measured as percentages in Table 17, whereas estimations presented in Table 18 to Table 24 are based on fractions (for instance, the average unemployment rate is 9.0 in Table 17, but it is used as 0.09 in the estimation procedure). The dependent variable is measured as "log (crime)" of seven types of crime (with "crime" measured as "number of offences per 100,000 inhabitants"). This procedure means obeying some general rules of interpretation:

a) If the explanatory variable is a share (or ratio, fraction, rate), estimates represent *semi-elasticities.* Thus an estimated coefficient of, say 10.0, means that increasing the explanatory variable by 1 (percentage) point would increase crime by 10.0 per cent. Let us consider the unemployment rate as an example. Assuming a rise of the unemployment rate from 5% to 6% would increase crime rates from, say, 2000 to 2200 per 100,000 inhabitants. Note, however, that increasing the unemployment rate from 5% to 6% means an increase of the unemployment rate by 20 per cent, so that the estimated coefficient 10 would imply a much smaller (dimensionless) (point-) elasticity of 10/20=0.5.

b) If the explanatory variable is a logarithmic variable, as for instance log (GDP per head), then estimated coefficients can be interpreted as elasticities. If the estimated coefficient is b, then increasing the explanatory variable by 1 per cent means a rise of crime by b per cent. For example, if b is 1.5, then increasing GDP per capita from, say, 30,000 EURO to 30,300 EURO would change crime from 2000 to 2030.

c) Finally, the reader will find direct measures of variables such as age. For instance, if we observe an estimated coefficient of "age at the moment of first marriage" of 0.07, then an increase of age by one year (say from 26 to 27) implies a raise of crime by 7 per cent.

4.2.1.3.2 Total Theft

The regression results for total theft are documented in Table 18. The first column is estimated without fixed effects, and demonstrates the importance of country specific effects by comparing it to column 2, which differs in considering so-called country specific dummy variables. Here, the impact of some variables has vanished (e.g. the influence of the female labour force participation rate), and other variables change their sign. For instance, "divorces per marriage" switches from a negative to a positive sign.

Table 18: Total theft

	Dependent variable: log (theft)				
Independent variables	(1)	(2)	(3)	(4)	(5)
Constant	-8.76 (4.41)	---	---	---	---
log (Real GDP per head)	1.14 (5.87)	---	---	---	---
Youth unemployment rate	2.42 (4.07)	1.70 (2.40)	1.41 (1.97)	0.94 (1.21)	---
Share of long-term unemployment	2.30 (4.98)	0.50 (2.48)	0.46 (2.34)	0.56 (2.58)	0.54 (2.49)
Male labour force participation rate, 15-64	---	2.94 (2.35)	2.68 (2.09)	2.04 (1.51)	0.99 (0.95)
Female labour force participation rate, 15-24	(7.94) (14.12)	---	---	---	---
Share of female workers with fixed-term contracts	---	5.67 (3.87)	5.90 (4.12)	5.84 (3.98)	5.48 (3.79)
Share of male workers with fixed-term contracts	-2.98 (2.13)	-5.44 (4.18)	-5.83 (4.57)	-6.08 (4.56)	-6.48 (4.96)
Share of female workers working part-time	2.39 (7.88)	-3.78 (3.94)	-4.26 (4.40)	-3.21 (3.24)	-2.53 (3.08)
Divorces per marriage	-1.48 (3.97)	1.08 (2.85)	1.53 (3.61)	1.02 (2.59)	1.18 (3.18)
log (drug offences)	---	---	---	0.08 (1.49)	0.09 (1.77)
Country effects	no	yes	yes	yes	yes
Number of observations	65	66	58	59	59
Adjusted R-squared	0.914	0.995	0.995	0.995	0.995

Notes: Ireland and Spain are excluded because of missing data. In columns 1 and 2, data for Belgium, Austria, Finland and Sweden are missing for the years 1990-1994. Columns 3 to 5 are based on samples without these countries.

The number of divorces per marriage - which is 35 % on average for our European sample from 1990–1996[61] - is used as indicator of "family disruption". Estimated coefficients in Table 18 suggest that an increase by one point would increase the number of thefts by 1 to 1.5 per cent. This result and the rising number of divorces in Europe are in accordance with several theories of criminal behaviour:

a) social disorganisation, differential association/ social learning theory: a substantial share of divorces is most likely associated with low parental supervision of youth,

b) social control theory: less and less people do believe in conventional values and norms,

c) self control theory: more and more people act in own short-term self interest, and

d) interactional theory: low family attachments of children.

All these lines of thought are also confirmed by the estimated coefficients of the "share of female workers with fixed-term contracts" (average of the European sample: 12.8 %). The impact of this indicator on theft is positive (with coefficients ranging from 5.5 to 5.9), hence it seems reasonable to interpret it as indicator of family disruption. The same interpretation applies to the female participation rate, which is positively associated with criminality according to previous results in the scientific literature. In case of Table 18, however, the female labour force participation rate has become insignificant after including the share of women with short-term contracts and female part-time working.

At first glance, the crime-preventing effect of female part-time working (sample average: 26% of the female work force, range of estimated coefficients: -2.5 to -4.3) seems to contradict the effect of female jobs with limited period contracts. Contrary to (fixed-term) full time jobs, part-time jobs apparently leave sufficient time for parental supervision and effective childhood socialisation (which both are crime preventing from the viewpoint of social control theory, social disorganisation theory, and differential association/ social learning theory). Moreover, part-time jobs for females improve the legal income opportunities of the family. As predicted by the economic theory of crime, better legal income opportunities would decrease the number of crimes.

The behaviour of male labour market variables differs from that of their female counterparts. A higher share of male workers with fixed-term contracts (sample average: 9.7%) reduces crime (range of estimates: between -5.4 and -6.5). This result cannot be seen isolated from the crime enhancing effects of both the youth unemployment rate (average: 18.5, estimates: between 0.9 and 1.7), and the share of long-term unemployment (average: 44.2, estimates: about 0.5). It seems to be important to bring men back into work, in particular young men (who are exposed to criminal risks to a higher extent than older people), and those who suffer from social exclusion.

Unemployment plays a central role in many theories. It serves as an indicator of lacking social cohesion, i.e. poverty, low economic status (social disorganisation) and relative deprivation,

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[61] The average annual growth rate of this period amounts to 5.5 %.

and it represents the gap between aspiration and expectation (strain theory) as well as low legal income opportunities (economic rational choice theory). Whereas the positive sign of the coefficient on unemployment is in line with all these theories, it contradicts the theory of life-style and routine activity, according to which higher unemployment would imply higher guardianship and less exposure to potential dangers and would thus result in a reduction in crime.

Lifestyle/ routine activity theory is partially confirmed by the role of the male labour force participation rate (sample average: 78.1, range of estimates: between 1.0 and 2.9). The higher the share of the "active" population is, the higher is the probability that potential offenders meet their victims.

The effect of the "male labour force participation rate" in the sense of lifestyle/ routine activity is also confirmed through its interaction with drug offences (these are included in columns 4 and 5 of Table 18). Including the number of drug offences per 100,000 inhabitants as an indicator of unfortunate lifestyle/ routine activity situations renders the effect of the male participation rate insignificant. The same holds for the youth unemployment rate, indicating that a substantial share of thefts committed by young people might be drug related. Looking at the total effect of drug related thefts, we can conclude that a 10 per cent increase in the number of drug offences increases the number of thefts by about 1 per cent (exact elasticity estimates: 0.08 and 0.09). From a statistical point of view, however, these estimates are only weakly significant. This might come as a surprise to those readers who expect a highly significant impact coming from illicit drug use. However, one has to keep in mind that our estimates represent the excess effect of drug offences, i.e. the measurable effect which remains after including all other potential sources of crime, many of which also belong to the causes of drug offences themselves (see Table 24).

4.2.1.3.3 Theft of motor vehicles

Theft of motor vehicles represents an important subgroup of total thefts. Moreover, car theft statistics can be regarded as highly reliable since the share of unreported cases is very low across countries (this can be concluded from victim surveys). Therefore car theft might be the most suitable theft category for international comparisons. In Table 19, estimation results are summarised. Some interesting deviations from total thefts can be observed. Here the role of the family is not linked to the female participation rate or to divorces (which both are insignificant), but to the age of males at the time of their first marriage. As "divorces per marriage", this alternative indicator can also be interpreted in the sense of social disorganisation, social control or other theories that focus on the central role of conventional family attachment. Later marriage means that young males delay the time at which they take responsibility for the well-being of a young family. Thus, later marriage means extending the period during which young men are exposed to risk groups and are more likely to act in own short-term self interest rather than in the long-term interest of social groups.

Table 19: Theft of motor vehicles

	Dependant variable: log (theft of motor vehicles)		
Independent variables	(1)	(2)	(3)
log (Real GDP per head)	0.94	0.59	---
	(2.45)	(1.55)	
Youth unemployment rate	8.89	5.96	5.90
	(4.85)	(3.07)	(2.75)
(Youth unemployment rate)^2	-13.00	-8.34	-9.07
	(4.67)	(2.81)	(2.93)
Male labour force participation rate, 15-24	2.14	2.11	2.28
	(2.54)	(2.56)	(2.74)
Share of foreigners, 15-24	---	4.42	3.89
		(3.50)	(3.10)
Age of males at time of first marriage	---	---	0.09
			(2.15)
Number of observations	80	73	68
Adjusted R-squared	0.972	0.976	0.978

Note: All estimates include country-specific constants. Italy is excluded in estimations 2 and 3 because of missing data.

The role of the active labour force, which, of course, is also the active one in the illegal sector, is confirmed for theft of motor vehicles. Here, the group of young men older than 15 and younger than 25 turns out to be a significant indicator of theft of motor vehicles.

It becomes very clear that car theft is first of all a matter of the young (men), a result confirmed by the influences stemming from unemployment and ethnic heterogeneity (see below). In the case of unemployment significant effects can be identified only for youth unemployment, not for general unemployment. Here, unlike total thefts, motor vehicle thefts are determined by a non-linear impact, revealing a concave (first strongly rising, than flattening) shape of the impact curve (with a maximal value, and zero change for youth unemployment rates at about 30 to 40 per cent, which means that most observable figures of about 10 to 20 per cent increasing youth unemployment rates imply the danger of further increasing thefts).

Finally, both ethnic heterogeneity measured by the share of young foreigners in a society and higher wealth increase the number of motor vehicle thefts. Wealth is measured by real GDP per capita. The positive sign of this indicator suggests that GDP should be interpreted as a measure of illegal income opportunities. A higher GDP per capita means a higher number of lucrative targets.

The effect of ethnic heterogeneity is in accordance with results known from social disorganisation theory (see Section 2.1.1). Nevertheless, the underlying reason for this result should be interpreted with care. There are many reasons why foreigners are over-represented in the group of suspects. First, they may be more often suspected wrongly than the native population. Second, there are some laws like the foreigner and asylum laws which can, by definition, only be broken by foreigners. Third, foreigners who reside in Europe are to a higher percentage young men. Fourth, some foreigners may be in European countries after fleeing their homeland because they were offenders there. Finally, most foreigners enter European countries because they had no economic success in their home country. The latter may be due to factors that foster crime, for example, lack of education. Since, in our econometric specifications, we are interested in the pure crime-effect of being a foreigner in a European member state, all the points mentioned above are potential sources of bias. These points should be kept in mind when judging the coefficients of the foreigner variable in our estimations.

One of our motivations to use a foreigner variable is its supposed connection with norms, tastes and social interactions (Eide 1994). A low adherence to norms may be the consequence of, or a reaction to discriminating tendencies against foreigners by the native population (see, for instance, Krueger and Pischke (1996), who analyse crime against foreigners in Germany). Moreover, concerning crime-enhancing social interactions, foreigners are presumably more likely to become offenders, since (especially young) foreigners spend more time in cliques.

Apart from norms, tastes and social interactions, the young-men and foreigner variables may also be related to deterrence variables and legal and illegal income opportunities. Young men/ people, especially when they are less than 18 years of age and/ or first-time offenders, would not be punished severely. Moreover, young men/ people who are pupils, students or jobbeginners with low wages have relatively low legal income opportunities. The same holds true for foreigners who may have low-paid jobs due to language problems or lack of education.

4.2.1.3.4 Burglary, Robbery

The analysis of crime against property is completed by burglary and robbery. Table 20 and Table 21 confirm the key role of social exclusion for the understanding of property crime. Burglary is positively associated with general unemployment, whereas high robbery rates are more likely associated with both high long-term unemployment and youth unemployment.

Table 20: Burglary

	Dependent variable: log (burglary)				
Independent variables	(1)	(2)	(3)	(4)	(5)
Unemployment rate	2.02 (4.13)	4.93 (6.33)	4.14 (4.10)	4.31 (3.77)	4.05 (3.60)
Female labour force participation rate, 15-64	---	1.96 (3.59)	1.18 (1.66)	1.23 (1.59)	---
Share of male workers with fixed-term contracts	---	-1.57 (2.23)	-1.98 (2.74)	-1.97 (2.55)	-1.69 (2.35)
Share of foreigners, 15-24	---	---	---	---	2.24 (3.49)
Divorces per marriage	---	---	0.69 (2.55)	0.60 (1.49)	0.72 (2.96)
Number of observations	91	74	67	59	59
Adjusted R-squared	0.924	0.992	0.993	0.993	0.994

Notes: All estimates include country-specific constants. Spain is excluded because of missing data on burglary. Columns 3-5: without Ireland (no data on marriages). Column 5: without Italy (no data on foreigners). Columns 3-5: without Belgium, Finland and Sweden (sparse data).

The merits of increasing female labour force participation might come with the unpleasant cost of higher crime rates. Recently, a number of authors have pointed at this important and often overlooked cause of crime: see Donohue and Siegelman (1998), Greenwood (1998), Wilson (1998), and Witt and Witte (1998). According to them, the influx of women into the labour market (without a simultaneous fall of the male participation rate) bears the danger of lacking parental supervision and ineffective childhood socialisation and hence the increasing supply of potential criminals. This conjecture is confirmed by our panel estimates. Estimated coefficients range between 1.2 and 2.0 (burglary), and 2.5 (robbery) meaning, for instance, that an increase of the average share of female labour force participation from 0.53, to 0.54 would increase burglary by about 1 to 2 per cent (respective point-elasticities: 0.6 and 1.1) and robbery by 2.5 per cent (point-elasticity: 1.3). Thus, female labour force participation might be linked to a growing absence of conventional formal and informal associational ties rooted in family life and ongoing socialisation processes (social disorganisation theory and social control theory), to missing parental supervision (lifestyle/ routine activity) and the learning of legal norms by communication in intimate personal groups (differential association/ social learning) and to ineffective childhood socialisation (social control, self-control).

Table 21: Robbery

	Dependent variable: log (robbery)			
Independent variable.	(1)	(2)	(3)	(4)
log (Real GDP per head)	0.97 (3.05)	1.01 (3.05)	0.71 (1.97)	---
Unemployment rate	3.88 (1.96)	---	---	---
(Unemployment rate)^2	-24.76 (2.71)	---	---	---
Youth unemployment rate	---	5.55 (3.20)	4.63 (2.69)	5.55 (4.29)
(Youth unemployment rate)^2	---	-11.26 (3.47)	-10.39 (3.29)	-14.56 (6.10)
Share of long-term unemployment	---	0.61 (1.74)	0.73 (2.14)	---
Female labour force participation rate, 15-64	---	---	2.47 (2.17)	---
Share of male workers with fixed-term contracts	---	---	---	-3.50 (3.37)
Share of male workers working part-time	---	---	---	12.29 (4.31)
Net reproduction rate	---	---	---	-1.90 (3.65)
Number of observations	93	69	77	76
Adjusted R-squared	0.967	0.973	0.974	0.983

Notes: All estimates include country-specific effects. In column 2 Belgium, Austria, Finland and Sweden are excluded (sparse data).

As for total thefts, divorces per marriage have crime enhancing effects on burglary rates, though the effect is somewhat smaller than in Table 18. In the case of robbery, the variable "net reproduction rate" remained significat after performing our sequential estimation and testing procedure and after carrying out tests of robustness. The negative sign indicates that societies with only few children per family seem to have more serious crime problems. We link this result to the more general set of indicators representing family disruption, and the erosion of traditional ties rooted in family life. Falling net reproduction rates are associated with lower needs for social protection, which are more likely guaranteed by the legal and social status of the family. In turn, individualistic behaviour becomes dominant over social behavioural norms. Individualistic behaviour is more likely linked to the individual rational offender (as is argued in the economic theory of crime) and to a higher probability of contact with criminal peers.

Obviously it is very important to create new jobs for male workers, unless these jobs are part-time jobs. This conclusion arises from the role of the indicator "share of male workers working-part time". Column 4 of Table 21 suggests that an increase by one percentage point (sample average = 9.7 %) increases the robbery rate by 12.3 per cent (point elasticity = 1.2), whereas higher shares of male workers with fixed-term contracts lead to a significant reduction of crime (see Table 20 and Table 21). The effect of part-time working is fully consistent with the well-known fact that legal and illegal activities do not represent mutually exclusive alternatives (see Section 2.1.11). Micro studies reveal that a high proportion of crime is committed by employed offenders. To a certain extent this observation might be due to the fact that employment exposes individuals to a wider network of delinquent peers (this view has been followed in Ploeger (1997)). This view is reinforced by the fact that part-time workers dispose of more leisure time than full-time workers. Since at the same time legal income opportunities of part-time workers are low, there is potential pressure to allocate available leisure time to illegal activities.

Other causal links are possible. Besides the mere status of being employed or not, the labour market bears further crime-enhancing aspects: Adequate pay, conditions of labour and inequality, for instance. Thus, any indicator for the absence of full time work (i.e. underemployment) is expected to have a crime increasing impact. More full-time jobs for males, however, even if they are of limited duration, reduce the number of potential offenders (see the negative sign on "share of male workers with fixed-term contracts" in Table 20 and Table 21). In this sense, our estimates confirm results presented in Allan and Steffensmeier (1989), who have found that the effects of inadequate pay and hours are associated with higher arrest rates of young adults.

As in the case of car theft, there is indication that higher wealth (measured by GDP p.c.) implies a higher propensity to commit property crimes (see Table 21), though the estimated coefficient becomes insignificant after including more specific labour market variables and the net reproduction rate. The impact of ethnic heterogeneity (share of foreigners in the population aged 15 to 24) is confirmed for burglary, but not for robbery.

4.2.1.3.5 Crime Against the Person: Intentional Homicide and Assault

Crime against the person is covered by the categories "number of intentional homicides" and "number of assaults", both measured as rates per 100,000 inhabitants. The results are summarised in Table 22 and Table 23. Contrary to crime against property, higher wealth is associated with less violent crime, at least with a lower number of intentional homicides. For assault the direction of influence is ambiguous and insignificant. Thus, higher wealth might be associated with higher moral norms or better protection from extremely *violent* crime.

Table 22: Homicide

	Dependent variable: log (homicide)				
Independent variable	(1)	(2)	(3)	(4)	(5)
Constant	-12.26	---	---	---	---
	(3.77)				
log (Real GDP per head)	---	---	---	-1.74	-1.76
				(1.76)	(2.16)
Labour force participation rate, 15-24	29.89	6.76	4.20	4.48	5.92
	(4.49)	(2.12)	(1.29)	(1.41)	(2.06)
(Labour force participation rate, 15-24)²	-28.40	-5.53	-3.55	-3.66	-4.85
	(4.53)	(1.83)	(1.21)	(1.28)	(2.05)
Share of foreigners, 15-24	---	---	2.50	3.47	4.58
			(2.26)	(2.87)	(2.02)
Age of males at time of first marriage	0.21	0.07	0.05	0.12	0.12
	(2.64)	(1.74)	(1.43)	(2.29)	(2.26)
Divorces per marriage	1.41	1.71	1.27	1.31	1.32
	(2.80)	(3.01)	(2.36)	(2.49)	(3.20)
Country-specific effects	no	yes	yes	yes	yes
Number of observations	65	58	52	52	50
Adjusted R-squared	0.256	0.969	0.978	0.979	0.988

Notes: Portugal is missing because of lacking data on homicides. In column 2 Belgium, Ireland, Austria, Finland and Sweden are excluded because of missing or sparse data of explanatory variables. Columns 3 and 4 present results in which additionally Italy is omitted (missing data on foreigners). Column 5 also excludes Luxembourg (check for robustness because of sparse data and a very high share of foreigners).

In accordance with property crime, youth unemployment remains a significant indicator of assault.[62] Intentional homicide, however, is not associated with any indicator of labour market tensions. Besides ethnic heterogeneity, indicators of family roots and family disruption are important and statistically robust factors. The elasticity on "age of males at time of first marriage" based on fixed-effect estimations in Table 22 and Table 23 varies between 0.05 and

[62] The concave total impact curve has a maximum at 20 (column 1), respectively 22 per cent (column 3), with strong effects for changes starting from small and medium youth unemployment rates.

0.12.[63] Thus, postponing the time of marriage by another year would increase the number of violent crimes by about 5 to 12 per cent.

The quantitative impact of divorces per marriage on homicides and assault is more or less the same as for theft, though the reason might be different. Since a large share of total violent crime emerges from marital rows among husband and wife, the significance of this parameter estimate arises, at least to a certain degree, because of the immediate and harmful consequence of family disruption itself, whereas for property crimes "divorces per marriage" more probably serves as indicator of lacking social control and family attachment of children (see the discussion of thefts above).

Table 23: Assault

	Dependent variable: log (assault)		
Independent variable	(1)	(2)	(3)
log (Real GDP per head)	-0.67	---	0.63
	(1.28)		(1.68)
Youth unemployment rate	1.86	---	1.76
	(2.08)		(2.80)
(Youth unemployment rate)^2	-4.99	---	-4.12
	(3.04)		(3.90)
Age of males at time of first marriage	0.11	0.07	0.05
	(2.39)	(3.00)	(1.79)
Divorces per marriage	---	0.47	0.64
		(1.40)	(2.88)
Number of oberservations	88	58	83
Adjusted R-squared	0.991	0.994	0.996

Notes: All estimates include country-specific effects. Belgium, Austria, Portugal, Finland , Sweden and Ireland are excluded from column 2 because of sparse data. Ireland is excluded from estimation 3.

4.2.1.3.6 Drug offences

The rate of drug offences was included as explanatory variable in all crime categories, but it proved (weakly) significant only for theft. In Table 24 various estimates are performed to explain drug offences as endogenous type of crime. From column 1 it can be inferred that drug offences are related to higher income levels. Column 2 then seems to suggest that societies with more generous welfare payments foster drug related crimes. This view, however, turns out to be short-sighted, since the ratio of social security payments becomes insignificant when the true reason behind extensive security payments is considered, i.e., high unemployment rates. Youth unemployment is highly significant and has a large numerical impact (see column

[63] The first column represents estimates without fixed-effects in order to demonstrate the correcting

3): An increase of the youth unemployment rate by one percentage point leads to an increase of the number of drug offences by about 2.7 per cent.

In column 4 of Table 24 other crime factors are included, which, however, cause the loss of many observations (from 80 to 47 in column 3). Nevertheless, it is interesting to observe that divorces per marriage, part-time working, the ratio of high qualified to low qualified labour force and the control for the active part of total population turn out to be more important factors than youth unemployment, and reasons that might stem from the abundance of rich societies (i.e. GDP p.c.), which now become insignificant. Divorces per marriage, part-time employment of males and the male labour force participation rate have the same effects (same signs) as they have for the other crime categories and should be interpreted in the same way as above. A new variable, which here shows significance for the first time, is the ratio of high qualified persons to low qualified persons in the labour force. We should interpret the result as an achievement of educational attainment. Evidently, better education helps to reduce the problem of drug abuse.

Table 24: Drug Offences

	Dependent variable: log (drug offences)			
Independent variable	(1)	(2)	(3)	(4)
log (Real GDP per head)	1.57 (2.67)	0.76 (0.97)	1.06 (1.98)	---
Youth unemployment	---	---	2.74 (4.23)	---
Male labour force participation rate, 15-64	---	---	---	7.04 (1.64)
Share of male workers working part-time	---	---	---	16.09 (2.19)
Ratio „high qualified" to „low qualified" labour force	---	---	---	-0.33 (2.19)
Divorces per marriage	---	---	---	2.59 (3.46)
Ratio of social security payments to GDP	---	7.25 (3.36)	---	---
Number of observations	83	67	80	47
Adjusted R-squared	0.931	0.929	0.938	0.967

Notes: Spain and England & Wales are omitted from the samples because of missing data on drug offences. Data on social security are only available until 1995. Data on qualification (column 4) are only available for the period 1992-1996. Ireland is omitted from column 4 (missing data on marriages).

influence of country-specific constants.

4.2.1.4 Summary of results

Table 25 gives a summary of "Crime in the Europe of Nations", i.e., of results based on a cross-section of national time series. We summarise Table 18 to Table 24 with respect to relevant indicators of crime, direction and magnitude of influence. For each relevant indicator we present affected categories of crime. The magnitude of the effect is presented as (point) elasticity. In those cases in which semi-elasticities were estimated, point-elasticities have been calculated at the point of the sample average. It has to be taken into account that some entries of Table 25 are based on results of "indicator plus indicator squared" (for instance, the effect of youth unemployment on theft of motor vehicles). In such cases, the elasticity of individual member states might differ substantially from that of the average, if, for instance, national unemployment rates are much higher or lower than the European average. As a general rule, it can be concluded that increasing the indicator by one per cent (not to be confused with a percentage point), and starting from initial values which are lower than the European average would lead to *higher* elasticities than those presented in Table 25, whereas the opposite is not necessarily true.[64]

The consistency of most results presented in Table 25 allows us to draw some general conclusions. First, wealth (GDP p.c.) varies positively with crime against property and negatively with intentional homicides. Drug abuse very likely is a problem of wealthy societies.[65] It becomes very clear that underemployment is a crucial reason behind crime in Europe. Unemployment, long-term unemployment and, in particular, youth unemployment increase the number of property crimes as well as the crime rate of assaults. Juvenile delinquency also seems to be the main driving force behind the positive variation of the share of young foreigners with theft of motor vehicles, burglary and intentional homicide.

Higher male participation rates lead to higher crime rates. This result simply reflects the fact that more active men magnify the pool of potential criminals. The crime enhancing effect of the female labour force participation is somewhat more difficult to interpret. On the one hand, the argument might be the same as for males, i.e. data on participation rates reflect nothing but

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[64] The reason for this asymmetry is the location of the maximum of the polynomial impact curve which lies above the national sample mean for most countries.

[65] Since drug offences are also positively related to youth unemployment, drug offences are also most likely a problem of cities, where high wealth and high unemployment rates coexist.

the part of the population that most likely is involved in criminal activities. Since, however, only a small part of all criminals are females, the interpretation has to be different from that of males. The positive sign rather indicates that a higher active share of females in the population also provides a larger pool of potential victims.

Table 25: Indicators of crime in the Europe of Nations: Summary of results

Indicator	Range of (mean) elasticities	Endogenous crime categories
Real GDP p.c.	0.6 – 0.9	Theft of motor vehicles
	0.7 – 1.0	Robbery
	-0.7 – 0.6	Assault
	-1.8 – -1.7	Intentional homicide
	0.8 – 1.1	Drug offences
Unemployment	0.4	Burglary
	0.01*	Robbery
Youth unemployment	0.2 – 0.3	Total theft
	0.1* – 0.2*	Theft of motor vehicles
	0.1*	Robbery
	0.2*	Assault
	0.5	Drug offences
Long-term unemployment	0.2	Total theft
	0.3	Robbery
Male labour force participation, 15-64	0.8 – 2.3	Total theft
	5.5	Drug offences
Female labour force participation, 15-64	0.6 – 1.1	Burglary
	1.3	Robbery
Labour force participation, 15-24	0.6* – 1.0*	Intentional homicide
Male labour force participation, 15-24	1.1 – 1.2	Theft of motor vehicles
Female workers with fixed-term contracts	0.7 – 0.8	Total theft
Male workers with fixed-term contracts	-0.6 – -0.5	Total theft
	-0.2	Burglary
	-0.3	Robbery
Female workers working part-time	-1.1 – -0.7	Total theft
Male workers working part-time	0.6	Robbery
	0.8	Drug offences
Ratio of high qualified to low qualified labour force	-0.2	Drug offences
Young foreigners, 15-24	0.3	Theft of motor vehicles
	0.2	Burglary
	0.2 – 0.3	Intentional homicide
Age of males at time of first marriage	2.6	Theft of motor vehicles
	1.4 – 3.1	Assault
	1.4 – 3.4	Intentional homicide
Divorces per 100 marriages	0.4 – 0.5	Total theft
	0.2 – 0.3	Burglary
	0.2	Assault
	0.4 – 0.6	Intentional homicide
	0.9	Drug offences
Net reproduction	-1.4	Robbery
Drug offences	0.1	Total theft

Note: Summary of estimates presented in Table 18 to Table 24. Preliminary results (e.g. results based on estimations without fixed-effects) are omitted. Semi-elasticities are transformed to elasticities on the basis of respective sample averages. *) indicates elasticities based on quadratic impact curves evaluated at the sample mean of the indicator variable.

On the other hand, however, there are arguments stressing the role of the increasing female labour force participation for the decline of conventional family values associated with changing social norms, lowering social attachments and deteriorating parental supervision.[66] Other more direct indicators confirm the crucial role of causal crime factors embedded in family disruption. Table 25 contains significant results for "age of males at time of first marriage", "divorces per marriage" and "average age of women at childbirth". All estimates show unanimous signs indicating that intensified family values would lead to lower crime rates. Here "more family" more specifically means taking responsibility at younger age (as regards marriage and childbirth) as well as sticking by the bonds of marriage. Coefficients on these variables reveal substantial quantitative effects.

Finally, fixed-term contracts and part-time working have opposite effects for males and females. Whereas for males full-time jobs seem to be crime preventing, even if the duration is limited by fixed-term contracts, part-time jobs seem to leave enough free time and "better" possibilities for illegal work and worse possibilities for legal work. Female fixed-term work, however, seems to take the effect of higher female participation rates. Thus, increasing the number female fixed-term contracts leads to higher criminality (confirmed for total theft). Part-time working has the opposite (negative) impact on crime. Again, these results can be interpreted in the context of family integration. Unlike full-time work, part-time jobs seem to leave enough time for the good upbringing of children, parental supervision and effective childhood socialisation.

4.2.2 Assessing the negative impact of crime on economic performance

4.2.2.1 The testing strategy

Most studies confirming the reverse direction of causation from crime to economics are based on individual data or data of an extremely high level of spatial detail (see Section 2.2). However, such data sets would not fit the basic requirement of our project proposal according to which indicators evaluated in our study need to be updated using regular national and interna-

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[66] Of course, some of the disagreeable effects of the increasing female labour force participation rate discussed in our Report could perhaps be offset by a simultaneous fall of the male participation rate. However, such cases escape from our analysis since they are not visible in aggregate data sets. Since our empirical work has to follow a positive research strategy, we can only deal with and comment on matters of statistical evidence.

tional statistical sources. At first glance, additional research seems to be superfluous, since all previous studies based on *aggregate* data state a unidirectional causality from unemployment to crime. However, reiterating previous arguments (Section 2.2.2.4), it seems unclear whether this result would hold for more recent data, since most time series used in previous studies date back to the sixties, seventies and early eighties. Since the massive increase of crime in the seventies and eighties has accumulated an unprecedented potential pool of criminals in Europe, a different picture might emerge when more recent data were used.

In this section we study the causal effects of several crime categories on GDP growth, employment growth and investment using recent panel data from the 15 EU member states of the nineties (1990-1996). All crime categories used in this section are already presented in Table 17 (data source: "Draft European Sourcebook of Crime and Criminal Justice Statistics" (CDPC 1999)). The analysis of the present section further includes economic variables related to the economic theory of growth. The data stems from the New Cronos database (Eurostat 1999) and from the Global Development Network Growth Database Descriptive (World Bank 2000). Descriptive statistics of these variables are presented in Table 26. Please note that, as before, Table 26 presents percentage shares, whereas subsequent estimates are based on ratios.

Table 26: Descriptive statistics of economic performance indicators

Indicator	Mean	Max.	Min.	Std. Dev.	Observ.
Gross domestic investment (% of GDP), 1985-1991	21.3	30.6	15.0	3.3	97
Telephone mainlines (per 1.000 people), 1985-1991	406.2	691.0	145.0	116.7	105
Growth of GDP p.c. in prices of 1990 and purchasing power standard (%)	1.3	10.2	-7.9	2.3	89
Percentage change in employment	0.2	5.1	-7.0	2.1	104

The research strategy followed in this section combines tests of causality in the sense of Granger (1969) with advances in the empirical literature on economic growth (Barro 1991, De Long and Summers 1991, Mankiw, Romer and Weil 1992, and Sala-i-Martin 1997b).

As known to everyone, correlation does not necessarily imply causation in any meaningful sense of that word. The widespread Granger (1969) approach to the question of whether x (criminality) causes y (economic performance) intents to investigate how much of the current y can be explained by past values of y and then to reveal whether adding lagged values of x

can improve the explanation. y is said to be Granger-caused by x if x helps in the prediction of y, or equaly if the coefficients on the lagged xs are statistically significant. Thus, Granger causality measures precedence and information content but it does not by itself indicate causality in the more common use of the term. Since, however, the general meaning of "causality" in its all embracing philosophical meaning most probably escapes any statistical feasibility, we content ourselves with this concept of causality based on time series analysis.

A common feature of empirical contributions to the economic growth literature is the consideration of investment variables as explaining variables. Sala-i-Martin (1997b) has tested the robustness of 59 indicators of growth in an international cross-section of nations and has found investment to belong to the most robust variables.[67] However, using investment as indicator of growth can be criticised on grounds of simultaneity. Looking at standard investment models such as the classical accelerator principle, it is obvious that investment itself is influenced by economic growth very likely leading to a simultaneity bias in most empirical growth models based on cross-sections (which is obvious but usually ignored). We avoid this problem by merging lagged investment data to economic performance indicators. The time lag of tested growth variables with respect to investment is 5 years. This time lag can be considered long enough in order to relate variations of economic performance to previous investment efforts.

The basic specification of our test equation follows the principle of Granger causality tests. Lagged investment variables serve as additional control variables. They are fixed in the sense that they appear in all regressions. Thus, the basic model looks as follows:

$$growth(t) = a\ growth(t-1) + b\ crime(t-1) + c\ investment(t-5)\,.$$

Here "growth" will be replaced by "growth of real GDP per capita" and "percentage change of employment". The causal influence of "crime" is sequentially tested for the crime categories murder, assault, robbery, total theft, theft of motor vehicles and drug offences. For reasons of potential multicollinearity among several types of crime we have only used one crime category per regression, instead of including all of them in one single regression. "Investment" is

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[67] Sala-i-Martin (1997b) has run 32,509 possible regressions based on permutations of 59 explanatory variables. In 99.97 % of all cases, equipment investment has shown statistical significance. Only the fraction of population that follows Confucius Religion (100%) performed better. It very likely acts as a dummy variable for East Asian miracle economies.

more precisely measured as the percentage share of gross domestic investment in GDP. Since previous investments in information and telecommunication techniques very likely represent one of the main indicators of future growth, we have added a second predetermined growth indicator, which is "telephone mainlines per 1000 people".

4.2.2.2 Results

Table 27 and Table 28 show estimation results. The parameter on "autoregressive influence", i.e. the parameter *a* of the growth equation measures how much of the current *y* can be explained by past values of *y*. It fluctuates between 0.28 and 0.40 for GDP growth rates and between 0.45 and 0.48 in case of employment growth. As expected, investments are important for future GDP growth (confirmed by significant t-values in Table 27). However, in order to achieve a growth of *employment*, it seems to be more important to invest more specifically in communication technologies, as can be seen from Table 28. Here, previous investment is only significant at a low probability level. The effect is dominated by previous variations of the telephone infrastructure, which shows a highly significant positive association with current employment growth rates.

Table 27: Testing the causal effect of crime on national GDP growth rates

Test of causal effects stemming from the following crime categories (in logarithmic form):

Dependent variable: GDP growth rate	Intentional homicide	Assault	Robbery	Total theft	Theft of motor vehicles	Burglary	Drug offences
Autoregressive Influence	0.40	0.36	0.34	0.35	0.33	0.33	0.28
	(3.6)	(3.4)	(3.1)	(3.0)	(3.1)	(2.9)	(2.3)
Crime (log crime(-1))	-0.027	0.015	-0.014	-0.021	-0.024	-0.027	0.020
	(1.6)	(0.6)	(0.8)	(0.6)	(1.1)	(0.9)	(1.8)
Gross domestic investment (-5)	0.44	0.43	0.38	0.42	0.44	0.44	0.42
(share in GDP)	(3.0)	(3.1)	(2.7)	(2.9)	(3.1)	(3.0)	(2.8)
Telephone infrastructure (-5) (log	0.06	0.06	0.08	0.07	0.06	0.08	0.07
telephone mainlines(-5), per 1000 people)	(1.5)	(1.5)	(1.8)	(1.5)	(1.5)	(1.8)	(1.5)
Fixed effects	yes	yes	yes	yes	yes	yes	Yes
Number of observations	62	66	63	60	65	61	56
Adjusted R-squared	0.592	0.573	0.577	0.586	0.578	0.592	0.607

Note: t-values in parentheses.

Turning to the crucial question whether crime does Granger cause economic performance, the answer based on the two tables has to be NO. None of the coefficients reveals t-values above the standard critical value, which is 1.96. The largest effects can be observed for murder (Table 27, t-value = 1.6), theft of motor vehicle (Table 28, t-value = 1.5) and drug offences

(Table 27, t-value=1.8). "Intentional homicide" and "theft of motor vehicles" both have the expected (negative) influences on economic performance, whereas the result for drug offences even suggest that drug related crimes foster economic growth. As t-values are below usual critical values, we should not read too much into these estimates.

Table 28: Testing the causal effect of crime on national employment growth rates

Test of causal effects stemming from the following crime categories (in logarithmic form):

Dependent variable: Employment growth rate	Intentional homicide	Assault	Robbery	Total theft	Theft of motor vehicles	Burglary	Drug offences
Autoregressive Influence	0.47	0.47	0.48	0.45	0.46	0.46	0.45
	(4.2)	(4.3)	(4.3)	(3.9)	(4.3)	(3.8)	(3.8)
Crime (log crime(-1))	0.006	-0.005	-0.002	0.012	-0.019	0.006	0.011
	(0.5)	(0.3)	(0.1)	(0.5)	(1.5)	(0.3)	(1.4)
Gross domestic investment (-5)	0.16	0.17	0.17	0.17	0.20	0.17	0.018
(share in GDP)	(1.3)	(1.4)	(1.3)	(1.4)	(1.6)	(1.3)	(1.4)
Telephone infrastructure (-5) (log	0.09	0.10	0.10	0.10	0.10	0.10	0.08
telephone mainlines(-5), per 1000 people)	(3.3)	(3.7)	(3.5)	(3.7)	(3.9)	(3.3)	(2.5)
Fixed effects	yes	yes	yes	yes	yes	yes	Yes
Number of observations	74	78	75	71	77	72	66
Adjusted R-squared	0.588	0.586	0.582	0.591	0.600	0.589	0.602

Note: t-values in parentheses.

Table 29 more directly concentrates on the main driving force behind future growth, i.e. investment itself. Here, more backward lagging investment rates and telephone infrastructure had no measurable impact. Thus, they are left out from the regression analysis. Testing the Granger causal effect of crime on national investment/ GDP ratios in the usual way, theft of motor vehicles proves to be a significant obstacle to future growth (t-value = 2.4). Burglary, too, hinders investment, though the t-value (1.7) is somewhat smaller than necessary for usual significance levels. All other crime categories turn out to be insignificant. Since the dependent variable is measured as a ratio (the mean value of the sample according to Table 26 is 0.21), the coefficient on "theft of motor vehicles" has to be interpreted as follows: According to our estimate, increases of theft of motor vehicles by 10 per cent (say, from 400 to 440 per 100,000 inhabitants) would lead to a drop of the investment rate of the following year by about 0.2 percentage points (for instance, from 21 % to 20.8 %). In Germany, for instance, this estimate would translate into a loss of investment of about 4 milliard Euro.

Table 29: Testing the causal effect of crime on national investment/ GDP ratios

Test of causal effects stemming from the following crime categories (in logarithmic form):

Dependent variable: Investment/ GDP ratio	Intentional homicide	Assault	Robbery	Total theft	Theft of motor vehicles	Burglary	Drug offences
Autoregressive Influence	0.43	0.44	0.44	0.42	0.42	0.36	0.43
	(6.5)	(7.12)	(6.9)	(6.5)	(7.0)	(4.9)	(5.9)
Crime (log crime(-1))	-0.005	-0.010	0.004	0.001	-0.022	-0.028	0.000
	(0.5)	(0.8)	(0.4)	(0.1)	(2.4)	(1.7)	(0.1)
Fixed effects	yes	yes	yes	yes	yes	yes	yes
Number of observations	77	80	77	73	79	74	68
Adjusted R-squared	0.875	0.883	0.880	0.884	0.891	0.890	0.875

Note: t-values in parentheses.

4.2.2.3 Summary

Only one out of 21 regressions has shown a significant feedback from crime to economic performance. The only exception is theft of motor vehicles, which seems to withhold firms from investment activities. Before we dismiss crime to be of no or only minor importance to economic performance, more tests will be needed. We continue by looking at an even broader international data set in the next section, before we finally investigate the growth-crime relationship of European regions at the NUTS 2 and NUTS 3 level.

4.2.3 Reconsidering the negative impact of crime on economic performance using a cross-section of nations

4.2.3.1 Data and the empirics of economic growth

Many of the most significant empirical contributions to the vast literature on economic growth are based on cross-country data from a large number of states (see, among many others, Barro 1991, Mankiw, Romer and Weil 1992, and Persson and Tabellini 1994). We follow widely used research strategies and focus on models developed to test conditional convergence of per capita income (see Maniw, Romer and Weil 1992). Convergence is tested by including the initial level of income, which is expected to have a negative effect on growth rates. In our sample (see Table 30 for descriptive statistics) we use real GDP per capita of 1977. Since unconditional models of economic convergence turned out to be rather unsuccessful, conditioning variables of educational and non-educational human capital have been added to the cross-sectional regressions. The variables chosen are primary school enrolment in 1965, secondary school enrolment in 1977 and life expectancy in 1977 (as a non-educational human capital variable). Estimations in Table 31 include at least one of the two educational human capital variables as well as life expectancy. The crime impact can now simply be tested by adding crime as an additional potential (negative) factor of growth. If statistical tests indicate its significance, a genuine contribution of crime on economic growth is found.

Table 30: Descriptive statistics

Indicator	Mean	Median	Max.	Min.	Std. Dev.	Observ.
PRIM65: Primary school enrolment (% gross) in 1965	78.1	90.0	148	7.0	33.4	137
SEC77: Secondary school enrolment (% gross) in 1977	42.3	42.0	93.0	2.0	28.5	116
LIFEEXP77: Life expectancy at birth in 1977, total (years)	59.9	61.8	76.3	31.2	11.4	163
GDP77: Real GDP per capita in 1977 (international prices, base year 1985)	4248	2600	29605	306	4557	145
MURDER: Median of murder per 100.000 inhabitants from 1977 to 1996 (or subsample)	7.8	4.4	91.3	0.01	11.5	163
SERIOUS ASSAULT: (see murder)	105	36.1	1193	0.14	178	159
THEFT: (see murder)	1153	415.6	7630	3.7	1590	164
FRAUD: (see murder)	88.2	22.0	12323	0.01	191	161
DRUG OFFENCES: (see murder)	81.4	16.3	2377	0.04	255	159
Regional dummies:						
- East Asia and Pacific	16.5	---	1	0	37.2	212
- East Europe and Central Asia	13.2	---	1	0	33.9	212
- East and North Africa	10.3	---	1	0	30.6	212
- South Asia	3.8	---	1	0	19.1	212
- West Europe	11.8	---	1	0	32.3	212
- North America	9.4	---	1	0	9.7	212
- Latin America and Caribbean	19.8	---	1	0	40.0	212
- Sub Sahara Africa	23.6	---	1	0	42.6	212
GRGDP: Average annual growth rate of per capita GDP from 1977 to 1996 (or subsample)	0.6	0.9	8.4	-11.4	3.1	173
GDINV: Average from 1977 to 1996 (or subsample) of the ratio of real domestic investment to real GDP	23.6	22.7	55.1	7.3	7.8	181

Note: The original sources of PRIM65, SEC77, LIFEEXP77 and GDINV are the World Bank's Global Development Finance & World Development Indicators. GDP77 stems from Penn World Table 5.6.

We use a cross-section data set for 212 countries of the period 1977 to 1996.[68] The socio-economic variables are again taken from the Global Development Network Growth Database. The crime data now stems from the International Crime Statistics of Interpol. The Interpol data is less reliable than the European Sourcebook of Crime and Criminal Justice Statistics data used above, but is has the advantage to contain a much higher number of countries.

[68] Note, however, that countries with at least one missing value for a variable employed in a specific regression will be automatically excluded by the statistical software package. As a consequence our estimations are only based on approximately 100 countries/ observations.

Whereas most socio-economic variables are based on averages, crime variables consist of median values in order to account for possible outliers and highly skewed distributions. Descriptive statistics of the socio-economic and crime variables are presented in Table 30.

4.2.3.2 Results

Table 31 presents test equations in the spirit of modern growth theory. All estimates reveal a negative sign for initial GDP (GDP77), in accordance with generally known results of the literature. The negative impact confirms the conditional convergence effect.[69] Better health conditions (higher life expectance) foster economic growth. This *a priori* belief is confirmed in Table 31. Primary and secondary school enrollment of the working-age population of the period 1977-1996 (approximated by PRIM65 and SEC77) vary positively with economic growth (see column 1). However, including life expectancy renders schooling insignificant (column 2). "Conditions of health" seems to be a more immediate and direct growth factor than schooling, which has more indirect channels of influence and, of course, includes life expectancy in the long-run. Partly, the lack of measurable influence can be recovered by further including regional indicators (dummy variables), to take account of specific growth features (for instance, Latin America, the Caribbean, East Asia and the Pacific). Nevertheless, the net effect of PRIM65 remains small and only weakly significant (see column 3). SEC77 is insignificant and left out from further investigations.

Column 3 represents the basic specification of our empirical growth model. "Murder", "serious assault", "theft", "fraud" and "drug offences" have been added to this model in columns 4 to 8. As before, there is no significant effect of crime on growth, though signs are in line with expectations. Hardly measurable effects can be detected for murder (a 10 per cent increase in murder would reduce the average growth by only about 0.01 percentage points, t-value = 1.0), serious assault (a 10 per cent increase reduces growth by 0.01 percentage points, t-value = 0.8), and fraud (same result as for serious assault).

Table 32 gathers information on estimating investment models, more precisely on estimating explanatory factors of the ratio of real domestic investment to real GDP. We started by run-

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[69] The calculation of the implied rate of convergence would require that our result could be interpreted within the context of a fully specified conditional convergence model (as presented by Mankiw, Romer and Weil (1992), for instance). This, however, is beyond the scope of the present report.

ning the specification that proved successful for estimating growth models (column 1). However, "life expectancy" and GDP77 turned out to be insignificant. Interestingly enough, column 2 reveals that LIFEEXP77 shows significance when PRIM65 is left out from our analysis. Unlike growth regressions presented in Table 2, education proves to be a better human capital indicator of future investment than the non-educational indicator "life expectancy".

Table 31: Testing the influence of crime on national growth rates

	Dependent variable: Average annual growth rate of real p.c. GDP, 1977-1996							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PRIM65	0.022	0.002	0.011	0.014	0.012	0.013	0.019	0.013
	(2.2)	(0.1)	(1.3)	(1.6)	(1.3)	(1.6)	(2.3)	(1.5)
SEC77	0.036	0.004	---	---	---	---	---	---
	(2.7)	(0.3)						
log (LIFEEXP77)	---	0.085	0.070	0.079	0.079	0.075	0.074	0.077
		(3.1)	(3.6)	(3.7)	(3.5)	(3.0)	(3.3)	(3.4)
log (GDP77)	-0.009	-0.011	-0.011	-0.014	-0.013	-0.014	-0.014	-0.013
	(2.6)	(2.8)	(3.6)	(4.3)	(4.1)	(4.2)	(4.6)	(3.9)
Regional dummies	No	no	yes	Yes	yes	yes	yes	yes
log (Murder)	---	---	---	-0.001	---	---	---	---
				(1.0)				
log (Serious assault)	---	---	---	---	-0.001	---	---	---
					(0.8)			
log (Theft)	---	---	---	---	---	0.000	---	---
						(0.0)		
log (Fraud)	---	---	---	---	---	---	-0.001	---
							(0.8)	
log (Drug Offences)	---	---	---	---	---	---	---	0.000
								(0.1)
Number of observ.	100	98	113	102	99	102	99	100
Adjusted R-squared	0.204	0.227	0.446	0.433	0.419	0.427	0.475	0.427

Note: All estimates include a constant term which is omitted from the table for reasons of space. Growth rates and shares enter the equations as fractions (e.g. 0.02 instead of 2%).

Column 3 represents our basic specification. Besides taking account of human capital endowments, we rely on conventional accelerator models of investment, according to which accelerating income is a prerequisite of investment. According to our estimate, increasing real GDP growth by one percentage point leads to an increase of the share of investment in GDP by 1.4 percentage points.

As regards the effect of crime, no significant result arises. The highest t-value can be observed for "fraud" (t-value = 1.2). However, the small coefficient of –0.005 implies that increases of fraud by 10 per cent would decrease the average share of investment by only about 0.05 percentage points.

Table 32: Testing the influence of crime on national investment rates

	Dependent variable: Average of the ratio of real domestic investment to real GDP, 1977-1996							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PRIM 65	0.066 (2.1)	---	0.065 (2.7)	0.063 (2.7)	0.067 (2.7)	0.066 (2.6)	0.082 (3.1)	0.066 (2.7)
log (LIFEEXP77)	0.092 (1.2)	0.23 (4.0)	---	---	---	---	---	---
log (GDP77)	-0.008 (0.7)	-0.010 (1.0)	---	---	---	---	---	---
GRGDP	---	---	1.35 (4.0)	0.95 (2.9)	0.95 (2.8)	0.94 (2.9)	0.86 (2.6)	0.95 (2.9)
Regional dummies	Yes	yes	yes	yes	yes	yes	yes	yes
log (Murder)	---	---	---	0.002 (0.5)	---	---	---	---
log (Serious assault)	---	---	---	---	0.000 (0.0)	---	---	---
log (Theft)	---	---	---	---	---	0.000 (0.1)	---	---
log (Fraud)	---	---	---	---	---	---	-0.005 (1.2)	---
log (Drug Offences)	---	---	---	---	---	---	---	-0.001 (0.1)
Number of observ.	119	127	125	110	106	110	107	107
Adjusted R-squared	0.187	0.198	0.270	0.323	0.318	0.322	0.330	0.317

Note: All estimates include a constant term which is omitted from the table for reasons of space. Growth rates and shares enter the equations as fractions (e.g. 0.02 instead of 2%).

4.2.3.3 Summary

Based on standard growth and investment models and using data from a cross section of 202 countries, we have tested whether the addition of further crime factors might hinder GDP growth or investment. No crime influence has been detected.

4.3 Empirical results based on regional data ("The Europe of Regions")

Before turning to the results for the "Europe of Regions" some general remarks - applying for both the investigations of the causes and the consequences of crime - are necessary.

As already mentioned above, the number of available variables on the NUTS 3 level in the Eurostat New Cronos database is rather small. Table 33 provides a complete list of the information available on the NUTS 3 basis.

Table 33: Available information on the NUTS 3 level in Eurostat New Cronos

Subject area	Variables
Agriculture and forestry	Structure of agricultural holdings
Demographic statistics	Total area of the regions Annual average population (total, female) Population density Births (live births, gross birth rate) Deaths (deaths, gross death rate)
Economic accounts	Employment (by sector and employment status) Gross value added at factor cost (by sector and currency) Gross value added at market prices (by sector and currency) Gross domestic product (by ECU/ PPP and total/ per capita)
Energy statistics	---
Community labour force survey	---
Research and development, patents	European patent applications
Tourism statistics	Number of establishments (by activity) Number of bedrooms (by activity) Number of bed places (by activity)
Transport statistics	---
Unemployment	Unemployment (by age and gender) Unemployment rates (by age and gender) Working population (by age and gender)

Source: Eurostat (1999).

Even from this short list we could not employ all variables, since the time series of some indicators are very short and others contain a high number of missing values. The tourism statistics, for instance, do not contain any information about the years prior to 1994, and most of the gender and age specific variables (unemployment and working population) reveal an enormous number of missing values - at least for some countries. Since it is one of our main intentions to detect similarities and differences of the causes and consequences of crime across the EU member states, we decided to use only variables which are available (or may be calculated) for all countries.[70] These variables are the following (abbreviations used throughout the report in parentheses):

- Log of real GDP per capita (LRGDPPC)[71]
- Unemployment rate (URT)
- Work force participation rate (WPOPTR)

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[70] There is an exception to this rule which, however, does not affect a variable from the New Cronos data base. We use the number the drug offences as a regressor for all countries except Spain and the Netherlands. For Spain such a variable is not available and for the Netherlands it is excluded from the analysis due to obvious inconsistencies.

[71] Real GDP per capita is not available for Italy on the NUTS 3 level. Here, we helped us by simply filling up the empty data cells with the values of the belonging NUTS 2 regions.

- Gross birth rate (GBIRTHRT)
- Share of employment in agricultural sector (AGRARERT)
- Growth rate of real GDP per capita (GROWTH)
- Growth rate of employment (DEMPLT)

As further regressors we use the frequency of drug crimes, lagged values of the endogenous variable and, of course, country specific constants (fixed-effects).

When interpreting the regression results one should differentiate between two groups of nations. On the one hand, we have Denmark, Germany, Italy and the Netherlands. These are countries without obvious shortcomings in their crime data.[72] Furthermore, they are all observed on the NUTS 3 level, and the respective number of regions is high (Germany, Italy and the Netherlands), and/ or the average population size and land area of the regions is rather low. For this group of countries one might be optimistic to obtain reliable results on the causes and consequences of crime. On the other hand, we have a group consisting of Spain, Finland, Sweden and the UK for which estimation results should be interpreted with care. As has already been discussed in Section 4.1.2.1, regression results based on Spanish crime data may severely suffer from the fact that only a certain, presumably time-variant fraction of those crimes which fall under the responsibility of other police forces is reported to the national police. As far as the UK is concerned, we are able to perform analyses on the basis of only 19 out of 36 NUTS 2 level regions, which is a consequence of the partial incompatibility between the British police force areas and the NUTS system. For the UK the number of observations is further reduced by a recent reorganisation of the whole British NUTS structure. For Sweden our investigations are likewise restricted to the NUTS 2 level, since, as a consequence of a recent change in the NUTS structure (the grouping of some NUTS 3 level regions), the respective time series are not long enough to allow for the introduction of an adequate lag structure. Using the NUTS 2 level for Sweden (8 regions) implies that one is left with only approximately 30 observations. The problem of a small sample size does also emerge for Finland, where the NUTS structure was likewise altered in 1998. The average number of observations in the regressions for Finland is approximately 100. Moreover, the Finish NUTS 3 level regions are obviously not at all compact as can be gathered from the very high average land area (see Table 14).

Finally, it should be mentioned that in order to check the robustness of our findings, we did not only perform NUTS 3 level estimations, but we have also run regressions with identical specifications on the NUTS 2 level. Unfortunately, this was only possible for Germany, Spain, Italy and the Netherlands. Denmark does not have a NUTS 2 level, and the Finish NUTS 2 level does only consist of six regions and therefore, with regard to the short time series, does not allow for a sound analysis.

4.3.1 Causes of crime

This section deals with two questions. On the one hand, we try to identify the factors of crime and check whether they show similarities across the included EU member states. On the other hand, we are going to determine the optimal lag structure of crime with respect to national indicators of crime. This allows us to carry out forecasts of crime on the basis of past realisations of explanatory variables.

4.3.1.1 Determination of the optimal lag structure

We started by assuming that contemporaneous crime (represented by 11 Interpol crime categories excluding counterfeit and total offences) might be influenced by either contemporaneous (lag=0), one year lagged (lag=1) or two year lagged (lag=2) changes in the explaining variables and by one year or two year lagged changes in the endogenous variable. We then developed a computer program which systematically performed fixed effects regressions country by country and crime category by crime category for all possible variable/ lag combinations, in order to identify the specification which performs best with respect to the adjusted R-squared. (The (adjusted) R-squared is a statistical measure which tells us how well the estimated model fits reality.) This might be best demonstrated by means of an fictitious example, say, for theft in Germany:

The first regression out of all permutations is

[72] The exception is the data on drug offences for the Netherlands, which – according to our national correspondent – is not reliable.

$$LO4(t) = a\ LRGDPPC(t) + b\ URT(t) + c\ WPOPRT(t) + d\ GBIRTHRT(t) \\ + e\ AGRARERT(t) + f\ LO7(t) \\ (\textit{fictitious adjusted } R^2 = 0.7)$$

and the final regression is

$$LO4(t) = a\ LRGDPPC(t-2) + b\ URT(t-2) + c\ WPOPRT(t-2) + d\ GBIRTHRT(t-2) \\ + e\ AGRARERT(t-2) + f\ LO7(t-2) + g\ LO4(t-2) \\ (\textit{fictitious adjusted } R^2 = 0.8)$$

Among these regressions there is the best fit, which, for example, could be

$$LO4(t) = a\ LRGDPPC(t-2) + b\ URT(t-1) + c\ WPOPRT(t) + d\ GBIRTHRT(t-2) \\ + e\ AGRARERT(t-1) + f\ LO7(t) + g\ LO4(t-1) \\ (\textit{fictitious adjusted } R^2 = 0.9)$$

Hence we have run z=x^y regressions per country and offence, where x ist the number of possible lags and y is the number of possible explaining variables. In our example, we have z=3^7=2187. Thus, we have obtained in total 2187 regression results with their corresponding R-squares. Concerning drugs, there are only 6 explanatory variables (drugs is endogenous), so that 729 regressions have been run. The same holds for all regressions concerning Spain and the Netherlands, because no (or no reliable) data on drugs are available.

Based on these regressions we have checked the robustness of the results by reporting the shares of significant parameter estimates from each set of all 2187 (729) possible results, as well as the corresponding directions of influence. This has been done in Table 34 and in Table 52 to Table 62 in the Appendix. Moreover, results performing best with respect to the R-squared criterion are presented in Table 35 to Table 45. (On what concerns the rules of interpretation of the estimated coefficients, the interested reader is referred to the explanations in Section 4.2.1.3.1.) Finally, in Table 46 the most striking results from Table 35 to Table 45 are summarised.

4.3.1.2 Results

Table 34 presents results out of which the most robust indicators of crime in Europe are extracted. The criterion for an indicator to be considered a robust European indicator of crime is that at least 50 per cent of its estimated coefficients across all countries need to be significant at least at the 10%-level on either the NUTS 2 or the NUTS 3 level. Indicators which meet this requirement for a certain crime category are depicted in bold type. According to the 50%-criterion, real GDP per capita is identified as a European indicator for serious assault (+)[73], robbery and violent theft (+), theft of motor cars (+) and drug offences (+). The unemployment rate is a European indicator for serious assault (+), total theft (-), theft of motor cars (-), and drug offences (+). The activity rate is a European indicator for breaking and entering (+) and drug offences (+). The gross birth rate is a European indicator for fraud (-). The share of employment in the agricultural sector is a European indicator for sex offences (-) and serious assault (-). Finally, the number of drug offences per 100,000 inhabitants is a European indicator for robbery and violent theft (+), breaking and entering (+) and fraud (+). One might conclude that these results are largely in accordance with our expectations. Country specific indicators are presented in Table 52 to Table 62 in the Appendix.

[73] "+" indicates that higher values of the indicator foster crime, "-" indicates that higher values of the indicator reduce crime.

Table 34: Factors of crime: Frequency distribution of coefficient estimates by sign and level of significance

Crime category	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Murder	LRGDPPC	12	36	42	10	16	49	30	5
	URT	13	47	30	11	6	32	31	31
	WPOPRT	13	60	22	5	16	33	42	9
	GBIRTHRT	18	26	39	17	17	23	36	24
	AGRARERT	3	31	44	22	7	33	40	19
	LO7	5	31	54	9	17	41	28	14
Sex offences	LRGDPPC	0	32	53	15	13	35	43	9
	URT	25	41	31	3	23	40	30	8
	WPOPRT	6	35	51	8	10	47	29	15
	GBIRTHRT	24	35	31	10	14	31	43	11
	AGRARERT	5	13	20	**62**	8	44	35	13
	LO7	16	16	57	11	18	37	43	2
Rape	LRGDPPC	27	16	39	17	28	23	20	28
	URT	7	43	43	7	10	37	32	20
	WPOPRT	12	62	24	2	18	41	32	9
	GBIRTHRT	7	45	44	5	4	37	43	17
	AGRARERT	15	16	49	20	2	41	45	13
	LO7	21	43	22	14	26	58	16	0
Serious assault	LRGDPPC	45	23	19	13	**59**	18	18	5
	URT	**61**	23	13	3	27	31	28	14
	WPOPRT	39	38	15	8	22	41	29	8
	GBIRTHRT	23	23	29	25	20	25	24	31
	AGRARERT	7	14	20	**60**	31	48	20	1
	LO7	22	42	26	10	23	28	26	22
Theft (all kinds of theft)	LRGDPPC	38	13	24	25	31	28	25	16
	URT	26	20	18	36	16	13	21	**50**
	WPOPRT	33	26	28	13	43	36	18	3
	GBIRTHRT	31	37	25	7	32	24	22	23
	AGRARERT	14	27	31	29	6	32	37	24
	LO7	43	33	20	4	30	28	22	20
Aggravated theft	LRGDPPC	38	22	22	18	34	28	21	17
	URT	26	18	22	33	11	21	24	44
	WPOPRT	35	26	24	15	47	36	16	1
	GBIRTHRT	13	27	31	29	21	26	32	21
	AGRARERT	22	37	18	23	10	34	27	29
	LO7	30	38	26	6	34	25	10	31
Robbery and violent theft	LRGDPPC	45	16	26	13	**61**	17	17	5
	URT	10	25	36	30	11	18	30	41
	WPOPRT	39	51	10	0	32	32	28	8
	GBIRTHRT	39	22	22	17	11	29	31	29
	AGRARERT	3	26	36	35	12	35	34	19
	LO7	34	35	29	2	**64**	12	23	1
Breaking and entering	LRGDPPC	28	19	20	33	31	20	19	30
	URT	31	24	23	23	14	23	32	31
	WPOPRT	35	34	28	3	**50**	37	12	1
	GBIRTHRT	7	25	35	32	19	30	35	16
	AGRARERT	24	46	24	6	12	39	36	13
	LO7	36	28	32	4	**51**	32	9	8

Theft of motor cars	LRGDPPC	**57**	31	5	6	39	28	20	12
	URT	18	26	22	34	14	12	20	**53**
	WPOPRT	30	28	37	4	41	36	20	2
	GBIRTHRT	25	33	26	16	28	20	23	29
	AGRARERT	25	20	20	36	14	44	24	17
	LO7	42	43	15	0	35	19	21	25
Fraud	LRGDPPC	48	27	24	1	40	32	22	6
	URT	33	25	38	3	28	21	23	28
	WPOPRT	10	34	48	8	21	38	34	7
	GBIRTHRT	0	8	38	**54**	25	17	21	37
	AGRARERT	39	27	23	11	2	56	39	2
	LO7	**60**	16	22	2	46	25	29	0
Drug offences	LRGDPPC	**54**	16	21	9	**73**	12	15	0
	URT	**69**	24	6	0	32	25	28	15
	WPOPRT	**56**	36	7	0	27	37	33	3
	GBIRTHRT	32	22	6	41	3	22	29	46
	AGRARERT	1	25	32	43	1	35	29	36

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 35: Murder (O1)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	-5.832	---	0.351	-0.590	0.522	0.409	0.447	0.529	-1.651	-1.132	-0.656	---	---	3.923	---	1.200
	(-2.299)		(1.630)	(-1.904)	(1.601)	(1.029)	(1.779)	(1.377)	(-1.441)	(-0.732)	(-0.805)			(1.810)		(2.914)
	1		2	0	2	0	1	2	2	1	0			2		2
URT	2.546	---	2.731	-0.616	0.849	-0.962	-1.310	-5.632	-9.073	-1.227	1.138	---	---	26.443	---	-5.978
	(0.428)		(2.339)	(-0.550)	(0.937)	(-0.981)	(-1.400)	(-3.148)	(-3.265)	(-0.374)	(1.039)			(5.133)		(-4.438)
	2		0	1	2	0	0	0	2	2	1			2		0
WPOPRT	2.580	---	1.068	2.479	-2.929	-3.325	2.123	-2.384	10.279	9.859	-3.278	---	---	22.276	---	-7.072
	(0.851)		(1.187)	(1.873)	(-1.429)	(-1.373)	(1.710)	(-0.902)	(3.424)	(1.882)	(-1.653)			(4.423)		(-3.035)
	0		2	0	0	2	0	2	2	0	0			1		0
GBIRTHRT	-32.293	---	-4.113	-6.532	1.507	-3.942	14.459	17.440	20.024	36.084	14.850	---	---	38.305	---	-4.693
	(-2.360)		(-1.631)	(-2.127)	(0.298)	(-0.636)	(3.569)	(2.519)	(2.201)	(3.398)	(1.980)			(3.307)		(-0.878)
	1		1	0	2	1	0	0	1	1	0			0		0
AGRARERT	-15.764	---	-0.289	-6.076	2.681	3.477	1.482	4.333	4.688	-8.713	-22.340	---	---	-48.762	---	-11.836
	(-1.777)		(-0.181)	(-2.796)	(2.017)	(1.969)	(1.315)	(1.641)	(1.156)	(-2.170)	(-2.661)			(-1.665)		(-1.174)
	0		2	2	0	0	2	1	0	2	2			0		0
LO7	0.345	---	-0.013	-0.100	---	---	0.085	0.197	---	---	-0.101	---	---	0.117	---	0.052
	(1.250)		(-0.395)	(-1.699)			(1.852)	(2.146)			(-1.365)			(1.435)		(0.712)
	1		0	2			2	2			2			1		0
LO1	-0.207	---	-0.084	0.077	-0.153	0.085	-0.058	-0.093	-0.143	0.376	-0.258	---	---	-0.565	---	---
	(-1.742)		(-3.636)	(1.211)	(-3.146)	(1.174)	(-1.778)	(-1.415)	(-2.140)	(3.257)	(-2.754)			(-4.519)		
	1		1	1	2	2	2	2	2	1	1			1		
Number of Obs.	84	---	2212	250	396	199	1030	239	244	69	120	---	---	30	---	147
Adj. R-squared	0.616	---	0.359	0.777	0.607	0.696	0.649	0.766	0.518	0.712	0.488	---	---	0.895	---	0.662
DW Statistic	1.975	---	2.116	2.042	2.123	2.140	2.131	2.219	1.921	1.928	2.044	---	---	2.748	---	2.060

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 36: Sex offences (O2)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	---	---	-0.060	-0.320	-0.661	0.408	---	---	-0.844	-2.172	-1.690	---	---	-1.756	---	0.201
			(-0.717)	(-1.722)	(-3.332)	(2.449)			(-1.274)	(-1.997)	(-1.591)			(-2.103)		(0.929)
			2	2	1	0			1	2	1			0		1
URT	---	---	-0.550	-0.178	0.105	1.120	---	---	3.792	2.166	-0.855	---	---	9.607	---	-1.058
			(-1.017)	(-0.242)	(0.228)	(2.545)			(2.636)	(0.888)	(-0.563)			(4.845)		(-1.409)
			0	0	0	0			2	2	1			2		0
WPOPRT	---	---	-0.683	-2.690	1.554	0.510	---	---	4.678	-7.078	2.767	---	---	2.817	---	2.518
			(-1.599)	(-3.325)	(1.385)	(0.471)			(3.000)	(-1.729)	(1.677)			(1.087)		(2.346)
			0	0	1	0			2	0	0			0		2
GBIRTHRT	---	---	2.422	2.370	-6.373	2.352	---	---	6.886	-28.890	-5.552	---	---	22.704	---	-2.465
			(2.393)	(1.171)	(-2.521)	(1.120)			(1.483)	(-3.192)	(-0.787)			(4.862)		(-0.978)
			0	2	2	1			1	0	1			0		0
AGRARERT	---	---	-2.477	0.288	-0.800	1.121	---	---	4.984	6.277	-15.705	---	---	-25.611	---	-4.125
			(-3.911)	(0.206)	(-1.079)	(1.790)			(2.361)	(1.338)	(-3.290)			(-3.866)		(-0.866)
			2	2	0	2			0	0	0			2		0
LO7	---	---	0.040	0.090	---	---	---	---	---	---	-0.107	---	---	0.123	---	-0.057
			(2.958)	(2.679)							(-1.719)			(3.189)		(-1.729)
			0	0							1			0		1
LO2	---	---	---	0.243	0.114	0.267	---	---	0.210	0.414	-0.105	---	---	0.316	---	0.397
				(3.945)	(2.313)	(4.132)			(3.129)	(3.473)	(-1.211)			(2.555)		(4.996)
				1	1	1			1	1	2			1		1
Number of Obs.	---	---	2561	268	442	233	---	---	245	70	120	---	---	30	---	161
Adj. R-squared	---	---	0.699	0.857	0.773	0.859	---	---	0.696	0.840	0.354	---	---	0.897	---	0.827
DW Statistic	---	---	1.981	2.186	1.864	2.073	---	---	2.365	2.450	2.332	---	---	2.055	---	2.403

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 37: Rape (O21)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3		NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	2.990	---	-0.241	-0.824	-0.847	-0.594	0.758	0.879	-0.899	-4.541	-1.792	---	---	-2.727	---	-0.016
	(1.750)		(-1.225)	(-2.589)	(-2.668)	(-2.033)	(2.995)	(2.755)	(-1.093)	(-4.030)	(-2.016)			(-1.704)		(-0.038)
	2		2	0	1	1	1	0	1	2	1			0		2
URT	-4.712	---	-1.668	-3.410	-2.071	-2.445	1.717	2.568	1.554	-2.109	-4.130	---	---	6.664	---	-1.463
	(-1.609)		(-1.665)	(-3.063)	(-2.792)	(-3.171)	(1.843)	(2.129)	(0.882)	(-0.677)	(-2.254)			(1.985)		(-1.235)
	1		1	0	0	0	1	0	2	0	2			2		0
WPOPRT	5.132	---	1.188	-0.133	2.539	2.866	0.997	-6.112	6.148	6.942	2.079	---	---	9.417	---	-0.308
	(2.900)		(1.536)	(-0.127)	(1.414)	(1.399)	(0.823)	(-3.240)	(3.148)	(2.637)	(1.007)			(1.920)		(-0.183)
	2		2	0	1	2	1	2	2	1	0			2		0
GBIRTHRT	24.603	---	-2.738	-2.521	3.272	7.929	-4.877	7.220	5.430	-7.439	-8.451	---	---	8.064	---	-13.787
	(2.651)		(-1.382)	(-0.864)	(0.808)	(1.709)	(-1.188)	(1.231)	(0.943)	(-0.917)	(-0.995)			(0.785)		(-3.661)
	0		2	1	2	2	1	2	1	0	1			1		0
AGRARERT	21.902	---	-1.870	-1.290	-1.217	-2.395	-3.190	2.829	-3.607	-6.297	-20.822	---	---	-25.298	---	-38.541
	(5.087)		(-1.390)	(-0.727)	(-1.023)	(-1.686)	(-2.844)	(1.236)	(-1.362)	(-1.787)	(-2.524)			(-1.316)		(-4.630)
	1		2	2	0	0	2	0	0	2	0			2		2
LO7	0.484	---	0.045	0.059	---	---	-0.123	0.102	---	---	0.081	---	---	0.213	---	0.102
	(2.769)		(1.610)	(1.195)			(-2.756)	(1.337)			(0.981)			(2.358)		(1.883)
	2		0	0			2	0			1			1		0
LO21	-0.445	---	-0.081	0.370	---	---	-0.042	-0.108	0.068	---	-0.194	---	---	-0.142	---	0.130
	(-3.839)		(-3.582)	(5.880)			(-1.336)	(-1.673)	(1.014)		(-1.949)			(-1.109)		(1.717)
	1		1	1			2	2	1		2			1		1
Number of Obs.	84	---	2272	263	442	199	1030	239	245	80	105	---	---	30	---	147
Adj. R-squared	0.518	---	0.472	0.855	0.621	0.757	0.174	0.293	0.664	0.820	0.373	---	---	0.778	---	0.835
DW Statistic	2.113	---	2.052	2.185	2.074	2.033	1.933	2.321	2.132	2.192	2.510	---	---	2.401	---	1.975

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 38: Serious assault (O3)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	0.489	---	0.499	0.576	-0.391	0.143	0.456	1.135	0.429	-1.247	0.149	---	---	0.298	---	1.345
	(1.052)		(7.487)	(5.575)	(-1.382)	(0.424)	(3.161)	(7.004)	(1.124)	(-1.874)	(0.911)			(0.733)		(4.555)
	2		1	1	2	1	0	2	0	2	0			0		2
URT	5.184	---	1.039	1.388	2.239	2.519	1.526	-0.127	0.590	-4.133	1.527	---	---	0.571	---	-2.003
	(6.877)		(2.796)	(3.804)	(3.164)	(3.108)	(3.014)	(-0.187)	(0.605)	(-1.738)	(4.611)			(0.832)		(-1.963)
	1		1	2	0	1	0	2	1	0	2			1		2
WPOPRT	1.926	---	-0.664	-0.771	0.810	-0.850	0.649	2.195	3.907	4.517	0.663	---	---	4.921	---	3.903
	(3.590)		(-2.363)	(-1.884)	(0.502)	(-0.404)	(0.985)	(2.095)	(4.427)	(2.254)	(1.304)			(3.889)		(2.532)
	2		0	0	2	0	2	0	2	2	2			2		0
GBIRTHRT	-3.608	---	-2.007	-3.335	7.538	13.414	4.432	5.975	-8.809	-14.101	4.630	---	---	-8.880	---	-8.683
	(-1.226)		(-3.003)	(-3.448)	(1.946)	(2.578)	(2.049)	(2.083)	(-2.988)	(-2.319)	(2.447)			(-4.674)		(-2.228)
	1		0	1	0	1	0	2	2	0	1			0		0
AGRARERT	-12.181	---	-1.247	0.357	2.367	2.608	-1.036	1.607	1.777	8.037	-4.567	---	---	24.217	---	33.790
	(-7.266)		(-2.821)	(0.495)	(2.263)	(1.709)	(-1.714)	(1.590)	(1.463)	(2.835)	(-3.027)			(2.568)		(4.875)
	2		2	2	0	0	2	1	0	0	1			0		1
LO7	0.052	---	0.031	0.040	---	---	-0.055	-0.146	---	---	-0.029	---	---	0.027	---	-0.084
	(0.892)		(3.361)	(2.087)			(-2.275)	(-4.022)			(-1.582)			(1.153)		(-1.636)
	2		0	2			2	2			1			1		1
LO3	-0.098	---	0.202	0.520	0.494	0.492	0.581	0.428	0.556	0.591	-0.274	---	---	---	---	0.596
	(-1.163)		(9.549)	(9.969)	(10.703)	(8.568)	(23.590)	(8.306)	(9.910)	(5.720)	(-2.321)					(10.066)
	2		1	1	1	1	1	1	1	1	2					1
Number of Obs.	84	---	2413	253	382	168	1027	239	245	70	105	---	---	30	---	161
Adj. R-squared	0.894	---	0.892	0.971	0.840	0.908	0.753	0.845	0.793	0.858	0.856	---	---	0.977	---	0.938
DW Statistic	1.876	---	2.184	2.336	2.049	2.117	2.107	1.727	2.179	2.716	1.679	---	---	1.242	---	2.425

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 39: Theft (all kinds of theft) (O4)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	-0.630	---	0.152	0.249	-0.100	0.183	0.272	0.221	-0.305	-0.387	0.429	---	---	-1.412	---	0.091
	(-2.570)		(4.372)	(3.073)	(-1.264)	(1.886)	(5.106)	(2.262)	(-1.586)	(-0.961)	(1.606)			(-3.844)		(0.961)
	2		2	2	2	1	0	0	1	2	1			2		2
URT	0.882	---	-2.229	-2.734	0.440	0.989	0.363	-1.856	-0.801	-0.700	1.047	---	---	-3.793	---	-2.458
	(2.087)		(-10.567)	(-6.357)	(2.120)	(4.456)	(1.941)	(-5.121)	(-1.690)	(-0.663)	(2.943)			(-6.447)		(-6.612)
	0		1	0	2	2	1	0	1	1	0			1		2
WPOPRT	1.185	---	-0.991	0.525	1.077	-0.754	0.728	2.006	1.054	1.891	-0.409	---	---	3.062	---	0.577
	(3.486)		(-6.253)	(1.427)	(2.273)	(-1.250)	(2.958)	(3.691)	(2.044)	(1.504)	(-1.027)			(2.638)		(1.024)
	0		1	2	0	1	0	0	0	0	2			2		1
GBIRTHRT	2.594	---	-1.040	-4.619	1.204	2.087	3.992	-2.638	5.127	7.426	-2.584	---	---	-8.517	---	4.832
	(1.769)		(-2.719)	(-5.156)	(1.025)	(1.479)	(5.232)	(-1.738)	(3.372)	(2.401)	(-1.503)			(-5.018)		(3.503)
	0		1	1	1	0	0	2	1	1	2			0		0
AGRARERT	-1.214	---	-0.718	-0.632	0.587	0.719	-0.219	-0.303	1.256	1.666	2.874	---	---	19.190	---	-7.246
	(-1.147)		(-2.821)	(-0.951)	(1.870)	(2.020)	(-1.021)	(-0.533)	(2.103)	(1.060)	(2.345)			(3.036)		(-2.849)
	0		2	0	2	2	2	0	1	0	1			1		1
LO7	-0.028	---	0.004	-0.057	---	---	0.061	0.072	---	---	-0.037	---	---	-0.057	---	-0.037
	(-0.949)		(0.668)	(-3.402)			(6.150)	(3.461)			(-2.361)			(-2.915)		(-1.958)
	0		2	0			0	0			1			2		2
LO4	-0.204	---	0.419	0.600	0.563	0.807	0.613	0.494	0.334	0.251	0.294	---	---	0.157	---	0.679
	(-1.411)		(21.526)	(11.454)	(13.799)	(16.604)	(26.758)	(9.631)	(5.659)	(2.184)	(3.106)			(1.127)		(16.071)
	2		1	1	1	1	1	1	1	1	1			1		1
Number of Obs.	72	---	2364	301	396	199	1112	260	280	80	105	---	---	30	---	161
Adj. R-squared	0.988	---	0.971	0.984	0.970	0.975	0.940	0.962	0.927	0.928	0.914	---	---	0.987	---	0.954
DW Statistic	2.165	---	1.939	1.658	2.057	2.202	1.906	1.640	2.178	2.182	2.152	---	---	2.156	---	1.807

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 40: Aggravated theft (O41)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	-0.286	---	0.208	0.300	-0.154	-0.254	0.514	0.552	-0.178	0.608	0.591	---	---	1.761	---	0.406
	(-0.647)		(3.920)	(2.973)	(-1.527)	(-1.922)	(7.566)	(4.753)	(-0.680)	(1.268)	(1.360)			(4.716)		(2.168)
	2		2	2	2	0	0	0	1	0	1			0		0
URT	2.835	---	-2.237	-3.141	0.612	1.124	-0.528	-0.796	-1.704	-3.189	1.472	---	---	-3.396	---	-5.239
	(4.101)		(-7.509)	(-5.823)	(2.349)	(4.260)	(-2.360)	(-1.993)	(-2.635)	(-2.901)	(2.550)			(-5.360)		(-10.721)
	0		1	0	2	2	0	0	1	2	0			1		2
WPOPRT	1.901	---	0.019	0.602	1.396	1.937	0.078	1.575	1.934	3.267	-1.104	---	---	8.732	---	2.271
	(3.302)		(0.089)	(1.289)	(2.310)	(2.500)	(0.256)	(2.467)	(2.684)	(1.970)	(-1.694)			(7.096)		(2.939)
	0		2	2	0	0	1	0	0	0	2			2		0
GBIRTHRT	-4.638	---	-1.367	-4.721	2.593	2.764	-2.013	-4.608	4.959	13.399	-5.420	---	---	-8.637	---	2.928
	(-1.870)		(-2.378)	(-4.157)	(1.754)	(1.620)	(-1.930)	(-2.578)	(2.393)	(3.647)	(-1.986)			(-4.923)		(1.357)
	1		0	1	1	0	2	2	1	1	2			0		0
AGRARERT	3.837	---	-0.764	-1.446	-0.685	-0.827	0.365	0.740	1.317	3.063	4.563	---	---	25.747	---	1.469
	(2.459)		(-1.995)	(-1.704)	(-1.686)	(-1.773)	(1.127)	(1.113)	(1.585)	(1.640)	(2.602)			(3.545)		(0.368)
	0		2	0	1	1	0	0	1	0	0			1		0
LO7	-0.108	---	-0.001	-0.126	---	---	0.055	0.027	---	---	-0.022	---	---	0.065	---	-0.024
	(-2.334)		(-0.122)	(-5.939)			(4.421)	(1.117)			(-0.870)			(3.047)		(-0.853)
	1		2	0			0	0			1			1		0
LO41	---	---	0.362	0.649	0.450	0.662	0.499	0.443	0.548	0.261	0.443	---	---	-0.445	---	0.782
			(17.189)	(12.812)	(10.164)	(11.803)	(19.502)	(8.269)	(10.661)	(2.101)	(4.989)			(-2.512)		(19.758)
			1	1	1	1	1	1	1	1	1			2		1
Number of Obs.	72	---	2235	301	396	199	1114	260	280	70	105	---	---	30	---	161
Adj. R-squared	0.952	---	0.966	0.986	0.952	0.965	0.886	0.934	0.927	0.958	0.848	---	---	0.981	---	0.966
DW Statistic	2.311	---	2.072	1.614	2.144	2.090	1.916	1.864	2.124	2.168	2.122	---	---	2.690	---	1.667

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 41: Robbery and violent theft (O411)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	-0.655	---	1.264	1.314	-0.119	-0.402	1.184	0.730	0.982	-0.798	-1.151	---	---	3.482	---	0.959
	(-0.735)		(10.619)	(6.316)	(-0.686)	(-2.581)	(9.530)	(3.153)	(1.828)	(-0.889)	(-2.274)			(3.520)		(4.898)
	2		2	1	0	0	0	0	2	1	1			2		2
URT	-1.936	---	-0.143	-1.189	-1.080	-1.302	-1.025	-1.427	-6.714	-6.984	-3.552	---	---	12.138	---	-3.275
	(-1.084)		(-0.204)	(-1.550)	(-2.837)	(-3.351)	(-2.475)	(-1.698)	(-4.418)	(-3.159)	(-3.635)			(4.756)		(-4.674)
	1		2	1	0	0	0	2	0	2	2			2		2
WPOPRT	1.695	---	0.780	0.167	1.026	-0.788	0.433	3.563	3.836	5.874	2.352	---	---	15.814	---	-0.928
	(1.229)		(1.731)	(0.241)	(1.202)	(-0.819)	(0.781)	(2.582)	(2.665)	(2.345)	(2.058)			(5.664)		(-0.863)
	0		1	2	2	2	2	0	1	2	0			1		2
GBIRTHRT	5.017	---	2.422	-6.194	3.237	-3.733	5.659	5.364	-6.812	10.744	-15.986	---	---	28.243	---	-5.312
	(1.036)		(2.231)	(-3.359)	(1.475)	(-1.644)	(3.030)	(1.536)	(-1.603)	(1.574)	(-3.502)			(3.895)		(-1.903)
	1		2	1	0	2	1	1	0	1	1			2		0
AGRARERT	4.66		-4.16	-1.53	1.19	1.7	-2.23	-1.79	-2.62	-8.05	-16.98			32.78		-14.28
	(1.56)		(-6.32)	(-1.34)	(2.33)	(2.84)	(-4.98)	(-1.79)	(-1.54)	(-2.41)	(-3.59)			(1.8)		(-2.62)
	2		2	2	2	2	2	2	2	1	0			0		2
LO7	-0.05		0.06	0.08			0.08	0.11			-0.03			-0.13		0.14
	(-0.50)		(4.08)	(2.36)			(4.4)	(2.59)			(-0.67)			(-2.89)		(3.33)
	1		0	0			2	2			1			0		1
LO411	0.25		0.06	0.46	0.46	0.67	0.38	0.37	0.42	0.26	-0.13			0.26		0.59
	(2.38)		(2.67)	(10.01)	(10.49)	(12.24)	(13.2)	(6.18)	(7.77)	(2.11)	(-1.38)			(1.87)		(9.51)
	1		1	1	1	1	1	1	1	1	1			2		1
Number of Obs.	84		2620	260	396	199	1026	239	280	70	105			30		146
Adj. R-squared	0.948		0.891	0.980	0.960	0.968	0.877	0.929	0.902	0.934	0.774			0.993		0.979
DW Statistic	2.182		2.159	2.287	2.113	2.175	2.171	2.017	2.085	2.212	2.351			2.87		2.190

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 42: Breaking and entering (O412)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3		NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	-0.282	---	-0.767	-1.388	-0.275	-0.316	0.509	0.531	-0.325	1.008	0.609	---	---	1.773	---	0.406
	(-0.639)		(-6.677)	(-4.791)	(-2.361)	(-2.285)	(7.269)	(4.528)	(-0.974)	(1.865)	(1.379)			(4.683)		(2.157)
	2		1	1	2	0	0	0	1	0	1			0		0
URT	2.831	---	1.622	-3.083	0.651	1.101	-0.429	-0.580	-1.939	-4.928	1.502	---	---	-3.409	---	-5.258
	(4.086)		(2.785)	(-2.598)	(2.340)	(3.933)	(-1.841)	(-1.440)	(-2.354)	(-4.140)	(2.558)			(-5.266)		(-10.702)
	0		0	1	2	2	0	0	1	2	0			1		2
WPOPRT	1.936	---	1.901	2.144	1.855	2.213	-0.114	0.897	1.958	-3.325	-1.117	---	---	8.817	---	2.388
	(3.353)		(4.479)	(1.904)	(2.596)	(2.679)	(-0.359)	(1.402)	(2.191)	(-1.889)	(-1.685)			(7.036)		(3.073)
	0		2	2	1	0	1	0	0	1	2			2		0
GBIRTHRT	-4.765	---	-1.007	-4.873	2.425	3.361	-2.249	-4.445	4.776	6.605	-5.607	---	---	-8.622	---	3.059
	(-1.916)		(-0.903)	(-1.893)	(1.545)	(2.030)	(-2.071)	(-2.447)	(1.805)	(1.719)	(-2.018)			(-4.813)		(1.413)
	1		0	0	1	2	2	2	1	1	2			0		0
AGRARERT	3.808	---	-0.357	-0.368	-0.858	-1.192	0.421	0.911	1.191	2.680	4.620	---	---	26.427	---	1.600
	(2.434)		(-0.428)	(-0.185)	(-1.916)	(-2.375)	(1.250)	(1.348)	(1.129)	(1.371)	(2.588)			(3.550)		(0.399)
	0		0	1	1	1	0	0	1	0	0			1		0
LO7	-0.107	---	0.054	0.165	---	---	0.061	0.035	---	---	-0.022	---	---	0.066	---	-0.026
	(-2.307)		(3.600)	(2.957)			(4.730)	(1.450)			(-0.840)			(3.018)		(-0.897)
	1		2	2			0	0			1			1		0
LO412	---	---	0.122	0.331	0.404	0.608	0.493	0.469	0.551	0.475	0.448	---	---	-0.451	---	0.782
			(5.727)	(6.086)	(8.838)	(10.815)	(19.349)	(8.959)	(10.750)	(3.863)	(5.065)			(-2.556)		(19.818)
			1	1	1	1	1	1	1	1	1			2		1
Number of Obs.	72	---	2428	295	396	199	1114	260	280	70	105	---	---	30	---	161
Adj. R-squared	0.950	---	0.863	0.942	0.925	0.945	0.880	0.935	0.891	0.954	0.845	---	---	0.978	---	0.965
DW Statistic	2.334	---	2.157	2.243	2.108	2.049	1.927	1.828	2.270	2.284	2.114	---	---	2.759	---	1.677

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 43: Theft of motor cars (O42)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	0.021	---	0.642	0.921	-0.083	-0.261	0.491	0.301	0.815	1.720	1.285	---	---	-0.339	---	-0.145
	(0.030)		(6.887)	(5.050)	(-0.552)	(-1.475)	(5.591)	(2.145)	(1.369)	(1.545)	(2.954)			(-0.736)		(-0.870)
	0		2	2	2	0	0	0	1	2	0			0		2
URT	-3.646	---	-2.767	-4.452	1.884	1.374	1.184	1.554	-5.617	-6.771	1.312	---	---	8.161	---	-2.790
	(-2.012)		(-5.391)	(-5.326)	(4.942)	(3.346)	(4.083)	(3.164)	(-4.217)	(-2.281)	(1.585)			(5.708)		(-4.461)
	2		1	0	2	2	2	2	2	2	2			2		1
WPOPRT	-2.054	---	-0.087	1.074	-0.976	-0.349	1.029	1.132	3.280	-2.613	-1.677	---	---	10.321	---	-1.105
	(-2.247)		(-0.234)	(1.374)	(-1.184)	(-0.342)	(2.573)	(1.242)	(2.201)	(-0.637)	(-1.644)			(5.584)		(-1.237)
	2		2	2	0	1	0	0	2	1	0			1		0
GBIRTHRT	6.959	---	-2.010	-5.602	1.246	-1.983	3.699	5.848	7.881	17.299	11.638	---	---	13.202	---	7.033
	(2.082)		(-2.149)	(-2.787)	(0.606)	(-0.747)	(2.975)	(2.724)	(1.830)	(1.899)	(2.802)			(3.416)		(3.291)
	2		0	0	2	1	0	0	1	2	0			2		0
AGRARERT	-6.600	---	-1.322	0.552	1.947	1.188	0.355	0.896	-1.874	-5.745	7.482	---	---	12.243	---	-10.887
	(-2.467)		(-2.127)	(0.387)	(3.708)	(1.914)	(0.981)	(1.155)	(-1.091)	(-1.607)	(1.746)			(2.944)		(-2.636)
	1		2	2	2	2	2	2	2	2	0			2		1
LO7	0.063	---	0.018	-0.160	---	---	0.083	0.099	---	---	0.082	---	---	-0.093	---	-0.052
	(0.868)		(1.382)	(-4.554)			(5.162)	(3.325)			(1.944)			(-3.663)		(-1.490)
	2		2	0			0	0			2			2		0
LO42	0.237	---	0.274	0.563	0.597	0.751	0.584	0.664	0.339	0.326	0.347	---	---	0.476	---	0.770
	(2.352)		(13.319)	(9.776)	(14.100)	(17.068)	(24.498)	(15.868)	(6.265)	(2.960)	(3.682)			(3.337)		(15.984)
	1		1	1	1	1	1	1	1	1	1			1		1
Number of Obs.	107	---	2415	278	396	199	1027	239	245	70	105	---	---	30	---	162
Adj. R-squared	0.925	---	0.884	0.972	0.927	0.939	0.944	0.975	0.892	0.898	0.873	---	---	0.989	---	0.961
DW Statistic	2.175	---	2.049	1.927	1.973	1.961	2.066	1.981	2.080	2.220	2.124	---	---	2.675	---	2.110

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 44: Fraud (O5)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	0.215	---	0.625	0.564	1.131	1.165	---	---	0.854	-1.457	---	---	---	4.917	---	0.037
	(0.233)		(7.349)	(2.914)	(4.566)	(4.958)			(1.598)	(-1.650)				(2.425)		(0.171)
	0		1	1	1	2			1	0				1		2
URT	0.696	---	3.441	3.875	3.743	3.182	---	---	0.321	0.346	---	---	---	-21.740	---	-2.940
	(0.295)		(7.248)	(4.068)	(6.644)	(5.160)			(0.290)	(0.163)				(-4.006)		(-3.768)
	1		0	0	2	2			2	2				2		2
WPOPRT	-0.988	---	0.041	-0.106	-3.383	-3.894	---	---	3.741	-7.885	---	---	---	-9.744	---	2.795
	(-0.947)		(0.117)	(-0.114)	(-2.493)	(-2.565)			(2.842)	(-2.204)				(-1.488)		(2.520)
	1		1	0	1	2			0	1				2		1
GBIRTHRT	-16.346	---	-4.335	-6.448	0.349	13.912	---	---	-12.894	-31.628	---	---	---	-63.128	---	5.331
	(-3.592)		(-5.002)	(-2.928)	(0.112)	(3.671)			(-3.276)	(-3.927)				(-3.132)		(1.867)
	2		0	0	2	0			2	0				2		1
AGRARERT	4.519	---	0.590	1.130	5.135	2.074	---	---	4.510	7.091	---	---	---	70.207	---	5.598
	(1.544)		(1.014)	(0.724)	(5.961)	(2.146)			(2.613)	(1.803)				(1.132)		(1.099)
	0		1	2	1	0			0	0				0		0
LO7	0.331	---	0.046	0.115	---	---	---	---	---	---	---	---	---	-0.164	---	0.013
	(3.154)		(3.945)	(2.771)										(-1.427)		(0.379)
	1		1	1										1		0
LO5	0.19		0.28	0.30	0.27	0.24			0.16					0.57		0.54
	(1.68)		(14.96)	(5.11)	(5.12)	(3.23)			(2.48)					(1.27)		(9.23)
	2		1	1	1	1			1					2		1
Number of Obs.	96		3127	277	396	233			245	70				30		145
Adj. R-squared	0.801		0.797	0.899	0.807	0.809			0.599	0.754				0.804		0.887
DW Statistic	2.477		2.060	2.239	1.931	1.674			2.1	2.239				2.301		1.926

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 45: Drug offences (O7)

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
LRGDPPC	-2.354	---	1.233	0.884	---	---	1.103	0.533	---	---	2.214	---	---	-3.849	---	1.919
	(-2.906)		(7.797)	(3.601)			(8.532)	(2.391)			(1.722)			(-0.998)		(5.273)
	0		1	0			1	1			0			2		0
URT	-2.236	---	4.948	4.665	---	---	1.063	0.289	---	---	8.036	---	---	10.550	---	-6.541
	(-1.117)		(6.280)	(5.495)			(2.040)	(0.281)			(4.199)			(1.867)		(-5.449)
	1		1	2			1	1			0			0		2
WPOPRT	3.501	---	0.972	1.609	---	---	1.009	5.163	---	---	2.947	---	---	-24.683	---	2.338
	(3.750)		(1.735)	(1.769)			(1.514)	(3.571)			(1.195)			(-2.411)		(1.262)
	1		2	2			0	0			0			2		0
GBIRTHRT	18.287	---	-6.212	-5.608	---	---	-13.134	-19.183	---	---	22.528	---	---	48.874	---	-0.616
	(4.907)		(-4.280)	(-3.152)			(-5.613)	(-4.840)			(2.703)			(2.963)		(-0.130)
	2		1	0			2	1			0			1		1
AGRARERT	1.563	---	-3.768	-8.742	---	---	-1.105	-3.424	---	---	-18.034	---	---	-29.938	---	8.707
	(0.575)		(-3.820)	(-5.568)			(-1.817)	(-2.380)			(-3.487)			(-0.788)		(1.057)
	0		1	0			2	2			0			2		2
LO7	---	---	0.297	0.686	---	---	0.440	0.490	---	---	0.435	---	---	-0.622	---	0.633
			(14.977)	(16.569)			(16.643)	(9.485)			(5.680)			(-3.341)		(10.934)
			1	1			1	1			1			2		1
Number of Obs.	96	---	2466	322	---	---	1112	259	---	---	135	---	---	30	---	180
Adj. R-squared	0.954	---	0.774	0.940	---	---	0.817	0.879	---	---	0.729	---	---	0.653	---	0.886
DW Statistic	2.492	---	2.060	1.857	---	---	2.163	2.037	---	---	2.312	---	---	2.889	---	2.398

Note: The lag structure of the respective regressions can be inferred from the numbers under the t-values. The lags can take on the values 0, 1 and 2.

Table 46: Leading factors of criminality (effect, lead)

	Murder	Rape	Serious Assault	Theft (total)	Robbery and violent theft	Theft of motor cars	Drug offences
Denmark	---	Agrarian sector, (+)(?), 1	Agrarian sector, (-), 2	---	---	---	Gross birth rate, (+), 2
Germany	---	---	GDP per capita, (+), 1	Unemployment, (-), 0-1	GDP per capita, (+), 1-2	GDP per capita, (+), 2	GDP per capita, (+), 1
Spain	---	---	Unemployment, (+), 0-1	---	---	Unemployment, (+), 2	n.a.
Italy	---	GDP per capita, (+), 1	GDP per capita, (+), 0-2	Unemployment, (+), 1	Drugs, (+), 2	Unemployment, (+), 2	Gross birth rate, (-), 1-2
The Nether-lands	---	Working age population, (+), 1-2	---	---	Unemployment, (-), 0-2	---	n.a.
Finland	Agrarian sector, (-), 2	---	Agrarian sector, (-), 1	---	Unemployment, (-), 2	---	---
Sweden	Unemployment, (+), 2	---	Working age population, (+), 2	Unemployment, (-), 1	Working age population, (+), 1	Unemployment, (+), 2	---
UK	---	Agrarian sector, (-), 2	Agrarian sector, (+)(?), 1	Unemployment, (-), 2	Unemployment, (-), 2	Unemployment, (-), 1	Unemployment, (-)(?), 2

Notes: Leading indicators based on regional crime data. The table contains factors of crime associated with non-zero lags, maximal t-values which have to exceed 2.6 and unambiguous results for the NUTS 2 and NUTS 3 level.

4.3.2 Consequences of crime

One of the main innovative contributions of this report is the assessment of the negative impact of crime on economic performance based on highly disaggregate data from several international sources. In contrast with aggregate data, data of a high spatial detail can reveal both cause and effect closer to the scene of the crime. Thus, unlike already existing work in the literature and in addition to attempts with alternative and recent aggregate data performed in Section 4.2.2 and Section 4.2.3, the data at the NUTS 2 level and, in particular, at the NUTS 3 level help us to identify economic decisions that might have been negatively affected by the local incidence of crime.

Our testing strategy is based on the economic theory of growth and on causality tests. It resembles the investigation of reversal crime effects in the analysis of crime in the "Europe of Nations" and in the international cross-section of nations (see Section 4.2.2 and Section 4.2.3). Using available data from all countries that have responded to our data request, we have tested the statistical significance of causal crime effects on the basis of the following equation:

$$growth(t) = a\ growth(t-1) + b\ crime(t-1) + c\ control(t-5)\,.$$

Economic "growth" is measured by growth of real GDP per head (in national currencies), as well as by employment growth. Employing the Granger causality test philosophy, all estimates require the presence of lagged growth rates. If statistical t-tests reject the null hypothesis that b equals zero, they confirm the causal effect of crime. Further control variables take the effect of initial variables known from the empirical growth literature. Since we are dealing with panel data, it is not possible to use GDP from a base year as we did in Section 4.2.3 (i.e. GDP77). Instead, we include the lagged ratio (lagged by five years) of employment in the agrarian sector to total employment into our regression. In accordance with the general convergence hypothesis, we would expect convergence towards more industrialised and service oriented societies. Countries with relatively high shares of agriculture are expected to catch up in a way that they witness higher growth rates. Hence, we expect a positive sign of the coefficient on agriculture. Finally, since we analyse real GDP per head as endogenous variable, lagged birth rates are added as an additional explanatory variable. It corrects for recent changes in the non-adult part of the population that might change the number of "heads", but not (yet) "real

GDP". Of course, all estimates rely on specifications using fixed (region) effects in order to correct for unobserved heterogeneity.

Detailed results of all estimates (all countries, all crime categories) can be found in the Appendix (Table 63 to Table 73). Based on these tables, Table 47 and Table 48 filter out estimates of the coefficient *b* as well as of corresponding t-values, i.e. they provide information about causality or non-causality of crime effects. In the following section, results are summarised by type of crime, by country, by magnitude and by general robustness.

4.3.2.1 Consequences by type of crime

The most significant results and striking evidence for negative crime effects can be observed for **"theft"**, in particular for **"aggravated theft"**, **"robbery and violent theft"** and **"theft of motor cars"**. It should be reminded that "theft of motor cars" is also the only category for which a negative impact on growth is detected at the aggregate (NUTS 0) level (see Table 29). GDP growth is affected in Denmark, Germany and Italy, whereas employment growth has mainly been hurt in Denmark, Germany and Sweden. Spain and Italy, too, reveal distortions of employment growth, but "only" from theft of motor cars in case of Italy and from "aggravated theft" and "robbery and violent theft" in case of Spain. Moreover, in the latter case results from the NUTS 2 and NUTS 3 level are not fully consistent: Statistical significance can be observed at the NUTS 2 level, but not at the NUTS 3 level.

Besides the effects arising from theft, violent theft and robbery, other types of crime hinder growth, though at a lower level of statistical certainty. The danger of **rape** seems to have a negative impact on employment in Germany and Denmark. Evidently, (female) labour intensive production will not be located in dangerous areas where a high number of sexual offences has become public. **"Murder"**, too, does affect employment (Germany and UK), whereas it has no significant causal effect on GDP growth. The list of obstacles to growth is completed by **serious assault** (Germany, Italy) and **drug offences** (Italy).

4.3.2.2 Consequences by country

Germany and **Italy** seem to be countries where crime has the strongest negative impact on economic performance. However, we should avoid jumping to conclusions. A closer look at the data reveals that just for these countries we dispose of the highest number of cross-sectional units. At the NUTS 3 level the German data underlying Table 47 and Table 48 consist of 330 regions ("Kreise"), and Italian evidence is based on about 90 regions ("Provincie"). At least 40 regions are also available for Spain (50 Provincias) and the Netherlands (40 COROP-Regio's). Estimates for Scandinavian countries and for the UK are based on 15 to 20 regions, Swedish evidence is based on only 8 regions ("Län"). The absolute number of regions, however, is also misleading, since, for instance, the number of inhabitants per region (Amt) in Denmark is 350,800, whereas it is 755,200 in Spain (see Table 14). Thus, as a general rule of thumb, it seems advisable to rely more on the evidence from those countries with a sufficient number of cross-sectional units, relatively long time-series and a high population density within the regions of our database. These countries are **Germany, Italy, the Netherlands and Denmark**. Thus, if crime effects do not show up in the estimations for the remaining countries, it should not be taken for granted that there is no feedback at all. Most probably, it simply has escaped detection.

Given this general observation, one exception should be noted. In spite of its relatively large number of cross-sectional units (40), the absence of any causal effect in **the Netherlands** is remarkable.

4.3.2.3 Consequences by magnitude

All estimated coefficients *b* collected in Table 47 and Table 48 can be interpreted as follows: Increasing crime by 1 per cent leads to a change of economic growth by *b* percentage points.

Illustrative example: The parameter estimate on theft of motor cars in Germany is highly significant for the explanation of both GDP growth and growth of employment. Inspecting the NUTS 3 level, *b* amounts to -0.02 in both cases. Thus, lowering car theft by one per cent would increase the growth rate of GDP (and of employment) by 0.02 percentage points. To be as concrete as possible we start from the following exemplary situation: Let us assume that the number of motor car thefts per 100.000 inhabitants is 300 (the overall German average of the year 1995 was 322). Moreover, we assume a real GDP p.c. growth rate of 2 per cent per year (which coincides with the sample average at the NUTS 3 level). Thus, a reduction by 1 per cent implies a reduction of the number of car thefts from 300 to 297. The reduction would cause GDP growth rates to shift from 2.00 % to 2.02 %. This effect seems to be very small at first glance, but it has to be noted that we are dealing with growth rates:

a) After 10 years a permanent growth by 2.00 % p.a. would lead to a rise of real GDP p.c. by 21.9 %, whereas 2.02 % growth per year cumulates to 22.13 %, so that the difference is already 0.23 % of GDP after 10 years. Thus, if we set this into relation to the German GDP of 1999, a permanent reduction of car theft by 1 per cent each year, being started ten years ago, would amount to a rise of present German GDP by 4.6 milliard Euro.

b) The effect in a) is the result of a very small change starting from a high level of crime. If we instead assume a sustainable reduction of offences by 5 per cent each year, then after 10 years the incidence of theft of motor vehicles would have fallen from 300 to 179.6 (300*0.95^10), which is equivalent to a reduction by 40.1 per cent. By inspecting our estimate in Table 47, we are able to quantify the cumulative effect of such a crime reduction: It would shift the growth rate from 2.0 % to 2.8 % (0.02*40=0.8). In terms of the German GDP of 1999, 0.8 % of GDP is equivalent to something like 16 milliard Euro.

c) Table 47 and Table 48 present direct (short-run) effects. The effect of crime on steady-state solutions (which are calculated under the assumption that growth rates are in a "steady-state", i.e. constant over time) could be achieved by the division $b/(1-a)$. In case of German GDP growth, this long-run effect of a single crime reduction (which is equivalent to the total effect after an infinite number of periods) is 0.023 (= 0.02/(1-0.12)). Thus, assuming that crime is not only changed once but reduced every year, the (very) long-run effect should be based on 0.023 instead of 0.02 and results in a) and b) would change accordingly.

Point c) has to be taken into consideration by interpreting Danish crime effects. These are higher than in other countries. For instance, "theft" has a very high short-run effect of –0.17. However, whereas for the majority of all relevant estimates *a* is not too far away from zero (see, for instance, the case of car theft in Germany presented above), *a* is negative and about –0.5 for Danish GDP growth rates. In the case of theft, the estimated coefficient is –0.59, such that the long-run effect is –0.11 and thus smaller (in absolute value) than the short-run effect. Still, this is a very large effect, which is much higher than the equally calculated (and likewise highly significant) effects in Italy (-0.016) or Germany (-0.057), for instance.

4.3.2.4 Consequences by robustness of results

Some results seem to suggest that crime has positive effects on economic growth. In total, however, the evidence is clear: Out of 56 significant estimates in Table 47 and Table 48 there are only 13 which are positive. Moreover, when we reduce the probability of spurious results by concentrating on data from those countries that have been found most suitable for the present purpose (Germany, Italy, the Netherlands, Denmark), the ratio changes to 46:5. Since we are dealing with statistics and uncertainty, we suggest to dismiss the small minority of 5 "growth fostering" crime effects as implausible statistical errors.

4.3.2.5 Conclusions

Contrary to the results based on international data, disaggregate data from the "Europe of Regions" reveal clear evidence of negative crime effects on economic performance. In particular, the incidence of theft and related crime categories (theft of motor cars, aggravated theft, robbery and violent theft) vary negatively with the growth of real GDP per capita and the growth of employment. Crime against the person, too, deters growth, but to a lesser extent. Here, the potential danger of "serious assault" and "rape" in the neighbourhood of workplaces seem to play a prominent role for the location decisions of firms.

Denmark, Germany, and Italy can be identified as most affected countries, whereas in the Netherlands no significant influence has been detected. However, it has become very clear from the comparison of highly aggregated and disaggregated data that investing in the search for crime data of a high spatial detail is a worthwhile project - also for future work - since the link from crime to economic performance is very difficult to unveil by use of aggregate data. Hence, countries not mentioned in the list above may nevertheless suffer from crime distortions, but so far they may have escaped detection.

Table 47: The effect of crime on GDP growth in the Europe of Regions

GROWTH	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Murder(-1)	0.000	---	0.000	-0.011	-0.006	0.000	0.001	-0.002	0.001	0.007	-0.004	---	---	-0.032	---	-0.006
	(-0.028)		(-0.128)	(-1.214)	(-1.550)	(0.012)	(0.513)	(-0.744)	(0.171)	(0.461)	(-0.287)			(-1.632)		(-0.517)
Sex offences(-1)	---	---	-0.003	**-0.028**	0.000	-0.031	---	---	-0.012	-0.004	0.012	---	---	0.064	---	-0.012
			(-1.044)	**(-2.020)**	(0.016)	(-1.956)			(-1.488)	(-0.213)	(0.804)			(1.424)		(-0.431)
Rape(-1)	-0.013	---	-0.002	-0.012	-0.002	-0.009	-0.002	-0.003	0.002	0.014	-0.002	---	---	0.046	---	-0.005
	(-1.341)		(-1.351)	(-1.313)	(-0.400)	(-0.942)	(-1.674)	(-0.740)	(0.265)	(0.887)	(-0.156)			(1.800)		(-0.217)
Serious assault(-1)	0.032	---	**-0.013**	-0.018	-0.004	-0.011	-0.004	**-0.013**	0.021	0.026	0.117	---	---	0.279	---	0.032
	(1.352)		**(-2.630)**	(-0.944)	(-1.073)	(-1.620)	(-2.012)	**(-2.488)**	(1.657)	(1.144)	(1.672)			(2.588)		(2.006)
Theft(-1)	**-0.171**	---	**-0.050**	**-0.091**	-0.011	**-0.058**	**-0.018**	**-0.028**	-0.013	-0.006	0.188	---	---	-0.187	---	0.011
	(-2.834)		**(-6.213)**	**(-3.979)**	(-0.932)	**(-2.490)**	**(-4.645)**	**(-2.942)**	(-0.543)	(-0.134)	(2.087)			(-1.637)		(0.335)
Aggravated theft(-1)	**-0.078**	---	**-0.022**	**-0.057**	-0.017	**-0.046**	**-0.017**	**-0.021**	-0.010	-0.011	0.086	---	---	-0.138	---	0.025
	(-2.345)		**(-3.564)**	**(-3.194)**	(-1.647)	**(-2.043)**	**(-4.863)**	**(-2.294)**	(-0.612)	(-0.282)	(1.682)			(-1.720)		(1.136)
Robbery and violent theft(-1)	**-0.041**	---	**-0.014**	**-0.035**	-0.011	-0.024	**-0.011**	-0.010	0.005	0.014	-0.012	---	---	-0.024	---	0.023
	(-2.767)		**(-4.485)**	**(-2.495)**	(-1.586)	(-1.614)	**(-4.570)**	(-1.833)	(0.593)	(0.762)	(-0.514)			(-0.488)		(1.654)
Breaking and entering(-1)	**-0.077**	---	0.000	0.011	-0.012	-0.035	**-0.015**	**-0.021**	-0.009	0.007	0.085	---	---	-0.134	---	0.024
	(-2.303)		(-0.122)	(1.409)	(-1.229)	(-1.666)	**(-4.558)**	**(-2.329)**	(-0.720)	(0.217)	(1.691)			(-1.685)		(1.122)
Theft of motor cars(-1)	-0.010	---	**-0.020**	**-0.046**	0.022	**-0.029**	**-0.014**	**-0.023**	-0.001	-0.005	-0.015	---	---	-0.080	---	0.003
	(-0.581)		**(-5.772)**	**(-3.846)**	(3.313)	**(-2.577)**	**(-4.799)**	**(-3.101)**	(-0.168)	(-0.291)	(-0.492)			(-0.816)		(0.162)
Fraud(-1)	**-0.031**	---	0.010	0.047	-0.010	0.012	---	---	-0.018	-0.023		---	---	-0.071	---	0.005
	(-2.014)		(2.747)	(4.597)	(-1.653)	(0.811)			(-1.691)	(-0.971)				(-1.346)		(0.204)
Drug offences(-1)	0.034	---	-0.002	0.006	---	---	**-0.006**	-0.008	---	---	0.038	---	---	-0.010	---	0.006
	(2.244)		(-0.688)	(0.847)			**(-3.571)**	(-1.765)			(2.949)			(-0.582)		(0.608)

Table 48: The effect of crime on employment in the Europe of Regions

GROWTH	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Murder(-1)	0.001	---	-0.001	**-0.015**	-0.002	0.009	0.001	-0.003	0.000	-0.003	0.003	---	---	-0.015	---	**-0.020**
	(0.264)		(-0.728)	**(-2.861)**	(-0.674)	(1.549)	(1.168)	(-0.644)	(-0.003)	(-0.224)	(0.342)			(-1.235)		**(-2.119)**
Sex offences(-1)	---	---	0.002	0.017	0.005	-0.012	---	---	0.008	-0.004	0.011	---	---	0.059	---	-0.022
			(0.837)	(2.058)	(1.159)	(-0.914)			(0.833)	(-0.322)	(1.045)			(2.309)		(-1.070)
Rape(-1)	**-0.014**	---	-0.001	**-0.015**	0.001	-0.006	-0.001	-0.009	-0.005	0.000	0.003	---	---	0.026	---	0.010
	(-3.712)		(-0.933)	**(-2.540)**	(0.235)	(-0.727)	(-1.035)	(-1.613)	(-0.586)	(-0.032)	(0.259)			(1.724)		(0.672)
Serious assault(-1)	0.004	---	-0.006	**-0.029**	-0.001	-0.007	0.000	0.006	0.012	0.000	0.043	---	---	0.211	---	0.019
	(0.396)		(-1.928)	**(-2.119)**	(-0.340)	(-1.158)	(-0.019)	(0.865)	(0.839)	(0.012)	(0.850)			(3.525)		(1.520)
Theft(-1)	**-0.112**	---	**-0.043**	**-0.093**	0.004	-0.035	-0.004	0.023	-0.050	-0.040	0.077	---	---	**-0.176**	---	-0.048
	(-4.815)		**(-9.727)**	**(-8.527)**	(0.480)	(-1.929)	(-0.956)	(1.686)	(-1.833)	(-1.049)	(1.231)			**(-2.666)**		(-1.704)
Aggravated theft(-1)	**-0.057**	---	**-0.030**	**-0.070**	-0.002	**-0.039**	-0.002	0.026	-0.029	-0.009	0.053	---	---	**-0.119**	---	0.001
	(-3.922)		**(-8.807)**	**(-7.954)**	(-0.268)	**(-2.233)**	(-0.549)	(2.025)	(-1.525)	(-0.281)	(1.504)			**(-2.484)**		(0.037)
Robbery and violent theft(-1)	-0.002	---	**-0.014**	**-0.042**	-0.008	**-0.030**	-0.004	-0.006	-0.011	-0.008	-0.003	---	---	-0.014	---	0.013
	(-0.422)		**(-8.043)**	**(-5.625)**	(-1.602)	**(-2.695)**	(-1.845)	(-0.726)	(-1.111)	(-0.473)	(-0.171)			(-0.477)		(1.272)
Breaking and entering(-1)	**-0.057**	---	0.000	-0.004	0.001	-0.024	-0.001	0.024	-0.012	-0.011	0.052	---	---	**-0.116**	---	-0.001
	(-3.930)		(-0.154)	(-0.969)	(0.211)	(-1.411)	(-0.417)	(1.904)	(-0.778)	(-0.389)	(1.493)			**(-2.432)**		(-0.036)
Theft of motor cars(-1)	**-0.018**	---	**-0.020**	**-0.046**	0.001	**-0.037**	**-0.007**	-0.018	0.001	0.009	-0.012	---	---	-0.065	---	-0.026
	(-2.005)		**(-10.438)**	**(-7.566)**	(0.240)	**(-4.354)**	**(-2.414)**	(-1.789)	(0.075)	(0.617)	(-0.565)			(-1.249)		(-1.580)
Fraud(-1)	0.000	---	-0.001	0.005	-0.006	0.003	---	---	-0.003	0.017		---	---	-0.037	---	-0.028
	(-0.012)		(-0.394)	(0.807)	(-1.290)	(0.276)			(-0.239)	(0.812)				(-1.183)		(-1.421)
Drug offences(-1)	-0.005	---	-0.001	-0.007	---	---	**-0.005**	-0.005	---	---	0.023	---	---	0.006	---	0.009
	(-0.832)		(-0.607)	(-1.424)			**(-2.734)**	(-0.789)			(2.800)			(0.548)		(1.153)

5 Conclusions

This report on behalf of the European Commission consists of three major parts:

a) summary of recent research on socio-economic causes, interactions and consequences of crime, presentation of a list of known indicators of criminality

b) presentation of suitable methods and development of an adequate parameterised model capable of

- evaluating and developing socio-economic indicators of crime,
- evaluating the negative impact of crime on economic performance,
- covering European evidence on the basis of official data.

c) validation of criminality indicators and assessment of the consequences of crime based on

- a panel data set from the national statistics of all 15 EU member states ("Crime in the Europe of Nations"),
- 12 national panel data sets from 8 member states using disaggregate information from the NUTS 3 and NUTS 2 level ("Crime in the Europe of Regions"),
- an international cross-section of 202 countries.

Results known from the scientific literature

Viewing the criminological literature, the literature on the economics of crime, and consulting international experts in the field have resulted in a long **list of potential indicators and consequences of crime**, which we summarised elsewhere in the report (Table 11). Without repeating too many details from the first part of the report, besides demographic factors like age and gender (a high share of all crimes is committed by young males aged 14 to 25), the following six indicators of crime are considered to be particularly important: urbanisation, family disruption, the influence of peer groups, poverty and unemployment, deterrence and wealth. We will discuss these factors in more detail below, when we assess them in the context of own results, exclusively prepared for this report.

The literature is relatively silent about the consequences of criminality on economic growth and development, as well as on costs of crime. Given its obvious importance for economists, there is surprisingly little evidence on how location decisions of firms and households might be affected by criminal factors. Recent work on 629 neighbourhoods (municipalities) in Los Angeles (Willis 1999b), however, provides a remarkable exception. Willis has shown, for instance, that a one per cent increase of violent crime is responsible for the loss of 14 jobs per square mile (see Section 2.2.3 for more details).

Estimates of **costs of crime** have been provided mainly for non-European countries (only few exceptions can be found for Europe, see, for instance, Palle and Godefroy (1998)). Many authors present figures for total costs of crime that amount to something like 4 per cent of GDP. The highest estimate is given for the U.S. by Anderson (1999), who has tried to make a comparison with the ideal state in which there is no occurrence of criminal behaviour at all. His cost estimate then would even amount to 11 per cent of GDP in 1999.

Previous causality tests based on aggregate data, however, have not revealed any causal link from crime to economics. Thanks to a unique data set based on socio-economic and criminological time series from approximately 550 European regions this report brings the reversal link between economics and crime into focus. Contrary to the known results from the literature a negative impact from crime on economic growth can be detected (see below).

Data and methods

The evaluation of indicators of crime and the test of causal relationships is based on **statistical methods** suitable for the analysis of dynamic panel data ("panel criminometrics"). Given the complex problem of criminality, the technical estimation and testing procedure is chosen such that multidimensional phenomena can be treated, and dynamic developments and feedback situations can be taken into consideration. Moreover, very important in the context of analysing crime rates is to control for potential **unobserved heterogeneity**. It arises in the presence of different shares of unreported crimes or because of slightly deviating definitions of crime between regions. For this reason all estimates of the report are based on fixed-effect panel models.

Results presented in the report have undergone an extensive **validation process** based on statistical specification tests. After testing numerous alternative models and indicators, the report finally presents results based on sound methods and robust model specifications.

Collecting data was a major problem while carrying out the project. On the one hand, it is aspired to perform the empirical analysis for as much EU member states as possible. On the other hand, data should be as disaggregate as possible. However, at least regional data on crime are not available from international data sources. National data are available from international sources, but they sometimes lack reliability (see Interpol and UN statistics, for instance). As a consequence, the regional crime data had to be collected directly from the member states. In Germany the situation was even worse, because the Federal Criminal Police Offices of all German states ("Landeskriminalämter") had to be contacted directly.[74] National crime data have been taken from the European Committee on Crime Problems (CDPC). Solely CDPC (1999:9) has proved to be aware of the absolute necessity of a thorough check on the data delivered by national sources. Since the aim of the project is to identify and quantify causes and consequences of criminality, we have also included a large set of socio-economic variables. The New Cronos database from Eurostat (1999) turned out to be very useful. It does not only contain very detailed national statistics for all EU member states, but also a number of important variables on different regional levels. As far as statistics on the national level are concerned we also used data from the World Bank.

The impact of socio-economic indicators on crime known from the literature, but not covered by the empirical analysis of this report

Arguments behind the relevance of **"urbanisation"**, **"family disruption"** and **"peer groups"** mainly originate from sociologically oriented contributions to the scientific literature (for instance, from theories of social disorganisation, differential association/ social learning and social control), whereas **"poverty and unemployment"**, **"deterrence"** and **"wealth"** play a more prominent role in the economic theory of crime. Sharp distinctions, however, are difficult to make. Poverty and unemployment, for instance, are also crucial to the understanding of social disorganisation theory as well as of strain theory, whereas the contributions of peer groups and of neighbourhood effects belong to the most discussed fields in modern economics.

The influence of **peer groups** is widely acknowledged but hardly measurable in any macro setting that has to be based on official data, as demanded for this report. **Deterrence**, at least in the form of changing clear-up rates, seems to be effective according to many (but not all)

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[74] Thanks to the kind support of the German Federal Criminal Police Office ("Bundeskriminalamt"), these contacts turned out to be very fruitful so that we have been able to create a quite rich German database.

authors, though the deterrence effect of more severe sentences is still under debate. The authors of this report have contributed to this field in a recent article (Entorf and Spengler 1998), but unfortunately there were no European data of sufficient quality and comparability available that could have been used in this report. Major problems have arisen because of deviating and changing definitions, or simply because of missing data at disaggregate levels.

The impact of socio-economic indicators on crime known from the literature and covered by the empirical analysis in this report

Based on a variety of both aggregate and disaggregate data sets, results on **the impact of socio-economic indicators** on crime have been documented in several tables (Table 18 to Table 24 and Table 34 to Table 45), as well as in the Appendix (Table 52 to Table 62). The most robust findings are summarised in Table 49. Indicators of family disruption, drug influence, labour force participation and the share of the labour force employed in agriculture play a crucial role for the understanding of all types of crime.

First, the total **labour force participation** rate is associated with higher crime rates simply because it represents the **"active" part of the population**. The potential of being "active" implies to work in a regular job or to search for such a job, but it likewise increases the probability of being "active" in the illegal sector. Moreover, since active people have to be mobile and do not stay at home, they more often are victims of criminal activities, too. Such reasoning holds a fortiori for the most "active" part of the population, i.e. the share of the young.

The share of the population working in the **agrarian sector** represents the degree of **urbanity** in a society. The crime enhancing influence of urban factors is particularly strong for assault and drug offences.

Many estimations based on the "Europe of Nations" confirm the crucial role of causal crime factors embedded in **family disruption** for almost all types of crime. Significant results have been found for "divorces per marriage", "average age of women at childbirth" and other indicators of family disruption. These results are in line with theories stressing the lowering parental supervision of youth, the declining value of conventional norms and the decreasing social capital within industrialised countries, since more and more people act in own short-term self interest.

Table 49: Main socio-economic causes of criminality and their directions of influence

General	Murder	Serious Assault	Total Theft	Robbery and violent theft	Theft of motor cars	Drug offences
Family disruption (+) Drugs (+) Active population (+) Urbanity (+)	Family disruption (+)	Wealth (+) Unemployment (+) Family disruption (+) Urbanity (+)	Wealth (+) Family disruption (+) Drugs (+)	Wealth (+) Drugs (+)	Wealth (+) Share of the young (+)	Wealth (+) Family disruption (+) Unemployment (+) Active population (+) Urbanity (+)

Note: Summary of the most robust findings based on estimations in this report.

Many offences are related to **drugs**. This conclusion becomes clear from the analysis of theft, in particular from the analysis of "robbery and violent theft". The explanatory factors of drug offences themselves are "wealth (+)", "family disruption (+)", "unemployment (+) ", "labour force participation (+) " and "agrarian region (-)". Hence, drug problems most probably arise in the climate of big cities, which is accompanied by social problems due to (structural) unemployment and family disruption.

The incidence of **theft** and related categories of crime (robbery and violent theft, theft of motor cars) can be best understood by consulting the economic theory of crime. Better **illegal income opportunities** lead to higher property crime rates, as can be seen from the presence of "wealth (+)" for the respective types of crime. It should be noted, however, that in cases of crimes against property the level of **"wealth"** means more than the mere level of real GDP per head. Table 40 (see the regressions for Germany, Italy, Sweden and the UK) indicates that in areas where both low unemployment and high GDP coexist, higher crime rates for theft, in particular for theft of motor cars, can be observed. Thus, in case of theft, high "wealth" refers to regions with both high levels of GDP and low unemployment rates. This pattern of GDP and unemployment does not coincide with the explanatory pattern of drug offences and serious assault, where the simultaneous existence of high GDP and relatively high unemployment rates seems to provide the unfavourable and unbalanced social situation that leads to high levels of respective crime rates. Our results reflect the widely discussed and unsolved problem in the scientific literature on how to interpret the effect of unemployment on crime. We suggest to have a closer look at the type of crime.

The negative impact of crime on economic performance

One of the most innovative contributions of this report is the assessment of the **negative impact of crime on economic performance** based on an international cross-section of nations, a panel consisting of national time series from the 15 EU member states and a set of regional panel data originating from 8 different countries. Our high investments in searching adequate regional data has brought substantial returns. It turned out that data of a higher spatial detail in fact entail a higher statistical power for the discovery of reversal crime effects. In contrast with previous attempts known from the scientific literature and in contrast with testing procedures carried out on aggregate data (see Section 4.2.2 and Section 4.2.3), causality tests based on the NUTS 2 level and, in particular, on the NUTS 3 level have shown that growth rates are indeed negatively affected by the regional incidence of crime.

Table 50 summarises the main findings. First of all, the incidence of **theft** and related crime categories (theft of motor cars, aggravated theft, robbery and violent theft) vary negatively with the growth of real GDP per capita and with the growth of employment. Crime against the person, too, deters growth, but to a lesser extent. Nevertheless, the potential dangers of **"serious assault"** and **"rape"** in the neighbourhood of workplaces seem to play a significant role for the location decisions of firms.

Table 50: Criminality indicators of economic performance

Criminality indicator	Affected countries, measures of economic performance: Y = GDP growth, L = employment growth
Serious assault	Germany (Y)
Rape	Denmark (L)
Theft (total)	Denmark (L, Y), Germany (L, Y), Italy (Y), Sweden (L)
Aggravated theft	Germany (L, Y), Italy (Y)
Robbery and violent theft	Denmark (Y), Germany (L, Y), Italy (Y)
Theft of motor cars	Germany (L,Y), Italy (Y), Europe (investment/ GDP ratio)
Fraud	Germany (Y, positive sign (?))
Drug offences	Italy (L, Y), Finland (L, Y, positive sign (?))

Note: Summary of most significant and robust results from Table 27 to Table 32, Table 47 and Table 48. Entries are based on data from the NUTS 3 level (if not available: NUTS 2). To be included, signs have to be unambiguous and t-values need to show significance at least at the one percent level.

Denmark, Germany and Italy can be identified as most affected countries, mostly by property crimes, whereas no significant influence has been detected for the **Netherlands.** However, as has become very clear from the comparison of highly aggregated and disaggregate data, the link from crime to economic performance is very difficult to unveil by use of aggregate data. Hence, countries not mentioned in the list above may nevertheless suffer from crime distortions, but so far they may have escaped detection because of insufficient data quality.

Interpretation of results, policy conclusions

Though drawing policy conclusions does not belong to the primary goals of the project, some remarks are straightforward. In European (and other industrialised) societies it seems that further growth of wealth, more and more built on self-interest rather than on social values, comes with the cost of family disruption, as can be seen, for instance, from the (still) growing number of divorces throughout Europe. Changing family structures, however, are an important and often overlooked cause of crime. Their strong impact has been confirmed by the empirical panel analysis in this report. According to a number of recent contributions to the scientific literature, the female labour force participation is an important factor of family disruption, and it is found to vary positively with crime rates (in this report, too, we have found a positive association with burglary and robbery, see Section 4.2.1). The main reasons for these empirical results might be seen in the lacking supervision and the degrading social attachment of children and in the rising negative influence of peer groups, which substitute for traditional family bonds.

As we do not want our empirical research to be understood in a way that the female participation rate should be reduced, other measures of family (re-)integration have to be considered, e.g. substitutes of parental supervision. Many pupils of working mothers and fathers have to take care of themselves after school, since teachers do not have the time to take care of their homework, for instance. The need for after school care centres is even much stronger for children in female headed households.

Regarding the importance of social cohesion on criminality and the strong evidence of reversal effects from crime to economics, one may finally conclude that fighting crime should not just be a matter of the police and of domestic policy, but it should also be a matter of social policy and of selfish economic interests, i.e. of economic policy.

6 Appendix

Letter 1: Accompanying letter of the German Federal Criminal Police Office

EU Research Project: "Development and Validation of Scientific Indicators of the Relationship between Criminality, Social Cohesion and Economic Performance"

As can be seen from the enclosed document, the Centre for European Economic Research (Zentrum für Europäische Wirtschaftsforschung, (ZEW) in Mannheim) is conducting the above-mentioned research project, which was commissioned by the EU. The project, which is endowed with 150.000 DM, has a duration of one year and will be completed at the end of January 2000.

In the year 1997, the German Federal Criminal Police Office (BKA) expressed its general consent to collaborate with the ZEW. The kind of support that is required for the ongoing project is to help the ZEW to obtain certain national and international data on crime.

The topic of this research project is the working out of a set of indicators considering demographic, socio-economic and legal indicators, allowing forecasts of the development of crime in general or of its individual areas.

By doing this research it is intended to get a deeper insight into the relationship between crime rates and the socio-economic environment. If appropriate, an "early-warning system" for future crime rate developments as a consequence of changing social conditions is to be developed. Moreover, the "economic point of view" can also provide approaches for an evaluation of the costs created by crime and thus for measuring the macro-economic damage.

As the practical value of the indicator system depends decisively on the quality of the data it is based upon, we would be very grateful for your support of the project.

Yours Sincerely

[...]

Letter 2: Data request sent to the EU member states

Dear Sir/ Madam,

on behalf of the European Commission (Directorate-General V - Employment, Industrial Relations and Social Affairs) and in co-operation with the German Federal Criminal Police Office (Group KI 1 „Criminal Strategy") and the University of Würzburg (Prof. Dr. Horst Entorf), the Centre for European Economic Research (ZEW) is working on a research project entitled „Development and validation of scientific indicators of the relationship between criminality, social cohesion and economic performance" (Contract No. 00844). The empirical part of this project is about examining the practical usefulness of a theoretical model of indicators with the help of data from as many EU member states as possible. To that end, apart from economic and socio-demographic data, obviously data on crime is also needed and that is why we are today requesting the data described below from your organisation.

Our client wants the empirical validation to be based on a body of data with the highest possible degree of spatial and factual disaggregation. As for spatial disaggregation, the obvious thing to do is to be orientated towards Eurostat's Nomenclature of Territorial Units for Statistics (NUTS), thus ensuring compatibility of the economic and socio-demographic data provided by Eurostat databases with the data on crime that cannot be provided by that source and that we are kindly asking you to supply. (For [Name of the country] the following NUTS levels do exist: NUTS 0 = [...], NUTS 1 = [...], NUTS 2 = [...], NUTS 3 = [...]). Since the highest possible disaggregation is required, NUTS level 3 ([...]) represents the degree of aggregation most suitable for our project.

Apart from spatial disaggregation, our client also attaches great importance to factual disaggregation. Therefore, the study is not meant to restrict itself to the overall criminal offences, but to include an examination differentiated by categories of offences, too. In accordance with Interpol's International Crime Statistics, the following categorisation should be the aim:

1. Murder
2. Sex offences (including rape)
    2.1 Rape
3. Serious assault
4. Theft (all kinds of)
    4.1 Aggravated theft
        4.1.1 Robbery and violent theft
        4.1.2 Breaking and entering
    4.2 Theft of motor cars
    4.3 Other thefts
5. Fraud
6. Not required
7. Drug offences
8. Total number of offences

For all these categories of offences, we need both the number of cases known to the police (in absolute terms and/ or expressed as volume of crime per 100 000 inhabitants) and the respective clear-up rates.

Finally, for statistical reasons, it is crucial that the individual statistical units can be studied over a longer period. Annual data completely covering the period 1980-1998 would be ideal.

Let me briefly sum up the data we request: we are asking you to make available annual information for the period 1980-1998 about the number of cases known to the police and the respective clear-up rates for the above mentioned categories of offences (Interpol classification) for [name of the country at the level of [name of NUTS 3 level].

The successful completion of the project parts that are still to be tackled essentially hinges on the availability of international data on crime, hence we would greatly appreciate your assistance.

Yours faithfully,

[...]

Table 51: Addresses of the contact persons in the EU member states

Country	Contact persons
Belgium	Mr Gerad de Coninck (Chef de Division), Service General D' Appui Policier, Division Appui en matière de politique policière, 47 Rue Royale, 1000 Bruxelles. Phone: +32/(0)2 500 2621. Fax: +32/(0)2 500 2640.
Denmark	Mr A. P. JØrgensen (Detective Superintendent), Interpol Copenhagen, Polititorvet 14, 1780 Copenhagen. Phone: +45/33 14 88 88 (operator). Fax: +45/33 32 27 71.
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Table 52: Assessing the factors of Murder: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	0	3	57	40	---	---	---	---
	UR	15	43	42	1	---	---	---	---
	WPOP	0	72	28	0	---	---	---	---
	BIRTH	0	13	55	32	---	---	---	---
	AGRAR	0	0	29	**71**	---	---	---	---
	DRUGS	1	35	42	21	---	---	---	---
Germany	GDP	9	62	29	0	0	28	55	17
	UR	36	53	11	0	6	50	44	0
	WPOP	4	87	10	0	6	45	49	0
	BIRTH	0	29	28	43	1	16	33	**50**
	AGRAR	0	2	91	8	0	0	43	**57**
	DRUGS	0	11	89	0	0	0	48	**52**
Spain	GDP	0	58	41	1	4	89	8	0
	UR	0	81	19	0	0	68	32	0
	WPOP	1	48	52	0	0	29	71	0
	BIRTH	0	13	87	0	0	43	55	2
	AGRAR	28	54	18	0	**83**	17	0	0
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	47	53	0	0	2	84	14	0
	UR	6	27	40	27	0	33	22	45
	WPOP	34	42	23	0	16	42	42	0
	BIRTH	**67**	31	2	0	**61**	32	7	0
	AGRAR	2	85	13	0	4	73	23	0
	DRUGS	20	62	18	0	**51**	49	0	0
The Netherlands	GDP	0	15	75	10	0	1	98	1
	UR	0	0	34	**66**	0	22	76	2
	WPOP	**66**	34	0	0	**64**	35	1	0
	BIRTH	31	3	60	6	32	38	29	0
	AGRAR	2	23	68	6	0	35	45	20
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	0	25	74	2	---	---	---	---
	UR	2	68	29	0	---	---	---	---
	WPOP	0	52	25	24	---	---	---	---
	BIRTH	8	45	47	0	---	---	---	---
	AGRAR	0	33	45	23	---	---	---	---
	DRUGS	0	18	67	15	---	---	---	---
Sweden	GDP	---	---	---	---	17	47	29	7
	UR	---	---	---	---	22	38	29	11
	WPOP	---	---	---	---	31	43	26	0
	BIRTH	---	---	---	---	4	25	35	35
	AGRAR	---	---	---	---	1	49	38	12
	DRUGS	---	---	---	---	0	64	35	0
UK	GDP	---	---	---	---	**54**	39	7	0
	UR	---	---	---	---	0	0	13	**87**
	WPOP	---	---	---	---	0	3	54	43
	BIRTH	---	---	---	---	0	7	65	28
	AGRAR	---	---	---	---	0	16	69	15
	DRUGS	---	---	---	---	19	50	30	1

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 53: Assessing the factors of Sex Offences: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	---	---	---	---	---	---	---	---
	UR	---	---	---	---	---	---	---	---
	WPOP	---	---	---	---	---	---	---	---
	BIRTH	---	---	---	---	---	---	---	---
	AGRAR	---	---	---	---	---	---	---	---
	DRUGS	---	---	---	---	---	---	---	---
Germany	GDP	0	63	37	0	7	47	44	2
	UR	32	24	38	6	6	51	33	9
	WPOP	0	11	87	2	0	2	45	**53**
	BIRTH	**62**	23	15	0	0	17	55	29
	AGRAR	0	0	0	**100**	19	79	2	0
	DRUGS	32	2	66	1	**50**	50	0	0
Spain	GDP	0	30	52	18	**58**	42	0	0
	UR	13	64	22	1	24	64	11	0
	WPOP	4	40	49	7	2	62	36	0
	BIRTH	0	67	0	33	29	68	3	0
	AGRAR	0	45	39	16	4	81	15	0
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	---	---	---	---	---	---	---	---
	UR	---	---	---	---	---	---	---	---
	WPOP	---	---	---	---	---	---	---	---
	BIRTH	---	---	---	---	---	---	---	---
	AGRAR	---	---	---	---	---	---	---	---
	DRUGS	---	---	---	---	---	---	---	---
The Netherlands	GDP	0	0	55	44	0	1	38	**61**
	UR	**53**	38	9	0	10	35	55	0
	WPOP	26	28	29	17	4	35	57	4
	BIRTH	3	46	47	4	0	13	63	25
	AGRAR	38	29	30	3	6	55	33	6
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	0	11	69	20	---	---	---	---
	UR	12	51	36	2	---	---	---	---
	WPOP	7	59	23	11	---	---	---	---
	BIRTH	0	33	52	15	---	---	---	---
	AGRAR	0	10	31	**59**	---	---	---	---
	DRUGS	0	30	48	22	---	---	---	---
Sweden	GDP	---	---	---	---	10	32	50	8
	UR	---	---	---	---	**65**	30	5	0
	WPOP	---	---	---	---	19	67	14	0
	BIRTH	---	---	---	---	41	43	16	1
	AGRAR	---	---	---	---	6	30	52	12
	DRUGS	---	---	---	---	4	50	46	0
UK	GDP	---	---	---	---	11	35	52	2
	UR	---	---	---	---	1	31	49	19
	WPOP	---	---	---	---	15	70	15	0
	BIRTH	---	---	---	---	2	27	67	4
	AGRAR	---	---	---	---	0	7	58	35
	DRUGS	---	---	---	---	0	10	83	6

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 54: Assessing the factors of Rape: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	31	60	9	0	---	---	---	---
	UR	4	54	39	3	---	---	---	---
	WPOP	24	65	11	0	---	---	---	---
	BIRTH	12	55	33	1	---	---	---	---
	AGRAR	**69**	27	3	0	---	---	---	---
	DRUGS	27	48	25	0	---	---	---	---
Germany	GDP	0	4	61	35	0	0	22	**78**
	UR	0	51	44	6	0	23	18	**59**
	WPOP	5	62	29	4	0	40	60	0
	BIRTH	3	38	50	8	1	25	50	24
	AGRAR	0	10	82	8	0	37	63	0
	DRUGS	**58**	42	0	0	14	81	5	0
Spain	GDP	0	0	55	45	0	2	62	37
	UR	0	0	54	46	0	5	39	**56**
	WPOP	8	69	23	0	37	62	1	0
	BIRTH	33	67	0	0	10	66	23	0
	AGRAR	0	27	72	2	1	39	60	0
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	**97**	3	0	0	**54**	43	3	0
	UR	27	43	30	0	29	40	31	0
	WPOP	0	54	44	3	0	1	58	42
	BIRTH	6	27	56	11	1	55	44	0
	AGRAR	2	16	32	**50**	2	53	32	13
	DRUGS	0	15	28	**57**	2	78	20	0
The Netherlands	GDP	0	3	88	9	0	0	20	**80**
	UR	0	43	57	0	1	53	46	0
	WPOP	**78**	22	0	0	**66**	34	0	0
	BIRTH	0	50	50	0	0	25	68	7
	AGRAR	0	4	77	19	0	11	66	23
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	0	8	65	27	---	---	---	---
	UR	0	41	50	10	---	---	---	---
	WPOP	0	79	21	0	---	---	---	---
	BIRTH	0	50	48	2	---	---	---	---
	AGRAR	0	11	60	29	---	---	---	---
	DRUGS	0	66	34	0	---	---	---	---
Sweden	GDP	---	---	---	---	0	51	33	15
	UR	---	---	---	---	19	66	15	0
	WPOP	---	---	---	---	24	66	10	0
	BIRTH	---	---	---	---	11	52	37	1
	AGRAR	---	---	---	---	7	60	31	3
	DRUGS	---	---	---	---	27	37	35	1
UK	GDP	---	---	---	---	**78**	14	7	0
	UR	---	---	---	---	0	26	56	18
	WPOP	---	---	---	---	29	50	21	0
	BIRTH	---	---	---	---	0	10	37	**52**
	AGRAR	---	---	---	---	0	23	42	35
	DRUGS	---	---	---	---	**63**	35	2	0

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 55: Assessing the factors of <u>Serious Assault</u>: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	5	34	30	31	---	---	---	---
	UR	**60**	18	20	2	---	---	---	---
	WPOP	**63**	34	3	0	---	---	---	---
	BIRTH	9	48	41	3	---	---	---	---
	AGRAR	0	0	3	**97**	---	---	---	---
	DRUGS	24	47	21	8	---	---	---	---
Germany	GDP	**100**	0	0	0	**98**	2	0	0
	UR	**80**	15	5	0	38	35	21	6
	WPOP	30	6	30	34	0	9	57	34
	BIRTH	0	0	42	**58**	0	0	4	**96**
	AGRAR	0	0	0	**100**	1	68	30	0
	DRUGS	34	33	32	0	**82**	18	0	0
Spain	GDP	0	28	54	19	0	22	63	15
	UR	**68**	26	2	3	36	41	11	11
	WPOP	4	62	34	0	20	33	48	0
	BIRTH	**86**	14	0	0	32	67	2	0
	AGRAR	**84**	16	0	0	21	67	12	0
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	**98**	2	0	0	**100**	0	0	0
	UR	**79**	21	0	0	0	19	54	27
	WPOP	**57**	43	0	0	36	55	9	0
	BIRTH	**61**	34	6	0	**70**	27	4	0
	AGRAR	0	43	50	7	44	51	5	0
	DRUGS	2	46	24	28	0	0	18	**82**
The Netherlands	GDP	0	30	65	5	0	1	64	36
	UR	6	71	23	0	1	62	36	0
	WPOP	**87**	13	0	0	**65**	31	4	0
	BIRTH	0	0	9	**91**	0	1	52	47
	AGRAR	6	50	27	17	13	43	39	6
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	9	51	20	20	---	---	---	---
	UR	42	20	28	10	---	---	---	---
	WPOP	1	70	28	1	---	---	---	---
	BIRTH	9	21	45	26	---	---	---	---
	AGRAR	0	0	31	**69**	---	---	---	---
	DRUGS	26	44	29	2	---	---	---	---
Sweden	GDP	---	---	---	---	13	40	40	7
	UR	---	---	---	---	**68**	28	4	0
	WPOP	---	---	---	---	28	38	32	2
	BIRTH	---	---	---	---	12	45	32	11
	AGRAR	---	---	---	---	19	35	41	4
	DRUGS	---	---	---	---	1	54	44	2
UK	GDP	---	---	---	---	**65**	33	2	0
	UR	---	---	---	---	5	30	39	26
	WPOP	---	---	---	---	11	70	19	0
	BIRTH	---	---	---	---	1	21	55	23
	AGRAR	---	---	---	---	**67**	33	0	0
	DRUGS	---	---	---	---	11	41	44	4

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 56: Assessing the factors of Total Theft: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	3	22	39	37	---	---	---	---
	UR	20	42	25	13	---	---	---	---
	WPOP	34	44	22	0	---	---	---	---
	BIRTH	14	50	33	3	---	---	---	---
	AGRAR	0	28	51	21	---	---	---	---
	DRUGS	15	54	30	1	---	---	---	---
Germany	GDP	**65**	6	9	21	33	31	11	24
	UR	22	0	4	**74**	0	2	21	**78**
	WPOP	21	12	9	**57**	24	36	33	7
	BIRTH	24	30	26	20	6	17	28	**50**
	AGRAR	0	0	5	**95**	0	9	51	40
	DRUGS	**67**	31	3	0	0	14	49	36
Spain	GDP	0	3	33	**64**	0	12	31	**56**
	UR	22	15	27	36	33	14	26	27
	WPOP	**51**	38	11	0	2	68	31	0
	BIRTH	**56**	42	2	0	14	49	36	0
	AGRAR	30	61	8	0	2	29	53	17
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	**100**	0	0	0	**74**	22	3	0
	UR	36	12	12	41	28	17	10	44
	WPOP	**62**	28	10	0	49	32	18	1
	BIRTH	**61**	23	14	2	38	28	22	12
	AGRAR	0	15	65	20	1	29	56	14
	DRUGS	**89**	8	3	0	**65**	23	12	0
The Netherlands	GDP	0	0	66	34	0	11	89	0
	UR	0	12	23	**64**	0	10	47	43
	WPOP	**56**	43	0	0	12	61	25	2
	BIRTH	**63**	36	1	0	38	56	6	0
	AGRAR	33	45	22	0	11	81	8	0
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	11	31	32	26	---	---	---	---
	UR	37	30	26	7	---	---	---	---
	WPOP	0	11	86	3	---	---	---	---
	BIRTH	7	44	45	5	---	---	---	---
	AGRAR	42	46	12	0	---	---	---	---
	DRUGS	3	37	45	15	---	---	---	---
Sweden	GDP	---	---	---	---	12	34	37	17
	UR	---	---	---	---	13	27	34	25
	WPOP	---	---	---	---	**79**	20	0	0
	BIRTH	---	---	---	---	2	16	36	47
	AGRAR	---	---	---	---	22	65	12	1
	DRUGS	---	---	---	---	4	58	8	31
UK	GDP	---	---	---	---	27	35	24	14
	UR	---	---	---	---	20	7	8	**65**
	WPOP	---	---	---	---	45	37	15	3
	BIRTH	---	---	---	---	**84**	15	1	0
	AGRAR	---	---	---	---	2	11	34	**52**
	DRUGS	---	---	---	---	**51**	18	20	11

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 57: Assessing the factors of Aggravated Theft: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	8	37	33	22	---	---	---	---
	UR	33	11	36	19	---	---	---	---
	WPOP	**52**	37	11	0	---	---	---	---
	BIRTH	0	7	46	47	---	---	---	---
	AGRAR	48	44	7	0	---	---	---	---
	DRUGS	11	43	30	16	---	---	---	---
Germany	GDP	47	9	10	34	17	29	22	31
	UR	22	0	6	**72**	0	1	20	**78**
	WPOP	16	17	14	**53**	30	41	28	1
	BIRTH	8	20	28	43	8	21	33	38
	AGRAR	0	0	6	**94**	0	3	22	**75**
	DRUGS	15	38	39	8	0	0	7	**93**
Spain	GDP	0	14	53	33	0	4	23	**73**
	UR	33	15	38	14	35	14	33	18
	WPOP	**53**	39	8	0	31	60	9	0
	BIRTH	**74**	25	1	0	17	44	32	7
	AGRAR	0	9	75	16	0	5	40	**55**
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	**100**	0	0	0	**100**	0	0	0
	UR	12	26	27	36	4	43	24	28
	WPOP	**56**	40	4	0	**53**	31	16	1
	BIRTH	6	20	40	34	8	21	42	29
	AGRAR	7	63	29	1	20	51	28	1
	DRUGS	**91**	9	0	0	35	56	9	0
The Netherlands	GDP	6	55	39	0	12	67	21	0
	UR	0	14	20	**67**	0	7	23	**70**
	WPOP	**66**	29	5	0	36	40	20	4
	BIRTH	**53**	45	3	0	41	53	6	0
	AGRAR	6	25	50	19	9	82	10	0
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	19	37	27	17	---	---	---	---
	UR	44	40	15	1	---	---	---	---
	WPOP	0	4	81	15	---	---	---	---
	BIRTH	3	58	28	12	---	---	---	---
	AGRAR	45	53	2	0	---	---	---	---
	DRUGS	3	61	36	0	---	---	---	---
Sweden	GDP	---	---	---	---	13	38	35	14
	UR	---	---	---	---	10	35	40	15
	WPOP	---	---	---	---	**82**	17	1	0
	BIRTH	---	---	---	---	0	20	52	28
	AGRAR	---	---	---	---	22	63	14	1
	DRUGS	---	---	---	---	39	28	4	29
UK	GDP	---	---	---	---	24	39	27	11
	UR	---	---	---	---	27	11	8	**54**
	WPOP	---	---	---	---	34	45	20	1
	BIRTH	---	---	---	---	**63**	28	8	1
	AGRAR	---	---	---	---	2	14	44	39
	DRUGS	---	---	---	---	**61**	16	21	2

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 58: Assessing the factors of Robbery and Violent Theft: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	0	26	46	28	---	---	---	---
	UR	13	50	36	1	---	---	---	---
	WPOP	25	64	11	0	---	---	---	---
	BIRTH	0	33	67	1	---	---	---	---
	AGRAR	5	35	56	5	---	---	---	---
	DRUGS	4	32	61	3	---	---	---	---
Germany	GDP	**100**	0	0	0	**100**	0	0	0
	UR	29	14	25	32	14	26	40	20
	WPOP	32	58	10	0	4	51	44	1
	BIRTH	39	21	14	25	0	6	25	**69**
	AGRAR	0	0	0	**100**	39	43	16	3
	DRUGS	**89**	11	0	0	**89**	11	0	0
Spain	GDP	3	26	53	19	1	11	29	**59**
	UR	6	27	32	35	23	14	17	45
	WPOP	22	65	13	0	0	19	81	0
	BIRTH	**60**	25	14	1	10	30	42	18
	AGRAR	1	7	26	**67**	1	5	30	**64**
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	**100**	0	0	0	**98**	2	0	0
	UR	0	10	59	31	0	0	39	61
	WPOP	**80**	20	0	0	**67**	27	7	0
	BIRTH	**88**	12	0	0	21	64	15	0
	AGRAR	0	40	53	7	11	61	28	0
	DRUGS	40	60	0	0	**67**	33	0	0
The Netherlands	GDP	29	64	8	0	0	16	80	4
	UR	0	0	0	**100**	0	0	19	**81**
	WPOP	**98**	2	0	0	**75**	25	0	0
	BIRTH	0	1	44	**55**	8	45	35	12
	AGRAR	1	25	38	36	0	9	37	**54**
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	1	18	55	26	---	---	---	---
	UR	2	33	36	29	---	---	---	---
	WPOP	5	75	20	0	---	---	---	---
	BIRTH	33	30	3	33	---	---	---	---
	AGRAR	10	35	36	18	---	---	---	---
	DRUGS	1	38	55	6	---	---	---	---
Sweden	GDP	---	---	---	---	14	47	36	3
	UR	---	---	---	---	20	42	30	9
	WPOP	---	---	---	---	**55**	44	1	0
	BIRTH	---	---	---	---	2	16	55	27
	AGRAR	---	---	---	---	4	37	50	9
	DRUGS	---	---	---	---	0	3	94	4
UK	GDP	---	---	---	---	**73**	21	5	0
	UR	---	---	---	---	10	14	18	**58**
	WPOP	---	---	---	---	1	13	50	37
	BIRTH	---	---	---	---	21	25	24	29
	AGRAR	---	---	---	---	0	17	44	39
	DRUGS	---	---	---	---	**99**	1	0	0

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 59: Assessing the factors of <u>Breaking and Entering</u>: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	8	38	32	22	---	---	---	---
	UR	33	11	37	19	---	---	---	---
	WPOP	**53**	37	10	0	---	---	---	---
	BIRTH	0	7	45	48	---	---	---	---
	AGRAR	48	44	7	0	---	---	---	---
	DRUGS	11	43	31	15	---	---	---	---
Germany	GDP	0	0	1	**99**	0	1	14	**85**
	UR	36	19	14	31	0	7	61	32
	WPOP	42	36	22	0	45	47	8	0
	BIRTH	0	5	55	40	2	38	47	12
	AGRAR	4	35	42	19	0	34	65	1
	DRUGS	33	5	60	2	**54**	42	3	0
Spain	GDP	0	6	50	44	0	2	18	**80**
	UR	36	27	31	6	35	26	31	7
	WPOP	**57**	36	7	0	**67**	29	5	0
	BIRTH	**69**	29	3	0	24	50	22	3
	AGRAR	0	15	79	6	0	1	40	**59**
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	**100**	0	0	0	**100**	0	0	0
	UR	18	27	25	30	17	39	22	21
	WPOP	34	54	13	0	37	37	24	2
	BIRTH	0	17	34	**50**	6	20	42	32
	AGRAR	14	62	24	0	26	45	28	0
	DRUGS	**99**	1	0	0	49	44	7	0
The Netherlands	GDP	12	35	50	4	34	47	19	0
	UR	0	13	20	**67**	0	17	18	**64**
	WPOP	**50**	44	5	0	30	46	20	4
	BIRTH	23	65	12	0	28	57	14	0
	AGRAR	3	51	27	19	21	75	4	0
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	19	37	27	17	---	---	---	---
	UR	44	40	14	1	---	---	---	---
	WPOP	0	4	81	15	---	---	---	---
	BIRTH	2	59	27	12	---	---	---	---
	AGRAR	45	53	2	0	---	---	---	---
	DRUGS	3	61	36	0	---	---	---	---
Sweden	GDP	---	---	---	---	12	38	35	14
	UR	---	---	---	---	9	36	40	15
	WPOP	---	---	---	---	**81**	18	1	0
	BIRTH	---	---	---	---	0	20	53	27
	AGRAR	---	---	---	---	22	63	14	1
	DRUGS	---	---	---	---	40	27	4	29
UK	GDP	---	---	---	---	22	39	27	12
	UR	---	---	---	---	28	10	8	**54**
	WPOP	---	---	---	---	39	45	16	1
	BIRTH	---	---	---	---	**64**	27	8	1
	AGRAR	---	---	---	---	2	14	45	39
	DRUGS	---	---	---	---	**61**	16	21	3

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 60: Assessing the factors of <u>Theft of Motor Cars</u>: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	24	74	2	0	---	---	---	---
	UR	0	44	56	1	---	---	---	---
	WPOP	0	39	48	14	---	---	---	---
	BIRTH	43	53	3	0	---	---	---	---
	AGRAR	0	2	31	**67**	---	---	---	---
	DRUGS	0	56	44	0	---	---	---	---
Germany	GDP	**87**	13	0	0	**81**	13	6	0
	UR	9	10	13	**68**	2	4	11	**83**
	WPOP	16	58	26	0	12	62	26	0
	BIRTH	14	22	29	35	14	21	29	36
	AGRAR	0	0	5	**95**	14	53	25	9
	DRUGS	43	53	4	0	0	6	25	**69**
Spain	GDP	0	1	14	**85**	0	0	27	**73**
	UR	28	12	22	39	41	15	19	25
	WPOP	2	25	58	15	0	18	79	3
	BIRTH	14	37	48	0	5	20	49	25
	AGRAR	42	33	24	0	24	50	17	9
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	**100**	0	0	0	**70**	30	0	0
	UR	46	20	1	33	40	18	14	28
	WPOP	**95**	5	0	0	**79**	19	2	0
	BIRTH	18	20	28	35	18	21	33	28
	AGRAR	24	46	29	0	31	57	12	0
	DRUGS	**100**	0	0	0	**93**	7	0	0
The Netherlands	GDP	17	78	5	0	32	57	11	0
	UR	0	0	0	**100**	0	6	47	47
	WPOP	**91**	9	0	0	**57**	38	5	0
	BIRTH	6	58	27	9	43	52	4	0
	AGRAR	0	27	60	13	0	36	59	5
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	**50**	32	17	1	---	---	---	---
	UR	21	43	26	10	---	---	---	---
	WPOP	0	19	79	2	---	---	---	---
	BIRTH	33	27	36	4	---	---	---	---
	AGRAR	**76**	23	1	0	---	---	---	---
	DRUGS	25	62	13	0	---	---	---	---
Sweden	GDP	---	---	---	---	16	41	28	16
	UR	---	---	---	---	9	19	37	35
	WPOP	---	---	---	---	**66**	30	4	0
	BIRTH	---	---	---	---	2	9	27	**62**
	AGRAR	---	---	---	---	14	63	21	2
	DRUGS	---	---	---	---	1	38	36	26
UK	GDP	---	---	---	---	8	29	46	17
	UR	---	---	---	---	2	9	11	**78**
	WPOP	---	---	---	---	18	38	35	8
	BIRTH	---	---	---	---	**80**	20	1	0
	AGRAR	---	---	---	---	0	5	29	**65**
	DRUGS	---	---	---	---	48	23	23	7

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 61: Assessing the factors of Fraud: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	3	42	54	1	---	---	---	---
	UR	0	36	60	4	---	---	---	---
	WPOP	0	27	68	5	---	---	---	---
	BIRTH	0	5	49	46	---	---	---	---
	AGRAR	**52**	45	3	0	---	---	---	---
	DRUGS	20	32	44	4	---	---	---	---
Germany	GDP	**99**	1	0	0	**82**	16	2	0
	UR	**70**	13	13	4	**64**	11	15	10
	WPOP	17	43	31	9	0	37	49	15
	BIRTH	0	5	16	**79**	0	0	12	**88**
	AGRAR	0	17	53	30	0	61	36	3
	DRUGS	**100**	0	0	0	**100**	0	0	0
Spain	GDP	**50**	46	4	0	48	42	10	0
	UR	**55**	20	23	2	40	53	8	0
	WPOP	0	14	60	25	0	22	58	20
	BIRTH	0	20	62	18	37	40	23	0
	AGRAR	**94**	6	0	0	8	83	9	0
	DRUGS	---	---	---	---	---	---	---	---
Italy	GDP	---	---	---	---	---	---	---	---
	UR	---	---	---	---	---	---	---	---
	WPOP	---	---	---	---	---	---	---	---
	BIRTH	---	---	---	---	---	---	---	---
	AGRAR	---	---	---	---	---	---	---	---
	DRUGS	---	---	---	---	---	---	---	---
The Netherlands	GDP	29	47	25	0	0	1	69	31
	UR	0	37	59	3	2	53	43	2
	WPOP	30	45	25	0	11	49	35	5
	BIRTH	0	16	48	36	0	15	34	**51**
	AGRAR	**64**	20	16	0	11	70	19	0
	DRUGS	---	---	---	---	---	---	---	---
Finland	GDP	---	---	---	---	---	---	---	---
	UR	---	---	---	---	---	---	---	---
	WPOP	---	---	---	---	---	---	---	---
	BIRTH	---	---	---	---	---	---	---	---
	AGRAR	---	---	---	---	---	---	---	---
	DRUGS	---	---	---	---	---	---	---	---
Sweden	GDP	---	---	---	---	37	55	7	0
	UR	---	---	---	---	0	10	44	46
	WPOP	---	---	---	---	17	58	25	0
	BIRTH	---	---	---	---	0	21	47	32
	AGRAR	---	---	---	---	0	48	51	2
	DRUGS	---	---	---	---	0	22	78	0
UK	GDP	---	---	---	---	11	31	46	12
	UR	---	---	---	---	23	19	10	47
	WPOP	---	---	---	---	**57**	22	20	1
	BIRTH	---	---	---	---	**78**	22	0	0
	AGRAR	---	---	---	---	3	47	45	5
	DRUGS	---	---	---	---	37	53	10	0

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 62: Assessing the factors of Drug Offences: Frequency distribution of coefficient estimates by sign and significance level

Country	Factors	NUTS 3				NUTS 2			
		+10%	+	-	-10%	+10%	+	-	-10%
Denmark	GDP	7	39	38	16	---	---	---	---
	UR	26	52	21	1	---	---	---	---
	WPOP	**77**	23	0	0	---	---	---	---
	BIRTH	**71**	24	5	0	---	---	---	---
	AGRAR	3	63	33	1	---	---	---	---
Germany	GDP	**100**	0	0	0	**96**	4	0	0
	UR	**84**	11	5	0	**84**	15	2	0
	WPOP	**90**	10	0	0	**54**	39	8	0
	BIRTH	19	14	0	**67**	0	10	33	**57**
	AGRAR	0	0	0	**100**	0	0	4	**96**
Spain	GDP	---	---	---	---	---	---	---	---
	UR	---	---	---	---	---	---	---	---
	WPOP	---	---	---	---	---	---	---	---
	BIRTH	---	---	---	---	---	---	---	---
	AGRAR	---	---	---	---	---	---	---	---
Italy	GDP	**100**	0	0	0	**100**	0	0	0
	UR	**73**	27	0	0	37	45	18	0
	WPOP	43	56	1	0	**50**	45	5	0
	BIRTH	0	0	3	**97**	0	0	11	**89**
	AGRAR	0	4	50	46	1	15	43	42
The Netherlands	GDP	---	---	---	---	---	---	---	---
	UR	---	---	---	---	---	---	---	---
	WPOP	---	---	---	---	---	---	---	---
	BIRTH	---	---	---	---	---	---	---	---
	AGRAR	---	---	---	---	---	---	---	---
Finland	GDP	10	24	45	21	---	---	---	---
	UR	**94**	6	0	0	---	---	---	---
	WPOP	15	56	28	1	---	---	---	---
	BIRTH	37	49	14	0	---	---	---	---
	AGRAR	0	33	43	23	---	---	---	---
Sweden	GDP	---	---	---	---	0	41	59	1
	UR	---	---	---	---	0	28	69	2
	WPOP	---	---	---	---	0	4	90	6
	BIRTH	---	---	---	---	3	58	39	0
	AGRAR	---	---	---	---	2	70	28	0
UK	GDP	---	---	---	---	**96**	4	0	0
	UR	---	---	---	---	6	14	24	**56**
	WPOP	---	---	---	---	5	60	29	5
	BIRTH	---	---	---	---	8	19	34	40
	AGRAR	---	---	---	---	1	54	40	4

Note: "+10 %" (and "-10%", respectively) indicate the percentage share of positive (negative) coefficient estimates that are significant at the 10 percent or higher level. "+" (-) represents shares of positive (negative) estimates below the 10 % significance level. Significant shares above 50 % are depicted in bold type.

Table 63: The consequences of <u>murder</u> for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.318	---	-1.617	-2.652	0.286	0.618	1.896	1.607	-0.588	-0.379	-0.978	---	---	1.096	---	2.124
	(1.871)		(-12.522)	(-8.581)	(1.827)	(2.150)	(13.191)	(6.182)	(-0.927)	(-0.315)	(-0.770)			(1.091)		(1.683)
AGRARERT(-5)	-0.728	---	0.506	-0.198	0.233	0.175	0.070	0.103	-0.052	-0.582	-1.930	---	---	2.042	---	-1.223
	(-1.412)		(4.218)	(-0.995)	(3.818)	(1.278)	(2.238)	(1.287)	(-0.210)	(-1.064)	(-1.238)			(1.107)		(-1.040)
LO1(-1)	0.000	---	0.000	-0.011	-0.006	0.000	0.001	-0.002	0.001	0.007	-0.004	---	---	-0.032	---	-0.006
	(-0.028)		(-0.128)	(-1.214)	(-1.550)	(0.012)	(0.513)	(-0.744)	(0.171)	(0.461)	(-0.287)			(-1.632)		(-0.517)
GROWTH(-1)	-0.495	---	0.150	-0.019	-0.134	-0.105	-0.075	-0.168	-0.317	-0.565	0.122	---	---	0.142	---	0.010
	(-4.741)		(5.874)	(-0.282)	(-3.090)	(-1.423)	(-2.331)	(-2.817)	(-3.547)	(-3.100)	(0.929)			(0.846)		(0.097)
Number of Obs.	81	---	1603	214	552	204	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.250	---	0.197	0.323	0.032	0.072	0.182	0.217	-0.052	0.060	-0.205	---	---	-0.119	---	-0.061
DW Statistic	2.713	---	2.147	2.109	1.839	1.577	2.258	1.898	2.121	2.127	2.425	---	---	2.211	---	2.090
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	0.908	---	-1.238	-1.927	0.474	0.378	0.395	-0.114	2.132	2.894	1.228	---	---	1.887	---	4.071
	(2.788)		(-16.325)	(-9.472)	(4.179)	(1.649)	(2.939)	(-0.329)	(2.876)	(2.895)	(1.565)			(3.140)		(4.278)
AGRARERT(-5)	0.367	---	0.393	0.029	0.037	0.125	0.059	-0.033	-0.390	0.006	0.654	---	---	2.028	---	-0.341
	(1.903)		(5.702)	(0.156)	(0.838)	(1.144)	(1.989)	(-0.317)	(-1.440)	(0.017)	(0.610)			(1.801)		(-0.395)
LO1(-1)	0.001	---	-0.001	-0.015	-0.002	0.009	0.001	-0.003	0.000	-0.003	0.003	---	---	-0.015	---	-0.020
	(0.264)		(-0.728)	(-2.861)	(-0.674)	(1.549)	(1.168)	(-0.644)	(-0.003)	(-0.224)	(0.342)			(-1.235)		(-2.119)
DEMPLT(-1)	0.292	---	0.188	0.116	0.112	0.082	0.169	-0.008	-0.538	-0.539	0.499	---	---	0.517	---	0.268
	(2.661)		(7.407)	(1.876)	(2.778)	(1.187)	(4.795)	(-0.122)	(-8.563)	(-3.693)	(4.269)			(3.945)		(3.137)
Number of Obs.	113	---	1609	192	552	204	869	240	209	59	75	---	---	42	---	110
Adj. R-squared	0.157	---	0.376	0.594	0.122	0.150	0.052	-0.078	0.241	0.269	0.146	---	---	0.289	---	0.185
DW Statistic	2.030	---	2.048	1.836	1.930	1.569	1.926	1.542	2.377	2.523	2.821	---	---	1.977	---	2.186

Table 64: The consequences of <u>sex offences</u> for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	---	---	-1.445	-2.686	0.293	0.494	---	---	-0.706	-0.353	-0.962	---	---	0.076	---	1.913
			(-12.023)	(-8.863)	(1.870)	(1.703)			(-1.115)	(-0.293)	(-0.764)			(0.067)		(1.512)
AGRARERT(-5)	---	---	0.480	-0.153	0.227	0.202	---	---	-0.044	-0.608	-2.128	---	---	2.881	---	-1.295
			(4.381)	(-0.770)	(3.721)	(1.492)			(-0.180)	(-1.117)	(-1.354)			(1.468)		(-1.075)
LO2(-1)	---	---	-0.003	-0.028	0.000	-0.031	---	---	-0.012	-0.004	0.012	---	---	0.064	---	-0.012
			(-1.044)	(-2.020)	(0.016)	(-1.956)			(-1.488)	(-0.213)	(0.804)			(1.424)		(-0.431)
GROWTH(-1)	---	---	0.167	0.010	-0.129	-0.107	---	---	-0.301	-0.549	0.104	---	---	0.126	---	0.010
			(6.751)	(0.158)	(-2.975)	(-1.470)			(-3.367)	(-2.918)	(0.784)			(0.747)		(0.094)
Number of Obs.	---	---	1693	223	552	204	---	---	175	50	75	---	---	42	---	128
Adj. R-squared	---	---	0.202	0.340	0.027	0.091	---	---	-0.036	0.055	-0.193	---	---	-0.140	---	-0.062
DW Statistic	---	---	2.131	2.141	1.844	1.622	---	---	2.124	2.093	2.453	---	---	2.170	---	2.104
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	---	---	-1.140	-1.906	0.481	0.295	---	---	2.231	2.849	1.162	---	---	1.081	---	3.530
			(-15.948)	(-9.442)	(4.240)	(1.253)			(2.998)	(2.918)	(1.497)			(1.703)		(3.679)
AGRARERT(-5)	---	---	0.388	0.092	0.037	0.158	---	---	-0.400	0.030	0.356	---	---	2.781	---	-0.593
			(6.003)	(0.520)	(0.830)	(1.433)			(-1.487)	(0.084)	(0.327)			(2.491)		(-0.649)
LO2(-1)	---	---	0.002	0.017	0.005	-0.012	---	---	0.008	-0.004	0.011	---	---	0.059	---	-0.022
			(0.837)	(2.058)	(1.159)	(-0.914)			(0.833)	(-0.322)	(1.045)			(2.309)		(-1.070)
DEMPLT(-1)	---	---	0.203	0.128	0.111	0.081	---	---	-0.538	-0.538	0.477	---	---	0.548	---	0.292
			(8.165)	(2.074)	(2.768)	(1.164)			(-8.621)	(-3.750)	(4.040)			(4.373)		(3.365)
Number of Obs.	---	---	1699	201	552	204	---	---	210	60	75	---	---	42	---	110
Adj. R-squared	---	---	0.371	0.584	0.124	0.143	---	---	0.245	0.273	0.161	---	---	0.361	---	0.155
DW Statistic	---	---	1.960	1.917	1.932	1.586	---	---	2.364	2.531	2.762	---	---	2.058	---	2.339

Table 65: The consequences of <u>rape</u> for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3		NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.360	---	-1.438	-2.716	0.292	0.596	1.899	1.653	-0.575	-0.380	-0.930	---	---	0.562	---	2.111
	(2.024)		(- 11.997)	(-8.858)	(1.864)	(2.081)	(13.381)	(6.406)	(-0.909)	(-0.319)	(-0.731)			(0.567)		(1.594)
AGRARERT(-5)	-0.655	---	0.485	-0.167	0.229	0.202	0.067	0.095	-0.049	-0.635	-1.836	---	---	2.231	---	-1.358
	(-1.350)		(4.447)	(-0.833)	(3.742)	(1.457)	(2.131)	(1.180)	(-0.198)	(-1.184)	(-1.163)			(1.217)		(-0.942)
LO21(-1)	-0.013	---	-0.002	-0.012	-0.002	-0.009	-0.002	-0.003	0.002	0.014	-0.002	---	---	0.046	---	-0.005
	(-1.341)		(-1.351)	(-1.313)	(-0.400)	(-0.942)	(-1.674)	(-0.740)	(0.265)	(0.887)	(-0.156)			(1.800)		(-0.217)
GROWTH(-1)	-0.507	---	0.166	-0.009	-0.129	-0.104	-0.077	-0.165	-0.319	-0.590	0.124	---	---	0.217	---	0.015
	(-5.032)		(6.710)	(-0.133)	(-2.985)	(-1.416)	(-2.372)	(-2.759)	(-3.556)	(-3.209)	(0.936)			(1.225)		(0.142)
Number of Obs.	81	---	1693	223	552	204	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.270	---	0.202	0.332	0.028	0.076	0.185	0.217	-0.052	0.075	-0.206	---	---	-0.101	---	-0.064
DW Statistic	2.745	---	2.132	2.134	1.846	1.592	2.253	1.897	2.125	2.184	2.445	---	---	2.179	---	2.094
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	0.822	---	-1.144	-2.011	0.477	0.333	0.378	-0.026	2.120	2.882	1.176	---	---	1.598	---	3.474
	(2.691)		(- 16.032)	(-9.974)	(4.201)	(1.449)	(2.841)	(-0.076)	(2.882)	(2.948)	(1.487)			(2.717)		(3.478)
AGRARERT(-5)	0.317	---	0.380	0.037	0.035	0.161	0.057	-0.055	-0.403	0.021	0.561	---	---	2.054	---	0.080
	(1.753)		(5.908)	(0.207)	(0.794)	(1.444)	(1.932)	(-0.533)	(-1.494)	(0.058)	(0.514)			(1.863)		(0.075)
LO21(-1)	-0.014	---	-0.001	-0.015	0.001	-0.006	-0.001	-0.009	-0.005	0.000	0.003	---	---	0.026	---	0.010
	(-3.712)		(-0.933)	(-2.540)	(0.235)	(-0.727)	(-1.035)	(-1.613)	(-0.586)	(-0.032)	(0.259)			(1.724)		(0.672)
DEMPLT(-1)	0.309	---	0.203	0.129	0.110	0.088	0.172	0.002	-0.536	-0.535	0.498	---	---	0.583	---	0.280
	(3.017)		(8.169)	(2.109)	(2.710)	(1.273)	(4.891)	(0.032)	(-8.575)	(-3.723)	(4.246)			(4.276)		(3.218)
Number of Obs.	113	---	1699	201	552	204	869	240	210	60	75	---	---	42	---	118
Adj. R-squared	0.261	---	0.371	0.589	0.121	0.141	0.052	-0.068	0.244	0.271	0.145	---	---	0.318	---	0.148
DW Statistic	2.061	---	1.965	1.900	1.927	1.579	1.925	1.569	2.390	2.524	2.795	---	---	1.983	---	2.257

Table 66: The consequences of serious assault for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.260	---	-1.415	-2.610	0.906	1.382	1.876	1.609	-0.768	-0.389	-0.894	---	---	-2.322	---	1.093
	(1.873)		(-11.801)	(-8.352)	(4.238)	(4.121)	(13.251)	(6.338)	(-1.208)	(-0.329)	(-0.723)			(-1.519)		(0.837)
AGRARERT(-5)	-0.442	---	0.434	-0.244	0.222	0.204	0.067	0.086	0.014	-0.525	-2.162	---	---	2.302	---	-1.192
	(-0.842)		(3.917)	(-1.227)	(3.570)	(1.778)	(2.146)	(1.087)	(0.056)	(-0.974)	(-1.420)			(1.316)		(-1.034)
LO3(-1)	0.032	---	-0.013	-0.018	-0.004	-0.011	-0.004	-0.013	0.021	0.026	0.117	---	---	0.279	---	0.032
	(1.352)		(-2.630)	(-0.944)	(-1.073)	(-1.620)	(-2.012)	(-2.488)	(1.657)	(1.144)	(1.672)			(2.588)		(2.006)
GROWTH(-1)	-0.499	---	0.166	-0.003	-0.127	-0.200	-0.078	-0.181	-0.323	-0.590	0.024	---	---	0.065	---	-0.032
	(-4.971)		(6.690)	(-0.047)	(-2.750)	(-2.676)	(-2.407)	(-3.066)	(-3.648)	(-3.257)	(0.172)			(0.412)		(-0.316)
Number of Obs.	81	---	1693	223	460	170	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.271	---	0.205	0.329	0.105	0.231	0.186	0.236	-0.032	0.087	-0.149	---	---	-0.002	---	-0.025
DW Statistic	2.739	---	2.131	2.089	2.120	2.214	2.255	1.919	2.156	2.205	2.336	---	---	2.392	---	2.173
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	0.894	---	-1.137	-1.902	1.215	1.079	0.369	-0.063	2.058	2.879	1.158	---	---	-0.594	---	3.078
	(2.736)		(-15.933)	(-9.427)	(7.448)	(3.807)	(2.778)	(-0.185)	(2.782)	(2.959)	(1.486)			(-0.703)		(3.011)
AGRARERT(-5)	0.417	---	0.362	-0.101	-0.019	-0.034	0.060	-0.019	-0.333	0.023	0.401	---	---	2.339	---	-0.310
	(1.814)		(5.545)	(-0.521)	(-0.401)	(-0.336)	(2.014)	(-0.184)	(-1.204)	(0.060)	(0.368)			(2.382)		(-0.354)
LO3(-1)	0.004	---	-0.006	-0.029	-0.001	-0.007	0.000	0.006	0.012	0.000	0.043	---	---	0.211	---	0.019
	(0.396)		(-1.928)	(-2.119)	(-0.340)	(-1.158)	(-0.019)	(0.865)	(0.839)	(0.012)	(0.850)			(3.525)		(1.520)
DEMPLT(-1)	0.290	---	0.199	0.136	0.093	0.291	0.173	-0.010	-0.539	-0.534	0.441	---	---	0.443	---	0.283
	(2.657)		(7.986)	(2.206)	(1.956)	(3.603)	(4.889)	(-0.143)	(-8.633)	(-3.732)	(3.266)			(3.871)		(3.296)
Number of Obs.	113	---	1699	201	460	170	869	240	210	60	75	---	---	42	---	110
Adj. R-squared	0.158	---	0.372	0.585	0.218	0.286	0.051	-0.077	0.245	0.271	0.155	---	---	0.463	---	0.166
DW Statistic	2.037	---	1.964	1.793	1.794	1.726	1.927	1.536	2.363	2.520	2.689	---	---	2.217	---	2.315

Table 67: The consequences of theft (all kinds of theft) for the growth rates of real GDP per capita and employment

	Dependent variable: Growth rate of real GDP per capita															
	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
GBIRTHRT(-5)	1.192	---	-1.312	-2.437	0.296	0.647	1.536	1.153	-0.567	-0.338	-1.348	---	---	-0.892	---	1.839
	(1.852)		(-10.934)	(-8.121)	(1.889)	(2.296)	(9.667)	(3.830)	(-0.898)	(-0.281)	(-1.091)			(-0.622)		(1.364)
AGRARERT(-5)	-1.083	---	0.365	-0.178	0.242	0.284	0.048	0.034	-0.059	-0.612	-0.486	---	---	-0.769	---	-0.953
	(-2.263)		(3.330)	(-0.935)	(3.839)	(2.016)	(1.542)	(0.414)	(-0.241)	(-1.121)	(-0.297)			(-0.308)		(-0.706)
LO4(-1)	-0.171	---	-0.050	-0.091	-0.011	-0.058	-0.018	-0.028	-0.013	-0.006	0.188	---	---	-0.187	---	0.011
	(-2.834)		(-6.213)	(-3.979)	(-0.932)	(-2.490)	(-4.645)	(-2.942)	(-0.543)	(-0.134)	(2.087)			(-1.637)		(0.335)
GROWTH(-1)	-0.589	---	0.123	-0.121	-0.130	-0.135	-0.100	-0.186	-0.311	-0.555	0.135	---	---	0.077	---	0.025
	(-5.803)		(4.828)	(-1.706)	(-3.011)	(-1.841)	(-3.078)	(-3.165)	(-3.453)	(-3.005)	(1.070)			(0.463)		(0.219)
Number of Obs.	81	---	1693	223	552	204	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.333	---	0.223	0.378	0.029	0.102	0.204	0.245	-0.050	0.055	-0.120	---	---	-0.118	---	-0.063
DW Statistic	2.605	---	2.106	2.077	1.841	1.578	2.278	1.931	2.110	2.098	2.520	---	---	2.041	---	2.126
	Dependent variable: Growth rate of employment															
GBIRTHRT(-5)	0.884	---	-1.027	-1.587	0.475	0.372	0.297	0.318	2.158	2.873	1.078	---	---	0.167	---	4.304
	(3.022)		(-14.656)	(-9.068)	(4.183)	(1.632)	(1.946)	(0.770)	(2.960)	(2.988)	(1.384)			(0.206)		(4.256)
AGRARERT(-5)	0.186	---	0.261	0.078	0.031	0.198	0.054	0.036	-0.360	0.127	1.184	---	---	-0.439	---	-1.169
	(1.049)		(4.108)	(0.520)	(0.685)	(1.774)	(1.773)	(0.328)	(-1.348)	(0.344)	(1.029)			(-0.315)		(-1.167)
LO4(-1)	-0.112	---	-0.043	-0.093	0.004	-0.035	-0.004	0.023	-0.050	-0.040	0.077	---	---	-0.176	---	-0.048
	(-4.815)		(-9.727)	(-8.527)	(0.480)	(-1.929)	(-0.956)	(1.686)	(-1.833)	(-1.049)	(1.231)			(-2.666)		(-1.704)
DEMPLT(-1)	0.133	---	0.166	0.060	0.109	0.098	0.176	-0.042	-0.544	-0.557	0.494	---	---	0.405	---	0.140
	(1.288)		(6.824)	(1.137)	(2.680)	(1.417)	(4.981)	(-0.612)	(-8.777)	(-3.892)	(4.278)			(3.218)		(1.159)
Number of Obs.	113	---	1699	201	552	204	869	240	210	60	75	---	---	42	---	110
Adj. R-squared	0.319	---	0.411	0.703	0.122	0.156	0.052	-0.066	0.257	0.288	0.167	---	---	0.390	---	0.171
DW Statistic	1.970	---	2.009	2.090	1.924	1.608	1.937	1.514	2.440	2.603	2.813	---	---	1.910	---	2.058

Table 68: The consequences of <u>aggravated theft</u> for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.087	---	-1.370	-2.579	0.264	0.467	1.573	1.248	-0.516	-0.273	-1.215	---	---	-0.096	---	1.259
	(1.644)		(-11.338)	(-8.607)	(1.679)	(1.596)	(10.234)	(4.087)	(-0.807)	(-0.223)	(-0.975)			(-0.086)		(0.897)
AGRARERT(-5)	-0.532	---	0.413	-0.275	0.239	0.262	0.039	0.041	-0.041	-0.616	-1.378	---	---	-0.032	---	-0.346
	(-1.115)		(3.732)	(-1.422)	(3.892)	(1.858)	(1.254)	(0.486)	(-0.165)	(-1.139)	(-0.893)			(-0.015)		(-0.251)
LO41(-1)	-0.078	---	-0.022	-0.057	-0.017	-0.046	-0.017	-0.021	-0.010	-0.011	0.086	---	---	-0.138	---	0.025
	(-2.345)		(-3.564)	(-3.194)	(-1.647)	(-2.043)	(-4.863)	(-2.294)	(-0.612)	(-0.282)	(1.682)			(-1.720)		(1.136)
GROWTH(-1)	-0.610	---	0.141	-0.084	-0.130	-0.124	-0.098	-0.186	-0.316	-0.557	0.094	---	---	0.050	---	0.033
	(-5.586)		(5.464)	(-1.204)	(-3.007)	(-1.699)	(-3.044)	(-3.117)	(-3.543)	(-3.057)	(0.729)			(0.297)		(0.314)
Number of Obs.	81	---	1693	223	552	204	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.309	---	0.209	0.361	0.033	0.092	0.206	0.233	-0.050	0.056	-0.149	---	---	-0.109	---	-0.051
DW Statistic	2.732	---	2.101	2.071	1.839	1.586	2.289	1.927	2.110	2.092	2.436	---	---	2.084	---	2.188
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	0.772	---	-1.055	-1.820	0.474	0.228	0.334	0.393	2.305	2.918	1.020	---	---	1.000	---	3.656
	(2.537)		(-15.030)	(-10.455)	(4.153)	(0.982)	(2.266)	(0.955)	(3.115)	(2.972)	(1.313)			(1.575)		(3.438)
AGRARERT(-5)	0.322	---	0.272	-0.078	0.037	0.205	0.056	0.056	-0.361	0.034	0.867	---	---	0.445	---	-0.306
	(1.792)		(4.264)	(-0.504)	(0.829)	(1.846)	(1.840)	(0.505)	(-1.347)	(0.095)	(0.817)			(0.361)		(-0.294)
LO41(-1)	-0.057	---	-0.030	-0.070	-0.002	-0.039	-0.002	0.026	-0.029	-0.009	0.053	---	---	-0.119	---	0.001
	(-3.922)		(-8.807)	(-7.954)	(-0.268)	(-2.233)	(-0.549)	(2.025)	(-1.525)	(-0.281)	(1.504)			(-2.484)		(0.037)
DEMPLT(-1)	0.147	---	0.156	0.040	0.113	0.101	0.172	-0.029	-0.539	-0.536	0.467	---	---	0.385	---	0.287
	(1.360)		(6.279)	(0.741)	(2.776)	(1.466)	(4.897)	(-0.433)	(-8.684)	(-3.745)	(3.998)			(2.943)		(2.882)
Number of Obs.	113	---	1699	201	552	204	869	240	210	60	75	---	---	42	---	110
Adj. R-squared	0.272	---	0.404	0.691	0.121	0.162	0.051	-0.060	0.252	0.273	0.177	---	---	0.375	---	0.144
DW Statistic	2.063	---	1.988	2.111	1.930	1.621	1.930	1.514	2.417	2.533	2.768	---	---	1.983	---	2.269

Table 69: The consequences of robbery and violent theft for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	0.881	---	-1.341	-2.128	0.257	0.485	1.686	1.428	-0.626	-0.480	-0.963	---	---	0.758	---	0.805
	(1.329)		(-11.088)	(-5.719)	(1.626)	(1.642)	(11.502)	(5.116)	(-0.984)	(-0.397)	(-0.762)			(0.736)		(0.563)
AGRARERT(-5)	-1.152	---	0.393	-0.278	0.233	0.228	0.040	0.078	-0.048	-0.528	-1.980	---	---	1.703	---	-0.297
	(-2.361)		(3.559)	(-1.417)	(3.816)	(1.640)	(1.271)	(0.963)	(-0.194)	(-0.958)	(-1.270)			(0.851)		(-0.233)
LO411(-1)	-0.041	---	-0.014	-0.035	-0.011	-0.024	-0.011	-0.010	0.005	0.014	-0.012	---	---	-0.024	---	0.023
	(-2.767)		(-4.485)	(-2.495)	(-1.586)	(-1.614)	(-4.570)	(-1.833)	(0.593)	(0.762)	(-0.514)			(-0.488)		(1.654)
GROWTH(-1)	-0.578	---	0.145	-0.048	-0.136	-0.122	-0.092	-0.173	-0.312	-0.553	0.121	---	---	0.084	---	-0.028
	(-5.736)		(5.776)	(-0.700)	(-3.143)	(-1.662)	(-2.855)	(-2.924)	(-3.473)	(-3.055)	(0.927)			(0.474)		(-0.266)
Number of Obs.	81	---	1693	223	552	204	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.329	---	0.213	0.348	0.032	0.085	0.203	0.227	-0.050	0.069	-0.201	---	---	-0.203	---	-0.037
DW Statistic	2.790	---	2.163	2.118	1.838	1.566	2.273	1.917	2.134	2.132	2.413	---	---	2.091	---	2.142
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	0.891	---	-1.040	-1.188	0.449	0.171	0.289	-0.192	2.220	2.960	1.206	---	---	1.740	---	3.110
	(2.724)		(-14.653)	(-5.173)	(3.922)	(0.727)	(2.070)	(-0.512)	(3.009)	(3.003)	(1.541)			(2.868)		(2.974)
AGRARERT(-5)	0.357	---	0.271	0.003	0.039	0.208	0.048	-0.046	-0.433	-0.038	0.592	---	---	1.879	---	0.224
	(1.834)		(4.208)	(0.018)	(0.877)	(1.892)	(1.570)	(-0.435)	(-1.597)	(-0.099)	(0.549)			(1.581)		(0.229)
LO411(-1)	-0.002	---	-0.014	-0.042	-0.008	-0.030	-0.004	-0.006	-0.011	-0.008	-0.003	---	---	-0.014	---	0.013
	(-0.422)		(-8.043)	(-5.625)	(-1.602)	(-2.695)	(-1.845)	(-0.726)	(-1.111)	(-0.473)	(-0.171)			(-0.477)		(1.272)
DEMPLT(-1)	0.272	---	0.187	0.134	0.111	0.078	0.168	-0.011	-0.536	-0.538	0.498	---	---	0.483	---	0.311
	(2.324)		(7.696)	(2.349)	(2.748)	(1.140)	(4.776)	(-0.165)	(-8.602)	(-3.762)	(4.237)			(3.499)		(3.510)
Number of Obs.	113	---	1699	201	552	204	869	240	210	60	75	---	---	42	---	110
Adj. R-squared	0.158	---	0.399	0.641	0.126	0.172	0.055	-0.078	0.247	0.275	0.145	---	---	0.260	---	0.159
DW Statistic	2.034	---	2.028	1.849	1.934	1.622	1.938	1.551	2.366	2.532	2.812	---	---	1.970	---	2.352

Table 70: The consequences of <u>breaking and entering</u> for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3		NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.093	---	-1.442	-2.805	0.279	0.542	1.593	1.241	-0.522	-0.417	-1.219	---	---	-0.084	---	1.291
	(1.652)		(-12.465)	(-9.496)	(1.776)	(1.886)	(10.354)	(4.064)	(-0.822)	(-0.333)	(-0.978)			(-0.075)		(0.925)
AGRARERT(-5)	-0.526	---	0.513	-0.259	0.236	0.231	0.044	0.039	-0.045	-0.629	-1.379	---	---	0.014	---	-0.348
	(-1.099)		(4.904)	(-1.330)	(3.840)	(1.662)	(1.389)	(0.466)	(-0.183)	(-1.159)	(-0.894)			(0.007)		(-0.252)
LO412(-1)	-0.077	---	0.000	0.011	-0.012	-0.035	-0.015	-0.021	-0.009	0.007	0.085	---	---	-0.134	---	0.024
	(-2.303)		(-0.122)	(1.409)	(-1.229)	(-1.666)	(-4.558)	(-2.329)	(-0.720)	(0.217)	(1.691)			(-1.685)		(1.122)
GROWTH(-1)	-0.67	---	0.34	0.33	-0.03	-0.07	-0.02	-0.17	-0.90	-1.14	-0.23	---	---	-0.56	---	0.27
	(-6.62)		(16.44)	(4.75)	(-0.59)	(-0.93)	(-0.72)	(-2.85)	(-7.91)	(-5.49)	(-1.76)			(-3.39)		(3.09)
Number of Obs.	81	---	2059	235	552	204	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.490	---	0.194	0.089	-0.043	0.010	0.047	0.059	0.167	0.287	-0.067	---	---	0.402	---	0.283
DW Statistic	2.653	---	2.609	2.391	1.899	1.608	2.063	1.908	2.044	1.987	2.054	---	---	2.700	---	2.205
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	0.774	---	-1.167	-1.964	0.478	0.308	0.342	0.366	2.200	2.967	1.021	---	---	1.010	---	3.689
	(2.542)		(-16.824)	(-9.882)	(4.206)	(1.337)	(2.325)	(0.889)	(2.973)	(2.975)	(1.313)			(1.583)		(3.485)
AGRARERT(-5)	0.324	---	0.421	0.118	0.035	0.172	0.057	0.052	-0.381	0.036	0.862	---	---	0.480	---	-0.346
	(1.805)		(6.797)	(0.666)	(0.787)	(1.559)	(1.883)	(0.470)	(-1.417)	(0.101)	(0.813)			(0.389)		(-0.331)
LO412(-1)	-0.057	---	0.000	-0.004	0.001	-0.024	-0.001	0.024	-0.012	-0.011	0.052	---	---	-0.116	---	-0.001
	(-3.930)		(-0.154)	(-0.969)	(0.211)	(-1.411)	(-0.417)	(1.904)	(-0.778)	(-0.389)	(1.493)			(-2.432)		(-0.036)
DEMPLT(-1)	0.149	---	0.206	0.140	0.110	0.103	0.172	-0.028	-0.540	-0.536	0.466	---	---	0.389	---	0.284
	(1.385)		(8.663)	(2.361)	(2.711)	(1.473)	(4.897)	(-0.413)	(-8.642)	(-3.746)	(3.990)			(2.968)		(2.836)
Number of Obs.	113	---	1770	210	552	204	869	240	210	60	75	---	---	42	---	110
Adj. R-squared	0.272	---	0.389	0.595	0.121	0.148	0.051	-0.063	0.245	0.274	0.177	---	---	0.371	---	0.144
DW Statistic	2.063	---	2.006	1.849	1.926	1.602	1.929	1.519	2.397	2.533	2.767	---	---	1.982	---	2.261

Table 71: The consequences of theft of <u>motor cars</u> for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.451	---	-1.271	-2.342	0.325	0.534	1.453	0.924	-0.561	-0.220	-0.808	---	---	-0.374	---	1.967
	(2.033)		(-10.762)	(-7.667)	(2.091)	(1.886)	(8.741)	(2.715)	(-0.875)	(-0.173)	(-0.623)			(-0.211)		(1.539)
AGRARERT(-5)	-0.698	---	0.449	-0.354	0.157	0.346	0.047	0.100	-0.053	-0.647	-1.753	---	---	1.173	---	-1.082
	(-1.426)		(4.318)	(-1.857)	(2.456)	(2.319)	(1.504)	(1.283)	(-0.217)	(-1.180)	(-1.117)			(0.546)		(-0.826)
LO42(-1)	-0.010	---	-0.020	-0.046	0.022	-0.029	-0.014	-0.023	-0.001	-0.005	-0.015	---	---	-0.080	---	0.003
	(-0.581)		(-5.772)	(-3.846)	(3.313)	(-2.577)	(-4.799)	(-3.101)	(-0.168)	(-0.291)	(-0.492)			(-0.816)		(0.162)
GROWTH(-1)	-0.500	---	0.120	-0.119	-0.133	-0.118	-0.106	-0.197	-0.317	-0.570	0.124	---	---	0.194	---	0.013
	(-4.915)		(4.909)	(-1.795)	(-3.114)	(-1.631)	(-3.268)	(-3.322)	(-3.550)	(-3.063)	(0.943)			(0.943)		(0.120)
Number of Obs.	81	---	1764	232	552	204	869	240	175	50	75	---	---	42	---	128
Adj. R-squared	0.254	---	0.218	0.381	0.048	0.104	0.205	0.248	-0.052	0.057	-0.202	---	---	-0.187	---	-0.064
DW Statistic	2.747	---	2.085	2.010	1.865	1.579	2.272	1.929	2.120	2.101	2.452	---	---	2.133	---	2.103
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	1.007	---	-0.992	-1.364	0.478	0.269	0.155	-0.642	2.124	2.719	1.323	---	---	0.771	---	3.925
	(3.118)		(-14.385)	(-7.162)	(4.206)	(1.227)	(0.971)	(-1.387)	(2.856)	(2.710)	(1.637)			(0.778)		(4.103)
AGRARERT(-5)	0.321	---	0.345	0.083	0.033	0.338	0.045	-0.042	-0.389	0.065	0.720	---	---	1.272	---	-1.008
	(1.684)		(5.742)	(0.540)	(0.700)	(2.986)	(1.504)	(-0.411)	(-1.442)	(0.180)	(0.666)			(0.997)		(-1.035)
LO42(-1)	-0.018	---	-0.020	-0.046	0.001	-0.037	-0.007	-0.018	0.001	0.009	-0.012	---	---	-0.065	---	-0.026
	(-2.005)		(-10.438)	(-7.566)	(0.240)	(-4.354)	(-2.414)	(-1.789)	(0.075)	(0.617)	(-0.565)			(-1.249)		(-1.580)
DEMPLT(-1)	0.251	---	0.173	0.080	0.109	0.128	0.173	-0.009	-0.538	-0.548	0.500	---	---	0.572	---	0.194
	(2.304)		(7.449)	(1.521)	(2.630)	(1.925)	(4.943)	(-0.131)	(-8.602)	(-3.798)	(4.292)			(4.020)		(1.879)
Number of Obs.	113	---	1770	210	552	204	869	240	210	60	75	---	---	42	---	110
Adj. R-squared	0.190	---	0.432	0.692	0.121	0.220	0.058	-0.065	0.242	0.277	0.149	---	---	0.289	---	0.167
DW Statistic	2.082	---	2.010	1.806	1.923	1.682	1.943	1.571	2.375	2.502	2.805	---	---	1.946	---	2.132

Table 72: The consequences of fraud for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.106	---	-1.500	-3.162	0.286	0.610	---	---	-0.543	-0.506	-0.684	---	---	-0.889	---	1.938
	(1.654)		(-12.714)	(-10.609)	(1.828)	(2.135)			(-0.867)	(-0.422)	(-0.544)			(-0.552)		(1.492)
AGRARERT(-5)	-0.507	---	0.565	-0.116	0.256	0.159	---	---	-0.051	-0.557	-2.297	---	---	2.786	---	-1.111
	(-1.041)		(5.270)	(-0.615)	(4.039)	(1.156)			(-0.211)	(-1.035)	(-1.484)			(1.423)		(-0.914)
LO5(-1)	-0.031	---	0.010	0.047	-0.010	0.012	---	---	-0.018	-0.023	-0.052	---	---	-0.071	---	0.005
	(-2.014)		(2.747)	(4.597)	(-1.653)	(0.811)			(-1.691)	(-0.971)	(-1.470)			(-1.346)		(0.204)
GROWTH(-1)	-0.472	---	0.173	0.007	-0.137	-0.100	---	---	-0.333	-0.540	0.008	---	---	0.127	---	0.014
	(-4.753)		(7.004)	(0.114)	(-3.163)	(-1.357)			(-3.747)	(-2.983)	(0.050)			(0.748)		(0.133)
Number of Obs.	81	---	1723	226	552	204	---	---	175	50	75	---	---	42	---	128
Adj. R-squared	0.294	---	0.214	0.404	0.033	0.075	---	---	-0.031	0.078	-0.162	---	---	-0.147	---	-0.064
DW Statistic	2.783	---	2.122	2.252	1.856	1.566	---	---	2.085	2.054	2.406	---	---	2.220	---	2.102
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	0.905	---	-1.184	-2.031	0.473	0.341	---	---	2.138	3.098	1.225	---	---	0.874	---	4.171
	(2.720)		(-16.741)	(-9.973)	(4.170)	(1.484)			(2.903)	(3.089)	(1.606)			(0.911)		(4.136)
AGRARERT(-5)	0.368	---	0.421	0.109	0.050	0.142	---	---	-0.393	0.020	0.000	---	---	2.455	---	-0.683
	(1.882)		(6.632)	(0.605)	(1.094)	(1.297)			(-1.459)	(0.057)	(0.000)			(2.071)		(-0.750)
LO5(-1)	0.000	---	-0.001	0.005	-0.006	0.003	---	---	-0.003	0.017	-0.043	---	---	-0.037	---	-0.028
	(-0.012)		(-0.394)	(0.807)	(-1.290)	(0.276)			(-0.239)	(0.812)	(-1.741)			(-1.183)		(-1.421)
DEMPLT(-1)	0.289	---	0.192	0.133	0.114	0.084	---	---	-0.536	-0.558	0.361	---	---	0.492	---	0.234
	(2.647)		(7.695)	(2.052)	(2.834)	(1.207)			(-8.534)	(-3.845)	(2.592)			(3.756)		(2.514)
Number of Obs.	113	---	1729	204	552	204	---	---	210	60	75	---	---	42	---	110
Adj. R-squared	0.156	---	0.381	0.592	0.124	0.139	---	---	0.242	0.282	0.188	---	---	0.286	---	0.163
DW Statistic	2.035	---	1.928	1.880	1.937	1.571	---	---	2.376	2.471	2.884	---	---	2.044	---	2.240

Table 73: The consequences of drug offences for the growth rates of real GDP per capita and employment

	Denmark		Germany		Spain		Italy		The Netherlands		Finland		Sweden		United Kingdom	
	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2	NUTS 3	NUTS 2
Dependent variable: Growth rate of real GDP per capita																
GBIRTHRT(-5)	1.015	---	-1.433	-2.833	---	---	1.606	1.294	---	---	-0.384	---	---	0.825	---	1.632
	(1.516)		(-12.306)	(-9.266)			(9.987)	(4.035)			(-0.322)			(0.805)		(1.172)
AGRARERT(-5)	-0.586	---	0.510	-0.139	---	---	0.051	0.046	---	---	-1.220	---	---	2.108	---	-0.833
	(-1.232)		(4.861)	(-0.610)			(1.629)	(0.536)			(-0.835)			(1.098)		(-0.641)
LO7(-1)	0.034	---	-0.002	0.006	---	---	-0.006	-0.008	---	---	0.038	---	---	-0.010	---	0.006
	(2.244)		(-0.688)	(0.847)			(-3.571)	(-1.765)			(2.949)			(-0.582)		(0.608)
GROWTH(-1)	-0.446	---	0.151	-0.021	---	---	-0.099	-0.190	---	---	-0.169	---	---	0.098	---	-0.003
	(-4.433)		(6.274)	(-0.339)			(-3.032)	(-3.125)			(-1.079)			(0.566)		(-0.024)
Number of Obs.	81	---	1764	232	---	---	869	240	---	---	75	---	---	42	---	128
Adj. R-squared	0.304	---	0.200	0.338	---	---	0.195	0.226	---	---	-0.045	---	---	-0.199	---	-0.060
DW Statistic	2.458	---	2.104	2.109	---	---	2.258	1.883	---	---	2.261	---	---	2.160	---	2.092
Dependent variable: Growth rate of employment																
GBIRTHRT(-5)	0.886	---	-1.163	-1.882	---	---	0.158	-0.288	---	---	1.099	---	---	1.754	---	3.252
	(2.722)		(-16.693)	(-9.125)			(1.036)	(-0.667)			(1.498)			(2.904)		(3.198)
AGRARERT(-5)	0.279	---	0.420	0.034	---	---	0.042	-0.070	---	---	0.585	---	---	1.959	---	0.228
	(1.273)		(6.774)	(0.183)			(1.387)	(-0.614)			(0.584)			(1.698)		(0.227)
LO7(-1)	-0.005	---	-0.001	-0.007	---	---	-0.005	-0.005	---	---	0.023	---	---	0.006	---	0.009
	(-0.832)		(-0.607)	(-1.424)			(-2.734)	(-0.789)			(2.800)			(0.548)		(1.153)
DEMPLT(-1)	0.257	---	0.205	0.148	---	---	0.175	-0.003	---	---	0.278	---	---	0.502	---	0.303
	(2.216)		(8.607)	(2.496)			(4.988)	(-0.044)			(2.057)			(3.774)		(3.451)
Number of Obs.	113	---	1770	210	---	---	869	240	---	---	75	---	---	42	---	110
Adj. R-squared	0.162	---	0.390	0.597	---	---	0.060	-0.077	---	---	0.249	---	---	0.262	---	0.156
DW Statistic	2.047	---	2.007	1.806	---	---	1.926	1.542	---	---	2.679	---	---	1.993	---	2.304

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