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Socioeconomic and demographic factors of crime in Germany

Evidence from panel data of the German states

Horst Entorf^{a,*}, Hannes Spengler^b

^a*Universität Würzburg, Institut für Volkswirtschaftslehre, Sanderring 2, 97070 Würzburg, Germany*

^b*Zentrum für Europäische Wirtschaftsforschung GmbH (ZEW), L 7, 1, 68161 Mannheim, Germany*

Abstract

Our study is based on the traditional Becker-Ehrlich deterrence model, but we analyze the model in the face of currently discussed factors of crime like demographic changes, youth unemployment, and income inequality. We use a panel of the German Laender (states) that allows us to exploit different experiences in densely and sparsely populated areas as well as areas in East and West Germany. Our results are based on static and dynamic panel econometrics/criminometrics. The results confirm the deterrence hypothesis for crime against property. Only weak support can be observed for crimes against the person. Economic and demographic factors reveal important and significant influences. Being young and unemployed increases the probability of committing crimes. © 2000 Elsevier Science Inc. All rights reserved.

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1. Introduction

Economic contributions in the area of crime started about 30 years ago. Before 1968, offenders were regarded as deviant individuals with atypical motivations. The theory of crime was largely composed of recommendations made by sociologists, psychologists, criminologists, political scientists, and law professors that were not based on rigorous empirical investigation but on beliefs about concepts like depravity, insanity, and abnormality.

* Corresponding author. Tel.: +49-931-31-2935; fax: +49-931-888-7097.

E-mail addresses: horst.entorf@mail.uni-wuerzburg.de (H. Entorf), spengler@zew.de (H. Spengler)

During the late 1960s, economists turned their attention to the field of criminology. The stimulus was the seminal article by Becker (1968) on “Crime and Punishment.” Becker’s theory of deterrence is an application of the general theory of rational behavior under uncertainty. The model predicts how changes in the probability and severity of sanctions may affect expected payoffs and, thus, the “supply” of crime.

Becker’s theoretical work was the stimulus for the empirical investigations of Ehrlich (1973). He extended Becker’s work by considering a time allocation model. The assumption of fixed leisure time requires that the remaining time be allocated to legal and illegal activities. If legal income opportunities are scarce, then the time allocation tradeoff predicts that crime becomes more likely. Because legal income opportunities can be approximated by abilities, family income, human capital, and other sociodemographic variables (age, race, gender, urbanization, etc.), the predictions of the Ehrlich model can be tested empirically.

The bulk of empirical studies uses the Becker-Ehrlich model to estimate the effect of deterrence, measured by the probability and severity of punishment, and the effect of the benefits and costs of legal and illegal activities on crime. In most studies, the effect of deterrence variables (clear-up or conviction rates, length of sentence, and fines) are found to be more or less negative, whereas income variables reveal no systematic effect on crime (see Eide, 1994, 1997, for excellent surveys). This ambiguity reflects the fact that income represents benefits not only for legal activities but also for illegal ones; therefore, a high number of rich people produce a more profitable target for crime. As a result, the income measure may be positively correlated with crime rates.

After some time of relative silence with only a few major contributions in the 1980s, the last few years have witnessed a vitalization of the “economics of crime” (see Eide, 1994; Grogger, 1995; DiIulio, 1996; Ehrlich, 1996; Freeman, 1996; Glaeser et al., 1996; and Levitt, 1997, 1998, to name only a few). Modern studies have been stimulated by the dramatic increase of crime rates in western countries, on the one hand, and by recent social and economic problems like unemployment, in particular youth unemployment, migration, and increasing income inequality, on the other. The focus of these contributions has changed from the pure testing of the deterrence hypothesis to the analysis of socioeconomic and demographic crime factors.

Our article is in the spirit of the traditional Becker-Ehrlich deterrence model, but we analyze the hypothesis in the face of currently discussed crime factors. We add several innovative elements to the existing literature:

- *German data:* We test the deterrence hypothesis using German data (for earlier studies see Entorf, 1996; and Spengler, 1996). Evidence from a panel of the Laender (the German states) allows us to exploit the very different experiences in densely populated areas such as Berlin, Bremen, and Hamburg (which are also states, so-called “Stadtstaaten,” i.e., “city-states”) and sparsely populated areas such as Lower Saxony. Moreover, it enables us to look at differences between East and West Germany.
- *Demographic and urban factors:* Simple descriptive statistics reveal that people under 21 years of age are responsible for about 28% of total offenses. However, the reason for higher crime rates might be that they are just poorer than other age groups. Controlling for income and other economic variables, we can test the “pure” effect of being young. Because

unemployment is often seen as a factor that aggravates the probability of belonging to a group with “dangerous” social interactions, we also estimate the impact of being young and unemployed. Moreover, we are trying to analyze the popular argument that the number of foreigners is responsible for growing crime rates. For instance, because East Germany has much lower rates of foreigners, we hope to find some evidence from East/West comparisons. Crime statistics generally show a positive correlation between population density/city size and crime rates (Bundeskriminalamt, 1996). Having very densely and sparsely populated states at our disposal, we are going to test whether population density remains a significant factor of crime in a multivariate setting.

- *Relative income*: As mentioned above, the impact of income on crime is not clear. We add a new relative income variable that might help to clarify the situation. The new variable measures relative wealth that might explain crime based on legal income opportunities.
- *Unemployment and youth unemployment*: Unemployment generally seems to have only minor effects in aggregate studies. We are going to test whether this hypothesis also holds true for Germany. In particular, we divide the analysis into the investigation of overall unemployment and youth unemployment effects.
- *Several types of crime*: Studies based on aggregated data have been criticized. This article breaks up aggregate crime into eight crime categories.¹ Thus, we are in the position to separate property crime, which might be more directly related to the rational offender, and crime against the person.
- *Static and dynamic estimation strategies*: Our estimation strategy is based on static and dynamic panel econometrics/criminometrics. The dynamic model is based on the error correction mechanism so that we can separate the long-run deterrence effect from short-run adjustments due to disequilibrium situations, which, for instance, might arise due to temporarily higher clear-up rates.

Our article is organized as follows. Section 2 describes the development of crime and of potential factors of crime in Germany. In Section 3, we present the basic model and estimation methods. After introducing the data in Section 4, results are reported and interpreted in Section 5. Section 6 concludes.

2. Crime and potential factors of crime

In this section, we provide an extensive discussion and descriptive analysis of crime and the potential factors of crime in Germany. The variables of interest are depicted over time and between observational units. Analyzing the crime statistics and, thus, learning about regional differences in the incidence of crime and about the sociodemographic structures of the offenders leads to a better understanding of the factors that may prevent or foster crime.

¹ The choice of categories is limited by the availability of data. There are no other categories with information on clear-up rates (see Bundeskriminalamt, 1996).

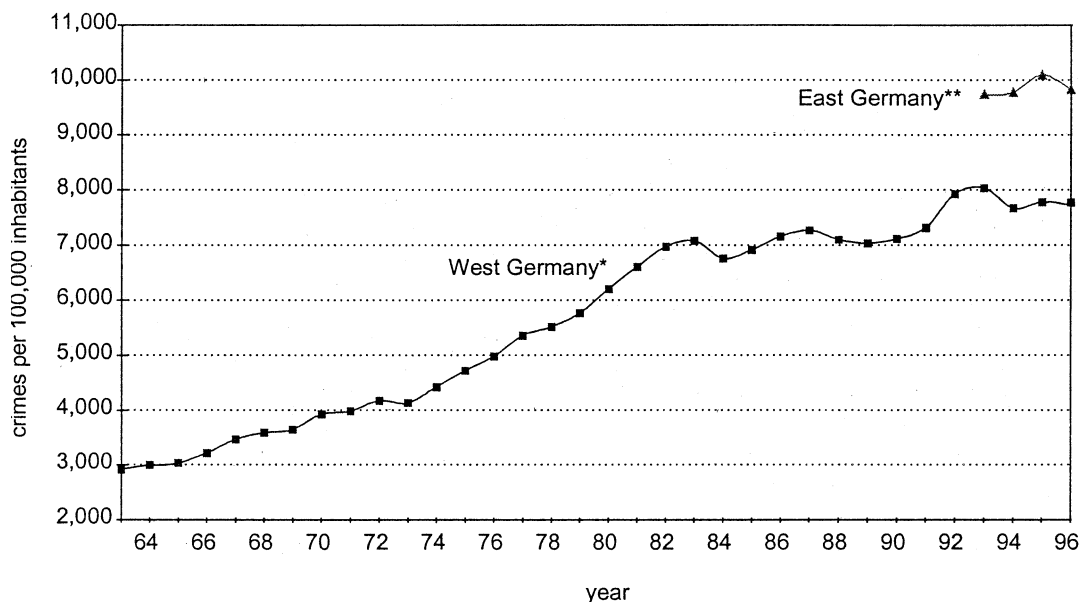


Fig. 1. General crime rates in West Germany (1963–1996) and East Germany (1993–1996). Source: various issues crime statistics of the German Federal Criminal Police Office (Bundeskriminalamt) *including East Berlin after 1990. **not including East Berlin

With only a few exceptions criminal prosecution is within the responsibility of the Laender. This is a source of heterogeneity that makes it suitable to choose the Laender as observational units in our descriptive and econometric analysis of crime. Apart from the investigation of the states, we take a close look at the federal level. Moreover, we draw comparisons between East and West Germany from a special consideration of the city-states. Our exclusive source of crime data is the annual crime reports of the German Federal Criminal Police Office (“Bundeskriminalamt”).²

It is important to mention that all empirical investigations of crime that are based on official statistics have at least one serious shortcoming: The statistics do not display the real intensity of crime but only the size of crime known to the police. How large the share of unreported crimes is depends heavily on the type of crime. Generally speaking, less serious crimes have a lower probability of being reported to the police than more serious crimes. In addition, the general reporting propensity of citizens and the level of clear-up efforts by the police play an important role for the number of unrecorded cases.

2.1. Evidence from the German crime statistics

In 1996, 6.64 million crimes were registered by the German police, 5.24 million of which took place in West Germany (including East Berlin) and 1.39 million in East Germany (not

² The Bundeskriminalamt is the information office of the Police Offices of the Laender. It is also directly responsible for combating organized crime and terrorism.

Table 1
Development of selected offenses in West Germany^a

Crime category	1975			1996 ^b		
	Cases, absolute numbers	Cases/100,000 inhabitants	Share of all crimes	Cases, absolute numbers	Cases/100,000 inhabitants	Share of all crimes
Murder and manslaughter	2,908	4.7	0.1	2,839	4.2	0.1
Rape	6,850	11.1	0.2	5,373	7.9	0.1
Robbery	20,362	32.9	0.7	55,010	81.1	1.0
Dangerous and serious assault	50,274	81.0	1.7	85,040	126	1.5
Assault (not dangerous or serious)	65,674	106	2.2	164,369	243	3.1
Theft WAC	864,849	1,399	29.6	1,269,521	1,877	23.5
Theft UAC	1,044,569	1,689	35.8	1,558,582	2,304	31.8
Fraud	209,841	339	7.2	556,888	823	9.8
Damage to property	213,746	458	8.3	474,576	702	9.4
Drug offenses	29,805	48.2	1.0	179,754	266.0	2.8
Environmental offenses	3,445	5.6	0.1	30,109	45.0	0.6

^a Source: Bundeskriminalamt, 1975, 1996.

^b Including East Berlin.

including East Berlin). Expressed in rates, these numbers mean that there have been approximately 8 offenses per 100 inhabitants in the West and a bit <10 offenses per 100 citizens in East Germany. Fig. 1 depicts the development of the general crime rate in West Germany for the past 30 years. There has been a steady increase in the crime rate in West Germany from three crimes per 100 persons in 1963 to seven crimes per 100 persons in 1983. The West German crime rate reached an all-time high in 1993 with a few more than eight crimes per 100 persons. Since 1994, the crime rate has remained about the same. In East Germany, with a crime rate of approximately 10 crimes per 100 persons in the last 4 years, the situation is even more serious. Compared with other countries of the European Union, German crime rates are neither very high nor very low.³

Regarding Fig. 1, two questions can be posed. First, why has crime increased to such a degree in West Germany during the last three decades? Second, why is there more crime in East Germany than in West Germany? We hope to shed some light on these questions in the proceeding sections of our article. Knowing that the general crime rate has risen dramatically is one factor. The other important thing to know is which crime categories are responsible for this growth. Table 1 provides an answer to this question. Because theft is the most important crime category (quantitatively) comprising >55% of all crimes, one can see that it was the increase of the number of thefts that drove the growth of the overall crime rate.

Although the total number of thefts experienced a growth of about 74% in the period from 1975–1996, other offenses also increased significantly. The number of environmental offenses was eight times higher in 1996 than 20 years before, the number of drug offenses was

³ The highest European Union crime rate in 1994 was reported for Sweden (12 crimes per 100 inhabitants), and the lowest was reported for Spain (1.7 crimes per 100 inhabitants) (source: United Nations [2000]).

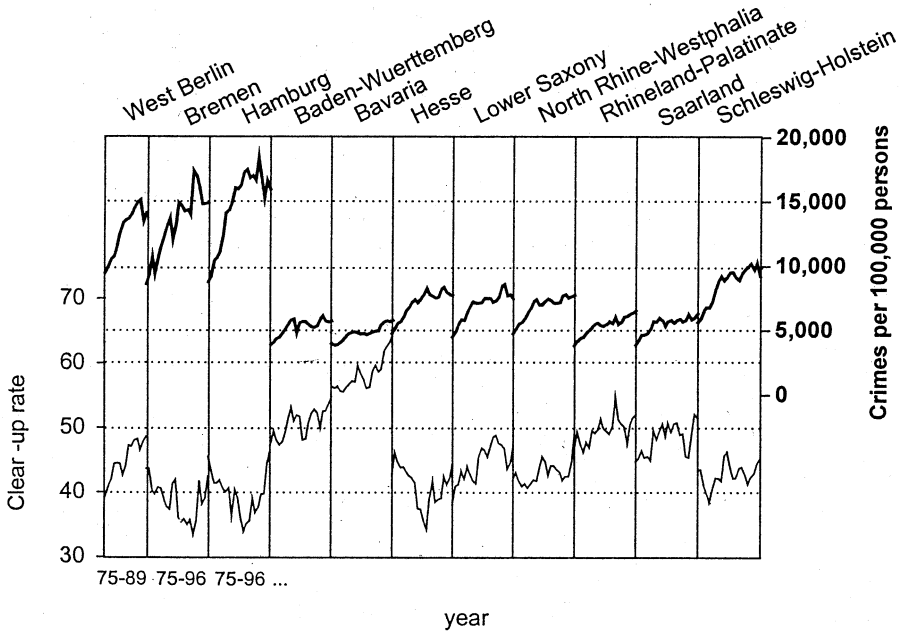


Fig. 2. General crime and clear-up rates in the West German states 1975–1996 (West Berlin, 1975–1989*). Source: various issues crime statistics of the German Federal Criminal Police Office (Bundeskriminalamt) *After 1989 the statistics contain only information about unified Berlin.

six times higher in 1996, and the number of robberies, assaults, and frauds at least doubled. The only crime categories that showed a decrease are murder and manslaughter, and rape.⁴

In contrast to current suggestions made by the mass media, violent crimes (murder and manslaughter, rape, robbery, and dangerous and serious assault) are only of minor quantitative importance. They accounted for only 2.7% of all reported crimes in 1996. Considering

⁴ One of the referees has expressed his concern about the reliability of the data presented in Table 1. He argues that “murder is nothing more than a dangerous and serious assault in the extreme.” Therefore, murder/manslaughter and dangerous/serious assault should be highly correlated. Table 1, however, reveals that murder and manslaughter remained roughly stable over the 22 years under consideration, whereas dangerous and serious assault increased by approximately 55%. The question is whether this unequal development may be subject to changes in crime reporting over time, a tendency of German assaults to become less deadly, and/or a change in the definition of assault. We can only rule out the latter supposition with certainty. The German development, however, is not an isolated case in the western world. Using various issues of the Interpol international crime statistics (Interpol, various issues) and comparing murder and assault rates from the years 1977 and 1996, we find similar patterns for Austria (change in the murder rate, +2%; change in the assault rate, +60%), France (+22 and +118, respectively), and for the United States (−16 and +61, respectively). On the other hand, the Scandinavian countries Denmark (+72 and +108, respectively), Norway (+267 and +363, respectively), and Sweden (+114 and +130, respectively) rather exhibit developments in accordance with the expectations of our referee.

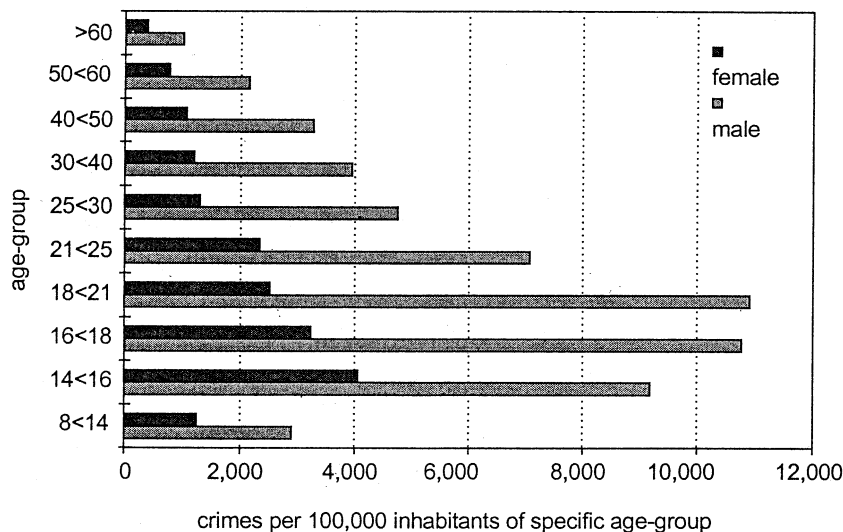


Fig. 3. German suspects of crime per 100,000 inhabitants of their age group. Source: 1996 crime statistics of the German Federal Criminal Police Office (Bundeskriminalamt)

only the most serious crimes (i.e., murder and manslaughter, and rape) the share is 0.2%.⁵ The bulk of crimes are offenses against property, which account for at least 75% of all crimes. Despite this, it should be noted that the propensity to violence has increased in the last 20 years (see robbery and assault). Moreover, estimates for the United States suggest that crimes against the person cause a multiple of the costs of property crime (Miller et al., 1996).

Fig. 2 displays the development of the general crime rate (the bold lines in the upper half of the figure) for the West German *Laender* in the period 1975–1996.⁶ It is striking that the very densely populated city-states of Berlin, Bremen, and Hamburg have, by far, the highest crime rates of all the *Laender* in West Germany. It is surprising that Schleswig-Holstein, a state with a rather low population density, exhibits the highest crime rate of all non-city-states. Generally speaking, crime rates are low in the southern regions of West Germany (Baden-Wuerttemberg, Bavaria, Saarland, and Rhineland-Palatinate) and are high in the north (North Rhine-Westphalia, Lower Saxony, and Schleswig-Holstein). Because northern states have lower growth rates in comparison to southern states (see Fig. 5), we find it appealing to consider measures of relative and absolute wealth as potential factors of crime.

After investigating the incidence of crime, it is straightforward to analyze the sociodemographic properties of the offenders. Of 100 suspects, approximately 75 are male, so gender seems to play an important role in the crime decision. Age is very important, since 40% of all crimes in 1996 were committed by offenders of <25 years of age.

⁵ If the number of unrecorded cases could be taken into account, this share would be even smaller because serious crimes tend to be reported more frequently than other offenses.

⁶ (West) Berlin is only considered until 1989 because crime data for West and East Berlin are not displayed separately in the years after German unification.

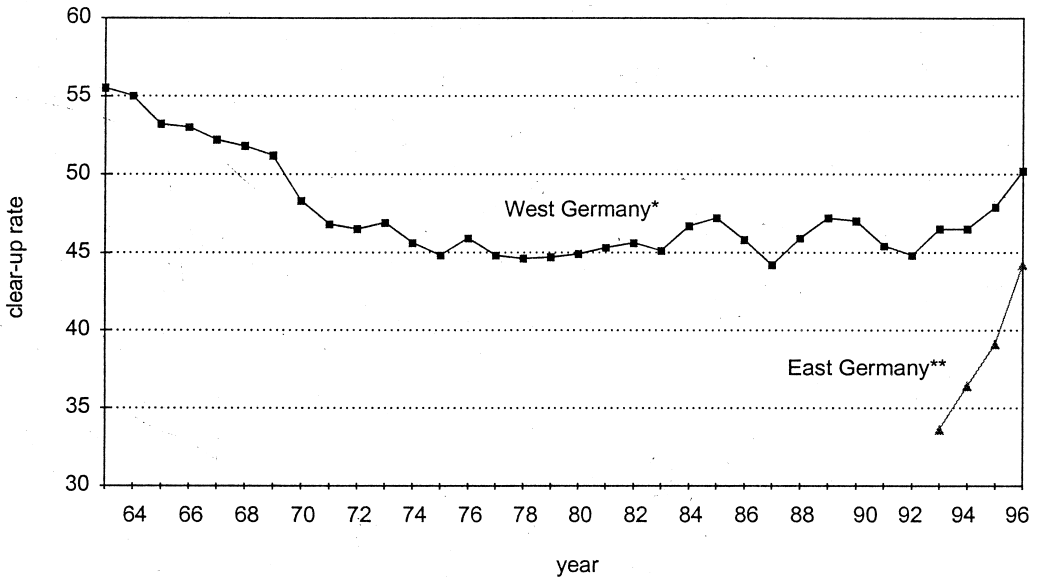


Fig. 4. General clear-up rates in West Germany (1963–1996) and East Germany (1993–1996). Source: various issues crime statistics of the German Federal Criminal Police Office (Bundeskriminalamt) *including East Berlin from 1990 on, **not including East Berlin

Fig. 3 puts age and gender in relative context to crime. It displays the number of offenders in a certain age-gender group in relation to the absolute size of this group in the population. It is striking that in the groups 16–<18 years of age (at least 16 and at most 17 years of age) and 18–<21 years of age for males, every ninth person has been a suspect in a crime. Thus, young men are the most criminal age-gender group in relation to their population share. For example, while the population share of men at least 14 years of age and at most 24 was 5.7% in 1996, their share of all suspects was 27%. According to this evidence, it seems reasonable to use a variable that measures the population share of young men in our econometric investigations. In contrast, a gender-variable would be less appropriate because of lacking variation over time and observational units.

Finally, it has to be mentioned that a high percentage of crimes in Germany is committed by foreigners. In 1996, approximately 28% of all suspects were foreigners, whereas their population share was only 9.0%. This divergence gives rise to the use of a foreigner variable in our estimations.

2.2. What prevents or fosters crime?

2.2.1. Deterrence

Deterrence variables, i.e., clear-up rates, conviction rates, and severity of punishment, are important determinants of the expected utility that potential offenders can yield from crime. These variables have been the focus of early studies. Admittedly, this focus changed in the 1980s and 1990s to economic and sociodemographic factors. Deterrence variables, however, should always be present in criminometric studies.

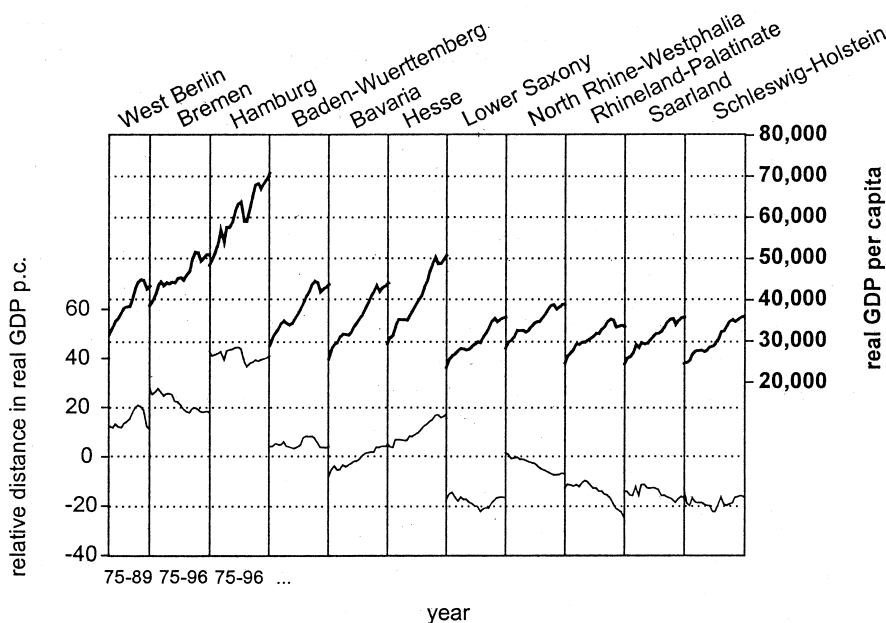


Fig. 5. Real GDP *per capita* in prices of 1991 and relative distance in real GDP *per capita* from the West German mean. Source: various issues statistics of the federal Statistical Office of Germany (Statistisches Bundesamt)

In his theory, Becker (1968) uses the probability of conviction and the severity of punishment as exogenous variables in the supply-of-offenses function. In his article, and in most other theoretical articles, the effect of deterrence variables on crime is clear. A higher probability of conviction/severity of punishment leads to a reduction in the expected utility from crime and, therefore, fewer offenses will be committed. As a result, we expect negative signs for the deterrence variables in our estimations.

Unfortunately, we are only able to use the clear-up rate in our econometric specifications, since this is the only deterrence variable for Germany available at the state level. In contrast to this, Wolpin (1978), in his empirical study of crime in England and Wales, uses five different deterrence variables:

- The proportion of crimes cleared by the police (clear-up rate);
- The proportion of those arrested who either plead guilty or are convicted (conviction rate);
- The proportion of the guilty persons who are imprisoned (imprisonment rate);
- The proportion of the guilty persons who are placed on recognizance (recognizance rate);
- The proportion of the guilty persons who are fined (fine rate); and
- The average length of the court imprisonment sentence for those imprisoned (average sentence).

To our knowledge, this study is the only one that applies such a complete set of deterrence variables. The majority of empirical investigations use, at most, two deterrence variables, one of which is the severity of punishment⁷ and the other is the probability of being caught or convicted.

Fig. 4 depicts the clear-up rates for reported aggregated crime in West and East Germany. In the West, the rate was highest in 1963 at approximately 55%. In the following 10 years it fell to 45% and then moved sideways until 1992 (with some fluctuations in the 1980s). After 1992, the rate grew continuously and, in 1996, reached the highest level since 1970. East Germany's clear-up rate started at a very low level (33.6%) and then increased strongly until 1996 (44.2%). Despite this increase, it has still not reached the West German level.

Comparing Figs. 1 and 4, it is striking that crime incidence and clear-up rates are obviously negatively related. West Germany exhibits higher clear-up rates than East Germany and, at the same time, has less crime. This evidence also can be drawn from a comparison of crime with clear-up rates for the Laender, shown in Fig. 2 (the clear-up rates are presented as fine lines in the lower part of the diagram).

Baden-Wuerttemberg and Bavaria have the highest clear-up rates and the lowest crime rates. On the other hand, states with low clear-up rates like Bremen, Hamburg, and Schleswig-Holstein show a higher incidence of crime. In the context of our previous discussion, the meaning of the graphically depicted negative correlation is straightforward. The higher risk of being detected by the police makes offending in Baden-Wuerttemberg *ceteris paribus* less attractive than in the city-states.

Unfortunately, the reality is not as simple as it seems to be, since there is presumably no clear causal relationship between the clear-up rate and the crime rate. In other words, it is likely that, apart from the influence of the clear-up rate on the crime rate, there is also an influence in the inverse direction. There may be two sources for short-run simultaneity. First, if crime rises and the number of police stay the same (for example, due to budgetary limitations), the police tend to be overloaded, and, thus, the clear-up rate falls (while the absolute number of cleared-up offenses stays the same). This would lead to an overestimation of the effect of interest (thus, from the clear-up rate on the crime rate). The second potential cause of bias emerges if higher crime rates lead to protests among the population, which, for instance, induce politicians to hire new policemen. As a result, the clear-up rate would rise (at least temporarily). This effect leads to an underestimation of the effect of interest. As the two potential sources of bias have opposite effects, the joint effect is not evident. However, because we are mainly interested in economic long-run behavior, potential short-run biases should cancel out in our estimations. Note that our panel data have a relatively large time dimension. We use static regression frameworks and dynamic error correction modeling (see Section 3.2).

⁷ It should be mentioned that clear measures of the severity of punishment for aggregated crime or special crimes cannot be easily obtained, because most crimes are not exclusively sanctioned by either fines or imprisonment. As a consequence, a suitable sanction variable for macroeconometric studies requires the conversion of time (the dimension of imprisonment) in money (the dimension of fines), or vice versa.

2.2.2. Legal and illegal income opportunities

The economic approach to crime is based on the appealing assumption that “offenders, as members of the human race, respond to incentives” (Ehrlich, 1996, p. 43). The deterrence variables discussed above are, for example, negative incentives in the context of crime decisions. Other straightforward incentives that slow down or foster crime are the legal and illegal income opportunities, which may be approximated by economic variables like total income, income distribution, or unemployment. Moreover, legal wages represent the opportunity costs of committing crimes. Grogger (1998) uses this feature of illegal behavior to explain why the likelihood of delinquency typically increases with age until the late teens and then declines.

Because illegal income opportunities cannot be directly measured, a proxy is needed. Ehrlich (1973) proposes the mean family income as such a measure. He argues that higher income means a higher level of transferable assets in the community and, thus, more lucrative targets for potential criminals. Other authors use the same variable to measure legal income opportunities. They argue that higher absolute wealth is an indicator for more rewarding legal jobs. Which interpretation is more appropriate? An answer to this question can only be obtained from empirical evidence, i.e., from the sign of the estimated coefficient of the absolute wealth variable in a multivariate analysis. A positive (negative) coefficient would support the interpretation of absolute wealth measures as indicators of illegal (legal) income opportunities. In the present article, we follow Ehrlich when using a measure of absolute wealth (real gross domestic product [GDP] *per capita*) as an indicator of illegal income opportunities. The variable is depicted in bold lines in the upper half of Fig. 5. The comparison of Fig. 1 with Fig. 5 yields some evidence for the appropriateness of our approximation. The two richest states (Bremen and Hamburg) also have the highest crime rates. This may be due to the fact that crime is particularly rewarding in these rich city-states.

The interpretation of *relative* income indicators is more straightforward. A higher income inequality, for instance, may lead to worse legal income opportunities and, at the same time, to better illegal income opportunities for the lower quantiles of the income distribution. Thus, changes in legal and illegal income opportunities both indicate an increase of delinquent behavior. As a consequence, the expected effect of relative income measures on crime is unambiguous. Our relative income variable is depicted in the lower half of Fig. 5. It measures the percentage distance between the income of individual states and the mean income over all states (i.e., West German GDP). *Ceteris paribus*, people in disadvantaged states have lower legal income opportunities and, therefore, higher incentives to commit crimes than people in areas wealthier than average (see Section 3.1 for a further discussion of our relative income variable as a measure of inequality in our econometric specification).

Because unemployed persons are per definition excluded from the legal income sector, this variable can be as well interpreted as a measure of legal income opportunities. The unemployment rates of the West German Laender are presented in Fig. 6. The comparison of Fig. 1 with Fig. 6 suggests that high (low) unemployment is associated with a high (low) incidence of crime (see Baden-Wuerttemberg, Bavaria, Bremen, and Hamburg).

At this point, it should be stressed that all judgments about potential interrelationships between economic, deterrence, and other variables that are based on simple descriptive

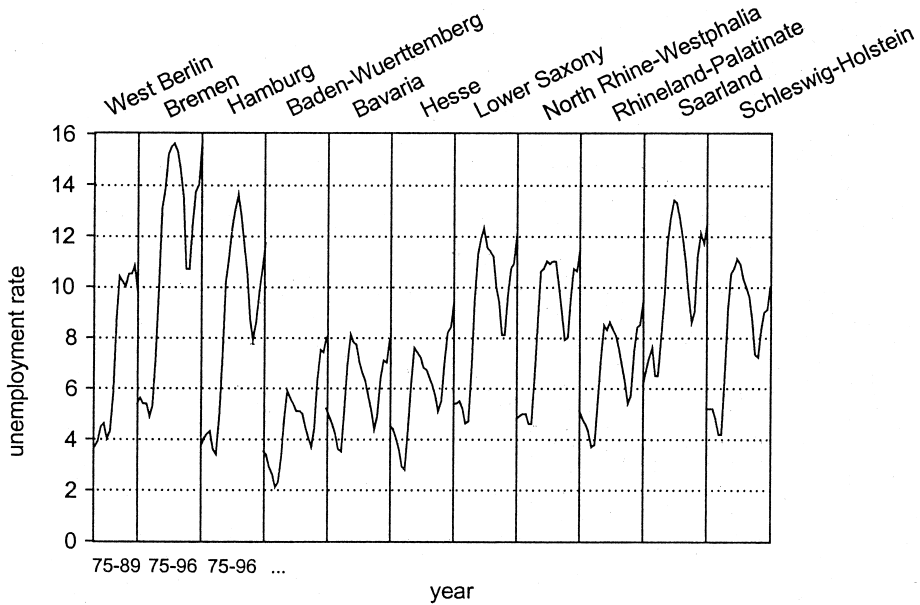


Fig. 6. Unemployment rates in the West German states 1975–1996 (West Berlin, 1975–1989). Source: various issues statistics of the Federal Statistical Office of Germany (Statistisches Bundesamt)

statistics are only preliminary. Whether these first impressions are right or misleading can only be established in the context of our econometric analysis in Section 4.

2.2.3. *Demographics, and its relation to norms and social interactions*

We include two demographic variables in our estimations that were partly motivated by our descriptive analysis of the suspects of crime, but also is discussed in the literature (see, for example, Eide, 1994). These variables are the percentage of foreigners and the percentage of men aged 15–24 years within the population (foreigner rate, young-men rate). Both variables are jointly presented in Fig. 7.

Why should the variables of age and the number of foreigners be included in an empirical investigation? Considering age first, one might think that young people (men) do not accept social (crime-averse) norms to the same extent as older people. This may be due to age-specific rebellion or lack of hindsight (see Eide, 1994). Further, young people are in a “better” social and physical position to commit crimes. Thus, the threat of loss of reputation and social status when being accused or convicted of a crime is much higher for adults with well-established social networks than for young people (see Williams and Sickles, 1997, for an investigation of the role of social capital formation in crime). Young men are physically superior to other groups within the population. This means that they have comparative advantages in committing crimes that require strength and/or speed. Older people are very often married and, therefore, spend their leisure time within their family. Young people, in contrast, spend much more time in their circle of friends and crowds. This might create dangerous social interactions when initially law-abiding members of a clique begin to imitate the behavior of the group’s delinquent peers (Glaeser et al., 1996; Akerlof, 1997; Ploeger, 1997).

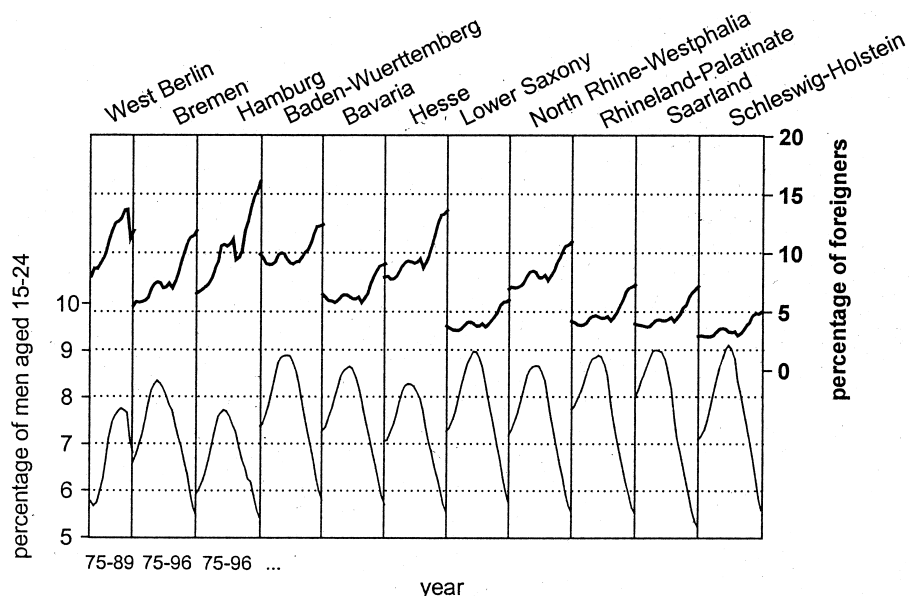


Fig. 7. Percentage of foreigners and men aged 15–24 years in the population of West German states 1975–1996 (West Berlin, 1975–1989). Source: various issues statistics of the federal Statistical Office of Germany (Statistisches Bundesamt)

There are many reasons why foreigners are overrepresented in the group of suspects (see Pfeiffer et al., 1996, for empirical evidence on this point). First, they may be more often suspected wrongly than the native population. Second, there are some laws like the foreigner and asylum laws that can, by definition, only be broken by foreigners. Third, foreigners who reside in Germany are, to a higher percentage, young men. Fourth, some foreigners may be in Germany after fleeing their homeland because they were offenders there. Finally, most foreigners come to Germany because they had no economic success in their home country. The latter reason may be due to factors that foster crime, for example, a lack of education. Because, in our econometric specifications, we are interested in the pure crime effect of being a foreigner in Germany, 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 in using 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 (Krueger & Pischke, 1996, analyze crime against foreigners in Germany). Moreover, concerning crime-enhancing social interactions, foreigners are presumably more likely to become offenders, because foreigners (especially young ones) 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 <18 years of age and/or first-time offenders, would not be punished severely. Moreover, young men/people who are pupils, students, or job-beginners with

low wages have relatively low legal income opportunities. The same holds true for foreigners who may have low-paying jobs due to language problems or lack of education.

In regard to the crime statistics, gender is obviously an important factor. Less than 30% of all suspects in Germany are women, a fact that may partly be explained by the social role of women in society (Eide, 1994). Statistically, women spend more time with their children and on housework. Thus, they have less time and fewer opportunities to commit crimes. Moreover, because of the tendency to impress friends, crime-increasing social interactions seem to be more extensive among men. Apart from the fact that gender is, indeed, an important factor of crime, its use in regressions of the supply-of-offenses is not meaningful because there is not enough variation in the gender variable, between observational units, or over time.

Population density is another important correlate of crime. This can be inferred from descriptive statistics (Bundeskriminalamt, 1996), in which densely populated areas/big cities show much higher crime rates than sparsely populated areas/smaller cities, as well as from multivariate investigations. For example, Sampson (1995, pp. 196–197) reports that several studies find “a significant and large association between population density and violent crime despite controlling for a host of social and economic variables.” In our econometric analysis, we use dummy variables to capture the crime effect of population density.

The majority of our descriptive analysis of crime and its factors has been carried out using data for West Germany (11 Laender, 1975–1996) alone. This focus is due to the fact that most of our estimations are based on this data set. However, in the econometric part of the present article we also use a data set that contains West and East German states (16 Laender, 1993–1996). Therefore, Table 2 gives an impression of the relevant variables in a West German/East German context. The table also contains aggregated information about the city-states.

3. Model specifications and estimation methods

3.1. *The basic model*

The economics of crime has its origin in the well-known and path-breaking article on “Crime and Punishment” by Becker (1968). The main purpose of his essay was to answer the question of how many resources and how much punishment should be used to minimize social losses due to the costs of crime (i.e., damages, and the cost of apprehension and conviction). His basic model is based on the assumption “...that a person commits an offense if the expected utility to him exceeds the utility he could get by using his time and other resources at other activities” (Becker, 1986, p. 176).⁸ The public’s decision variables are its expenditures on police, courts, and the size and the form of punishment that help to

⁸ Many applications of the Becker model state that the main purpose of his essay was to present a microeconomic model of rational behavior. This is not true. Though his model is based on the central assumption of von Neumann-Morgenstern utility, which was introduced in a footnote (Becker, 1968, p. 177). Becker clearly

Table 2

Crime and socioeconomic conditions in West Germany, East Germany, and the city-states in 1996^a

Variables	West Germany ^b	City-states ^c	East Germany ^d
All crimes/100,000 inhabitants	7,768	16,520	9,828
General clear-up rate	50.2	44.8	44.2
Robberies per 100,000 inhabitants	81	303	89
Clear-up rate for robbery	46.1	36.7	53.5
Thefts UAC/100,000 inhabitants	2,304	5,142	3,903
Clear-up rate for thefts UAC	12.9	8.6	15.5
Murders/100,000 inhabitants	7.9	8.0	6.0
Clear-up rate for murders	93.0	87.4	88.5
Foreign citizens in the population (%)	10.3	13.7	1.7
Real GDP <i>per capita</i> in prices from 1991	41,530	48,066	18,016
Unemployment rate	10.7	14.5	17.0
Unemployed aged 24 years or younger as a percentage of all unemployed people	12.9	11.3	11.1
Males aged 15–24 years in the population (%)	5.6	5.4	6.4

^a Source: Annual crime statistics 1996 of the German Federal Criminal Police Office (Bundeskriminalamt), annual statistics 1996 of the Federal Statistical Office of Germany (Statistisches Bundesamt), annual labor statistics 1996 of the Federal Employment Service (Bundesanstalt für Arbeit) and our own calculations.

^b West Germany includes East Berlin.

^c The city-states are Berlin (West and East-Berlin), Bremen and Hamburg.

^d East Germany does not include East Berlin.

determine the individual probability of committing a crime. Changing these factors of deterrence means that the expected payoff from crimes will change and, with that, the number of offenses. Becker calls this relationship between the number of offenses and the amount of deterrence the “supply of offenses.”

Becker’s theoretical work was extended by Ehrlich (1973). By considering a time-allocation model, he motivated the introduction of indicators for legal and illegal income opportunities. These considerations lead to the basic Becker-Ehrlich specification, which is commonly written in logarithmic form:

$$\ln O = \alpha + \beta \ln D + \gamma \ln Y + \delta \ln X, \quad (1)$$

where O is the crime rate, D is deterrence, Y is income, and X is other influences.

In our specification, as in most applications of the Becker-Ehrlich model, we measure deterrence by clear-up rates. A minor part of empirical investigations also uses size and form of punishment. Both are expected to have negative signs in Eq. (1). We refrain from testing the effects of varying the severity of punishment, because the identification of state-specific law interpretations is difficult to obtain and is left to future research.

Our specification also uses two proxies for legal and illegal income opportunities. The first one is the usual indicator (real), GDP *per capita*, which is, according to Ehrlich (1973), a

expresses his motivation by developing “optimal public and private policies to combat illegal behavior” (Becker, 1968, p. 207).

Table 3

List of variables used in regression analysis

Variables used in regressions with both data sets	
<i>O</i>	General crime rate calculated as number of crimes known to the police/100,000 inhabitants
Specific crime rates	
<i>O1</i>	Robbery
<i>O2</i>	Theft UAC
<i>O3</i>	Theft WAC
<i>O4</i>	Fraud
<i>O5</i>	Murder and manslaughter
<i>O6</i>	Rape
<i>O7</i>	Dangerous and serious assault
<i>O8</i>	Damage to property
<i>p</i>	Percentage of crimes cleared up by the police
<i>p1–p8</i>	Specific clear-up ratios
<i>FOREIGN</i>	Percentage of foreign citizens in the population
<i>Y^a</i>	Real GDP <i>per capita</i> in prices from 1991
<i>UNEMPL</i>	Unemployment rate
<i>M15–24</i>	Percentage of males aged 15–24 years in the population
Variables used only in regressions with the long panel (1975–1996)	
<i>Y^r</i>	Relative difference between real GDP <i>per capita</i> in the particular state and the West German average as a percentage of the <i>per capita</i> GDP in the particular state
*–1	1 year lagged values of the variables mentioned above
Δ^*	First differences of the variables mentioned above
Variables used only in regressions with the short panel (1993–1996)	
<i>EAST</i>	Dummy variable that is 1 if the state belongs to the territory of the former German Democratic Republic, and 0 otherwise (united Berlin is treated as a West German state).
<i>CITY</i>	Dummy variable that is 1 if the state is a so-called “city-state,” and 0 otherwise.
<i>UNEMPL24</i>	Unemployed aged 24 years or younger as a percentage of all unemployed people

measure of illegal income opportunities. It should, therefore, have a positive impact on the crime rate. The second proxy is “relative distance to average income” (measured by [“real GDP *per capita* in the respective state” – “federal real GDP *per capita*”]/“real GDP *per capita* in the respective state”), which serves as an indicator of legal income opportunities. This measure is a departure from the relative income variables usually employed in the literature, because it is defined as the inequality between and not within the observational units (states). Our choice is due to the fact that within-state inequality indicators, like the percentage of the population on welfare, percentage of population below some poverty lines, Gini coefficient etc., are not obtainable from official statistics at the state level for the whole period under consideration. Nevertheless, we think that our substitute represents more than a stopgap variable. Given the experience of potential offenders who know overall German standards and possibilities (due to modern mass media and widespread social networks), it is reasonable to assume that potential offenders would ground their personal level of aspiration and their legal reservation wages on well-known national standards, not on local circumstances. Thus, persons, who in fact choose between relative legal and illegal income opportunities, and who are looking for a legal job and/or certain wage levels, would be more successful in relatively rich regions. The person from a relatively poor region would not orient

himself by lower local income levels, even when these might be high from an “absolute” point of view. Thus, we think that our relative income measure is a suitable indicator of legal income opportunities. We expect a negative sign in the supply-of-offenses function.

In modern studies, “other influences” have reached central attention. They are discussed because of the sustainable growth rates of crime in western countries and because of recent economic and demographic problems like unemployment, increasing income inequality, high numbers of foreigners, urbanization, and youth unemployment. Studies about Germany also are faced with the problem of East/West adjustments.

Our general specification takes these points into consideration. It can be written as

$$\ln O = \alpha + \beta \ln p + \gamma_1 \ln Y^a + \gamma_2 Y^r + X' \delta, \quad (2)$$

where O is the crime rate (number of offenses per 100,000 inhabitants), p is the clear-up rate (“probability of being detected”), Y^a is absolute income, Y^r is relative income, and X is unemployment, age, foreigners, urbanization, and east-west differentials.

Eq. (2) serves as a starting point for our econometric specification. In the sense of Eide (1994), it should be named “criminometric” specification.

3.2. *The econometric/criminometric specification*

Our data consist of a cross-section of time series from the German Laender. To exploit both the time-series and cross-section variation of the data, we use standard panel econometric techniques.

The bulk of our estimates is based on annual data from 11 states for the sample period 1975–1996. To keep the analysis tractable, we check the robustness of our results by continuing in two steps. First, we run a static regression using the specification presented above. Then, in a second step, we implement the following error correction model (ECM), which is well known from dynamic time-series analysis (it can be interpreted in the presence of both stationary or nonstationary time series):

$$\begin{aligned} \Delta \ln O = & c + g(\ln O_{-1} - \beta \ln p_{-1} - \gamma_1 \ln Y_{-1}^a - \gamma_2 Y_{-1}^r - X'_{-1} \delta) \\ & + \beta \Delta \ln P + \gamma_1 \Delta \ln Y^a + \gamma_2 \Delta Y^r + \Delta X' \delta, \end{aligned} \quad (3)$$

where Δ is the difference operator. Deviations from the long-run general equilibrium, which is defined in the static Eq. (2) and which can be recognized in parentheses, are expected to be corrected in the next period. Hence, g should have a negative sign. Otherwise, there would be no convergence and the deterrence equation would not be valid.⁹ The estimation results of the barred parameters show whether there are significant forces in the short run that might lead to corrections of the crime rate.

We include dummy variables to control for unobserved heterogeneity within the German Laender. Because the state governments are responsible for criminal prosecution, these dummies cover potential differences in the efficiency of regional criminal justice systems. Moreover, in

⁹ This can be seen easily after transforming $\Delta \ln O = g \ln O(-1)$ to $\ln O = (1 + g) \ln O(-1)$.

Table 4

Estimates of the supply-of-offenses functions: West Germany 1975–1996^a

Independent variables	lnO	lnO1	lnO2	lnO3	lnO4
Constant	−1.93* (−3.74)	−0.66 (−0.46)	1.75* (2.03)	1.18 (1.68)	−12.96* (−5.58)
<i>lnp</i> , <i>lnp1</i> – <i>lnp4</i>	−0.20* (−3.43)	−0.74* (−7.72)	−0.43* (−12.43)	−0.08 (−0.77)	1.12* (4.07)
<i>lnY</i> ^a	0.89* (19.56)	0.40* (3.33)	0.34* (4.24)	0.41* (4.80)	1.23* (7.91)
<i>Y</i> ^r	−1.12* (−9.68)	−0.73* (−2.35)	−0.90* (−4.71)	−0.39* (−2.12)	−1.02* (−2.68)
lnFOREIGN	0.35* (9.80)	0.99* (10.77)	0.42* (7.42)	0.49* (9.53)	0.26* (2.16)
lnUNEMPL	0.04* (2.95)	0.01 (0.25)	0.08* (3.51)	−0.14* (−5.43)	0.37* (7.62)
lnM15–24	0.54* (14.38)	0.38* (4.12)	1.01* (17.08)	0.66* (12.41)	−0.05 (−0.37)
Fixed effects					
Baden-Württemberg	−0.07* (−2.77)	−0.16* (−2.78)	0.11* (2.84)	−0.18* (−5.51)	0.17* {2.26}
Berlin	0.88* (27.25)	1.02* (13.31)	1.25* (26.61)	0.77* (18.72)	0.53* (5.64)
Bremen	0.90* (22.12)	1.30* (15.81)	1.46* (27.17)	0.88* (19.97)	0.56* (5.49)
Hamburg	0.93* (16.90)	1.31* (9.77)	1.48* (18.63)	0.81* (11.64)	0.93* (5.90)
Hesse	0.23* (7.62)	0.25* (3.95)	0.70* (18.74)	0.10* (2.81)	0.22* (3.02)
Lower Saxony	0.40* (11.81)	0.86* (11.52)	0.89* (19.14)	0.57* (12.11)	0.15 (1.46)
North Rhine-Westphalia	0.20* (8.33)	0.33* (7.78)	0.76* (29.46)	0.19* (7.24)	0.02 (0.39)
Rhineland-Palatinate	0.14* (5.74)	0.42* (7.01)	0.46* (12.47)	0.25* (6.11)	0.19* (2.41)
Saarland	0.16* (5.44)	0.65* (9.63)	0.39* (9.43)	0.46* (10.23)	−0.28* (−3.05)
Schleswig-Holstein	0.66* (17.14)	1.02* (11.94)	1.10* (20.84)	0.89* (15.76)	0.27* (2.29)
Adjusted R ²	0.986	0.965	0.982	0.959	0.903
Sum of squared residuals	0.049	0.123	0.076	0.070	0.158
BFN-DW-statistic	1.12	0.82	1.04	0.76	0.83
Wald test on fixed effects	3117.26	847.26	3201.38	1887.29	266.39

contrast to cross-sectional studies, fixed-effect modeling (i.e., the inclusion of state dummy variables) allows us to consider different shares of unreported crime at the state level.

4. Data

For our empirical investigations on the supply-of-offenses functions, we use two different panel data sets. The first one—the *long panel*—is an exclusively West German panel containing

Table 4
Continued

Independent variables	LnO	lnO5	lnO6	lnO7	lnO8
Constant	−1.93* (−3.74)	9.87* (4.37)	11.75* (8.86)	−8.72* (−4.92)	−3.41* (−2.22)
ln <i>p</i> , ln <i>p</i> 5–ln <i>p</i> 8	−0.20* (−3.43)	−0.64* (−1.99)	−0.41* (−3.43)	0.86* (3.28)	−0.27* (−3.36)
ln <i>Y</i> ^a	0.89* (19.56)	−0.64* (−4.35)	−0.95* (−8.61)	0.74* (7.57)	0.88* (6.78)
<i>Y</i> ^r	−1.12* (−9.68)	0.08 (0.22)	0.42 (1.48)	−1.23* (−4.78)	−1.19* (−4.62)
ln <i>FOREIGN</i>	0.35* (9.80)	0.23 (1.90)	0.42* (4.86)	0.44* (5.37)	0.20* (2.55)
ln <i>UNEMPL</i>	0.04* (2.95)	0.08 (1.60)	−0.18* (−5.00)	−0.05 (−1.52)	0.00 (−0.04)
ln <i>M15–24</i>	0.54* (14.38)	0.25* (2.06)	0.72* (7.98)	0.38* (4.74)	0.39* (3.99)
Fixed Effects					
Baden-Württemberg	−0.07* (−2.77)	0.08 (1.00)	−0.05 (−0.91)	−0.20* (−3.98)	−0.10* (−2.00)
Berlin	0.88* (27.25)	0.53* (5.64)	0.91* (11.74)	1.32* (17.64)	0.87* (14.58)
Bremen	0.90* (22.12)	0.90* (8.84)	1.20* (15.07)	1.09* (13.73)	0.74* (11.92)
Hamburg	0.93* (16.90)	0.46* (2.89)	1.16* (9.75)	0.74* (6.55)	0.73* (7.65)
Hesse	0.23* (7.62)	0.34* (4.62)	0.19* (3.25)	−0.01 (−0.25)	0.20* (4.04)
Lower Saxony	0.40* (11.81)	0.19 (1.90)	0.44* (6.12)	0.27* (4.27)	0.32* (5.28)
North Rhine-Westphalia	0.20* (8.33)	−0.14* (−2.60)	0.11* (2.82)	0.23* (6.36)	0.14* (3.95)
Rhineland-Palatinate	0.14* (5.74)	0.29* (3.66)	0.21* (3.72)	0.08 (1.55)	0.06 (1.17)
Saarland	0.16* (5.44)	0.26* (2.93)	0.18* (2.74)	0.36* (6.32)	0.23* (4.07)
Schleswig-Holstein	0.66* (17.14)	−0.05 (−0.41)	0.50* (6.14)	0.53* (6.85)	0.71* (10.29)
Adjusted R ²	0.986	0.732	0.921	0.933	0.925
Sum of squared residuals	0.049	0.161	0.112	0.103	0.090
BFN-DW-statistic	1.12	1.06	1.04	0.49	0.65
Wald test on fixed effects	3117.26	362.33	558.46	972.79	940.40

^a Number of observations is 235 (202 for vandalism). “Bavaria” represents the reference state dummy variable.* Represents *t*-values > 2.

annual data from all 11 Laender that formed the Federal Republic of Germany before the German unification in 1990. This panel is unbalanced because reliable data for the former West Berlin are only available until 1989. All other states are considered from 1975–1996.

The second data set—the *short panel*—contains annual data from all 16 Laender that constitute the Federal Republic of Germany now. In the years following the unification, there were difficulties in the registration of crimes and clear-ups in the five new Laender (Brandenburg, Mecklenburg-Vorpommern, Saxony, Saxony-Anhalt, and Thuringia). For that

Table 5

ECM estimates of the supply-of-offenses functions: West Germany 1975–1996^a

Independent variables	$\Delta \ln O$	$\Delta \ln OI$	$\Delta \ln O2$	$\Delta \ln O3$	$\Delta \ln O4$
Adjustment parameters (g)					
$\ln O_{-1}, \ln OI_{-1} - \ln O4_{-1}$	-0.68* (-11.56)	-0.34* (-6.30)	-0.54* (-9.19)	-0.47* (-8.82)	-0.45* (-7.82)
Long-run coefficients ($\beta, \gamma_1, \gamma_2, \delta$)					
Constant	-1.49 (-1.57)	-11.65* (-2.50)	2.03 (1.04)	2.62 (1.49)	-12.29* (-2.00)
$\ln p_{-1}, \ln pI_{-1} - \ln p4_{-1}$	-0.28* (-3.67)	-1.52* (-5.94)	-0.42* (-7.32)	-0.08 (-0.40)	0.95 (1.54)
$\ln Y^u_{-1}$	0.93* (10.09)	1.93* (4.08)	0.30 (1.59)	0.38* (2.09)	1.26* (2.65)
Y^r_{-1}	-1.24* (-7.77)	-2.59* (-3.27)	-1.15* (-3.50)	-0.50 (-1.58)	-1.22 (-1.50)
$\ln FOREIGN_{-1}$	0.21* (3.82)	0.35 (1.39)	0.32* (3.01)	0.28* (2.89)	0.27 (0.96)
$\ln UNEMPL_{-1}$	0.05 (1.81)	-0.08 (-0.67)	0.00 (-0.02)	-0.13* (-2.57)	0.25* (2.06)
$\ln M15-24_{-1}$	0.43* (7.85)	0.16 (0.66)	1.20* (10.64)	0.31* (2.99)	-0.06 (-0.20)
Fixed effects					
Baden-Württemberg	-0.01 (-0.20)	0.02 (0.17)	0.15* (2.22)	-0.08 (-1.34)	0.14 (0.81)
Berlin	0.94* (21.57)	1.23* (6.55)	1.39* (17.00)	0.85* (11.80)	0.66* (3.32)
Bremen	0.90* (16.41)	1.40* (6.82)	1.63* (17.82)	0.91* (12.09)	0.64* (3.05)
Hamburg	0.97* (13.42)	1.26* (3.90)	1.73* (12.99)	0.89* (7.74)	1.02* (3.17)
Hesse	0.27* (6.74)	0.33* (2.29)	0.81* (12.69)	0.18* (2.84)	0.25 (1.70)
Lower Saxony	0.31* (6.60)	0.50* (2.73)	0.85* (10.52)	0.44* (5.41)	0.21 (0.97)
North Rhine-Westphalia	0.21* (6.76)	0.44* (4.58)	0.83* (19.49)	0.23* (4.97)	0.10 (0.93)
Rhineland-Palatinate	0.09* (2.65)	0.17 (1.23)	0.42* (6.90)	0.16* (2.31)	0.24 (1.47)
Saarland	0.09* (2.22)	0.39* (2.45)	0.37* (5.04)	0.37* (4.67)	-0.23 (-1.17)
Schleswig-Holstein	0.54* (9.90)	0.48* (2.20)	1.04* (11.11)	0.72* (7.17)	0.31 (1.15)
Short-run coefficients ($\bar{\beta}, \bar{\gamma}_1, \bar{\gamma}_2, \bar{\delta}$)					
$\Delta \ln p, \Delta \ln pI - \Delta \ln p4$	-0.12 (-1.81)	-0.22* (-2.19)	-0.16* (-3.58)	0.16 (1.78)	0.63* (2.37)
$\Delta \ln Y^u$	-0.09 (-0.67)	0.23 (0.76)	-0.35 (-1.59)	-0.28 (-1.56)	0.08 (0.17)
ΔY^r	0.00 (0.56)	0.00 (-0.23)	0.00 (0.41)	0.00 (0.20)	-0.02 (-0.72)
$\Delta \ln FOREIGN$	0.18* (2.41)	0.11 (0.63)	0.38* (3.22)	0.23* (2.35)	-0.21 (-0.84)
$\Delta \ln UNEMPL$	0.07* (2.80)	0.06 (1.10)	0.06 (1.51)	-0.08* (-2.48)	0.31* (3.68)
$\Delta \ln M15-24$	0.53* (3.07)	1.52* (3.64)	0.31 (1.11)	0.68* (2.76)	-0.07 (-0.12)
Adjusted R ²	0.512	0.244	0.498	0.419	0.249
Sum of squared residuals	0.038	0.083	0.060	0.049	0.127
BFN-DW-statistic	1.89	1.93	1.78	1.86	2.13
Wald test on fixed effects	1818.87	135.10	1244.77	593.62	83.16

Table 5
Continued

Independent variables	$\Delta \ln O$	$\Delta \ln O5$	$\Delta \ln O6$	$\Delta \ln O7$	$\Delta \ln O8$
Adjustment parameters (g)					
$\ln O_{-1}, \ln O5_{-1} - \ln O8_{-1}$	-0.68* (-11.56)	-0.54* (-8.42)	-0.51* (-7.78)	-0.25* (-5.87)	-0.27* (-4.68)
Long-run coefficients ($\beta, \gamma_1, \gamma_2, \delta$)					
Constant	-1.49 (-1.57)	1.60 (0.27)	9.71* (2.74)	-16.50* (-3.27)	5.34 (0.66)
$\ln p_{-1}, \ln p5_{-1} - \ln p8_{-1}$	-0.28* (-3.67)	-0.30 (-0.38)	-0.43 (-1.51)	-0.09 (-0.12)	0.03 (0.11)
$\ln Y^u_{-1}$	0.93* (10.09)	-0.08 (-0.18)	-0.64 (-1.89)	2.09* (4.73)	0.06 (0.08)
Y^r_{-1}	-1.24* (-7.77)	-0.97 (-1.26)	0.23 (0.38)	-2.30* (-3.32)	-0.49 (-0.51)
$\ln FOREIGN_{-1}$	0.21* (3.82)	0.38 (1.43)	0.17 (0.84)	-0.04 (-0.14)	0.15 (0.55)
$\ln UNEMPL_{-1}$	0.05 (1.81)	-0.07 (-0.56)	-0.18* (-2.01)	-0.09 (-0.89)	0.02 (0.18)
$\ln M15-24_{-1}$	0.43* (7.85)	0.65* (2.47)	0.42* (2.03)	-0.15 (-0.64)	-0.10 (-0.29)
Fixed effects					
Baden-Württemberg	-0.01 (-0.20)	0.00 (0.02)	0.03 (0.27)	0.00 (-0.04)	0.02 (0.15)
Berlin	0.94* (21.57)	0.60* (3.34)	0.97* (6.01)	1.31* (6.84)	0.94* (4.91)
Bremen	0.90* (16.41)	1.09* (5.52)	1.20* (7.18)	0.90* (4.37)	0.81* (4.26)
Hamburg	0.97* (13.42)	0.66* (2.23)	1.15* (4.82)	0.46 (1.55)	0.87* (3.09)
Hesse	0.27* (6.74)	0.36* (2.71)	0.23* (2.07)	0.04 (0.33)	0.23 (1.54)
Lower Saxony	0.31* (6.60)	0.24 (1.25)	0.33* (2.19)	0.16 (0.95)	0.28 (1.48)
North Rhine-Westphalia	0.21* (6.76)	-0.13 (-1.29)	0.16* (2.12)	0.33* (3.87)	0.17 (1.64)
Rhineland-Palatinate	0.09* (2.65)	0.30* (2.11)	0.14 (1.27)	0.04 (0.32)	0.08 (0.52)
Saarland	0.09* (2.22)	0.29 (1.69)	0.08 (0.58)	0.38* (2.47)	0.20 (1.13)
Schleswig-Holstein	0.54* (9.90)	-0.01 (-0.06)	0.35* (1.98)	0.22 (1.01)	0.65* (2.94)
Short-run coefficients ($\bar{\beta}, \bar{\gamma}_1, \bar{\gamma}_2, \bar{\delta}$)					
$\Delta \ln p, \Delta \ln p5 - \Delta \ln p8$	-0.12 (-1.81)	-0.32 (-1.07)	-0.33* (-2.71)	-0.35 (-1.50)	0.02 (0.33)
$\Delta \ln Y^u$	-0.09 (-0.67)	-0.19 (-0.35)	-0.36 (-0.95)	0.16 (0.77)	-0.12 (-0.47)
ΔY^r	0.00 (0.56)	-0.01 (-0.45)	0.01 (0.31)	0.00 (0.36)	0.02 (1.80)
$\Delta \ln FOREIGN$	0.18* (2.41)	0.11 (0.38)	0.06 (0.28)	0.03 (0.22)	0.25 (1.78)
$\Delta \ln UNEMPL$	0.07* (2.80)	0.07 (0.74)	-0.02 (-0.35)	-0.04 (-1.03)	-0.09 (-1.93)
$\Delta \ln M15-24$	0.53* (3.07)	0.40 (0.59)	0.82 (1.70)	1.34* (5.07)	0.17 (0.42)
Adjusted R^2	0.512	0.238	0.222	0.300	0.216
Sum of squared residuals	0.038	0.143	0.105	0.057	0.061
BFN-DW-Statistic	1.89	2.08	2.03	1.98	2.01
Wald test on fixed effects	1818.87	130.42	122.92	172.45	113.49

^a Numbers of observations is 224 (191 for vandalism). "Bavaria" represents the reference state dummy variable

* Represents t -values > 2 .

Table 6
Estimates of the supply-of-offenses functions: Germany 1993–1996^a

Independent variables	lnO	lnOI	lnO2	lnO3	lnO4	lnO5	lnO6	lnO7	lnO8
Constant	6.65* (2.35)	-2.98 (-0.86)	-4.76 (-1.09)	0.33 (0.16)	-0.37 (-0.12)	5.43 (1.84)	-9.47* (-3.16)	0.58 (0.14)	3.86 (1.11)
<i>EAST</i>	0.44* (2.05)	1.28* (4.93)	0.95* (2.73)	0.33* (2.02)	0.54 (1.87)	0.53* (2.17)	0.57* (2.53)	-0.72* (-3.12)	0.31 (1.08)
<i>CITY</i>	0.60* (6.26)	0.77* (5.95)	0.44* (2.53)	0.54* (6.94)	0.69* (5.77)	0.45* (3.30)	0.94* (8.49)	0.64* (3.93)	0.58* (4.46)
<i>lnp, lnpl-lnp8</i>	-0.65* (-3.73)	-1.20* (-5.72)	-0.60* (-3.83)	-0.91* (-5.34)	-0.02 (-0.08)	-1.94* (-7.08)	0.18 (0.66)	0.87 (1.30)	0.23 (1.16)
<i>lnY^{ei}</i>	0.03 (0.15)	0.43* (2.00)	0.18 (0.62)	0.47* (3.25)	0.36 (1.65)	-0.10 (-0.43)	0.21 (1.12)	-0.50* (-2.55)	-0.34 (-1.44)
<i>lnFOREIGN</i>	0.22* (2.61)	0.44* (4.16)	0.36* (2.54)	0.07 (0.97)	0.21 (1.91)	0.33* (3.25)	0.23* (2.51)	0.23* (2.35)	0.20 (1.60)
<i>lnUNEMPL</i>	0.41* (2.33)	1.13* (5.57)	1.25* (4.50)	0.67* (5.12)	0.30 (1.45)	0.45* (2.29)	0.31 (1.73)	0.99* (5.34)	0.67* (2.95)
<i>lnUNEMPL24</i>	0.67 (1.38)	1.29* (2.25)	1.95* (2.45)	0.72 (1.94)	0.78 (1.35)	1.63* (2.98)	1.95* (3.92)	0.23 (0.45)	0.92 (1.46)
<i>lnMI5-24</i>	0.75 (1.59)	0.12 (0.21)	1.98* (2.57)	1.29* (3.39)	0.02 (0.04)	-0.10 (-0.17)	1.18* (2.32)	1.30* (2.45)	0.67 (1.03)
Adjusted R ²	0.824	0.921	0.790	0.867	0.776	0.796	0.838	0.798	0.668
Sum of squared residuals	0.152	0.188	0.251	0.122	0.190	0.182	0.167	0.172	0.211
BFN-DW-statistic	0.62	0.95	0.85	1.11	0.64	0.93	1.24	0.65	0.49

^a Note: number of observations is 64. * Represents *t*-values > 2.

reason, only a period of 4 years (1993–1996) can be considered in a crime-related data set containing all 16 Laender of the unified Germany.¹⁰ Furthermore, it should be mentioned that Berlin, which contained West German and East German parts, is treated as a West German state in our empirical analysis.¹¹

Table 3 describes all variables that are used in our estimations. All crime and clear-up rates are taken from the German Federal Criminal Police Office (Bundeskriminalamt). The choice of crime categories is limited by the availability of clear-up rates on the state level.

The variables *FOREIGN* (percentage of foreigners in the population), Y^a (real GDP *per capita* in constant prices), *M15-24* (percentage of males aged 15–24 years in the population), and Y^r (relative distance between states' GDP and federal GDP) result from our own calculations on the basis of Statistical Yearbooks from the Federal Statistical Office of Germany (Statistisches Bundesamt). The variable *UNEMPL* (unemployment rate) was taken from annual reports of the Federal Employment Service (Bundesanstalt für Arbeit), and the variable *UNEMPL24* (share of unemployed persons under 25 years of age out of all unemployed persons) is our own calculation on the basis of the periodical "Strukturanalyse" of the same office. Because data on the number of unemployed persons under 25 years of age are not available for the years before 1991 at the state level, the variable *UNEMPL24* can only be used for estimations based on the short panel. Because we run exclusively fixed-effects regressions in the long panel and because the latter only consists of West German states, the variables *EAST* (indicator variable for East Germany) and *CITY* (indicator variable for the city-states) can only be used in the short panel. Other variables are exclusively used in the long panel. The use of Y^r in the short panel is not reasonable because the relative income measure does not exhibit enough variation over time.

5. Results

Our results are based on static and dynamic panel data modeling. Table 4 presents static fixed-effect estimations for the long panel, Table 5 reveals the corresponding error correction specification, and Table 6 shows the results for the short panel. We first comment on results presented in Tables 4 and 5. After this, we check whether the results hold for recent data from the unified Germany.

As in most empirical studies investigating aggregate crime, the effect of the deterrence variable p shows a negative sign. The aggregate parameter is -0.20 in the static framework and -0.28 in the ECM.¹² It is somewhat smaller than the median elasticity of about -0.5 that

¹⁰ According to notes given in our data source (Bundeskriminalamt, 1996), East German police statistics from the years 1990–1992 are biased downward due to administrative adjustment problems. Thus, 1993 is the first year after the unification that allows for a reasonable comparison between East and West German crime figures.

¹¹ This can be justified by the fact that former West Berlin is about 65% larger in population and 150% larger in GDP than East Berlin. Because of the fast adjustment of East Berlin's living conditions to West German standards, the united city may be more appropriately considered West German than East German.

¹² To investigate potential biases due to the simultaneity between crime and clear-up rates, we have run regressions with delayed clear-up ratios. We found that the estimated coefficients remained largely unaffected by

is given in the study by Eide (1997), who summarizes the estimates of 21 cross-sectional studies based on a variety of model specifications, types of data, and regression techniques. The deterrence hypothesis works quite well for crime against property, in particular theft under aggravating circumstances (UAC) and robbery. An unexpected positive sign, however, is found for fraud, although the parameter becomes insignificant in Table 5, where error correction dynamics are taken into account.¹³

The demographic factors reveal important and significant influences. Relatively large, young cohorts (we measure the relative size of the group 15–24 years old) increase crime rates in the majority of crime categories. Looking at the size of the parameter, we find, perhaps not surprisingly, that theft UAC is mainly influenced by the population share of young people (elasticities in Tables 4 and 5, 1.0 and 1.2, respectively). Urbanization effects are covered by fixed effects. We started by considering population density directly. It was highly significant, with expected higher crime rates in densely populated areas. Then we added fixed effects, which became significant, whereas population density changed to insignificance. We concluded that fixed effects cover population density but that they also contain additional unobserved heterogeneity. Thus, we stayed with fixed effects only. The positive impact of foreigners on crime rates is significant at first glance (see Table 4). However, significance levels may be biased due to serial correlation, as is suggested by the low BFN-DW-statistic¹⁴ for panel data in Table 4. Inspecting dynamic estimations in Table 5, in which the serial correlation of residuals has been removed, we observe that among the various types of crime only theft UAC and without aggravating circumstances (WAC) remain significant. In particular, there is no significant difference to Germans with respect to crime against the person. Thus, because theft is the category closest to the rational offender, one might conclude that crimes of foreigners are more often committed for economic reasons. Of course, such conclusions can only be preliminary and would need more (micro) studies that can control for individual effects such as neighborhood and social interaction.

this modification. The estimation results that are omitted here can be obtained from an earlier version of this article (Entorf and Spengler, 1998). This article is available on the Internet (http://papers.ssrn.com/paper.taf?abstract_id=155274) or, by request, from the authors. Alternative ways to deal with simultaneity are proposed by Ehrlich (1973) and Levitt (1997). Ehrlich (1973) accounts for the interactional relationship between crime and conviction rates by formulating a simultaneous equation model composed of three equations: a supply-of-offenses function, in which the crime rate is the left-hand side variable; a production function of direct law-enforcement activity by police and courts (the left-hand side variable is conviction rate); and a public demand function for law enforcement (the left-hand side variable is *per capita* expenditure on police in a given year). Employing two-stage least squares and simultaneous-equation estimation methods, Ehrlich confirms the significant negative coefficient of the deterrence variable (i.e., the rate of conviction). Levitt (1997) finds similar results in his panel analysis based on 59 U.S. cities from the period 1970–1992, using the number of police instead of the conviction or clear-up rate as the deterrence variable. In ordinary least squares regressions, the impact of changes in the number of police on reductions in the crime rates turns out to be lower than in two-stage least squares regressions, in which simultaneity is tackled by using the timing of elections as an instrumental variable of the police variable. Thus, Levitt's results suggest that ordinary least squares might underestimate the true deterrence effect.

¹³ A positive sign in the supply of offenses function would indicate risk-loving criminals, the inferiority of leisure, or the endowment income effect of the Slutsky equation (known from the reasoning behind the backward-bending labor-supply curve) (see, for instance, Entorf, 1999, for details).

¹⁴ Bhargava et al. (1982) simulate and tabulate critical values for different N, T, and numbers of regressors.

As expected, absolute income, measured by GDP *per capita*, turns out to be an indicator of illegal rather than legal income opportunities. Across all types of property crime (robbery,¹⁵ theft UAC, theft WAC and fraud), and for static as well as dynamic specifications, GDP *per capita* shows positive significant effects on crime (the only exception is the positive insignificant estimate in the error correction regression of theft UAC). In contrast to that, for the felonies murder and rape we find negative significant effects of absolute wealth in the static regressions and negative insignificant absolute wealth effects in the error correction framework. On the one hand, these results seem to indicate that for lethal violence (absolute) income has to be interpreted as a measure of legal income opportunities (instead of indicating illegal income possibilities, as in the case of crime against property).

On the other hand, the findings might rather imply that the concept of income opportunities (legal or illegal) is not the appropriate way to assess the incidence of crimes like murder and rape, for which pecuniary motives are less obvious. This, however, does not necessarily mean that measures of absolute or relative wealth should be excluded from violent crime regressions. In models of violent crime, we propose to interpret wealth as an indicator of the regard for individual rights. Thus, it would be correlated with income and the degree of economic freedom, but also associated with the degree of human, social, and cultural capital in a society. Whereas this interpretation might be a bit farfetched for an investigation as ours, which is based on (disaggregate) data from one single country, it certainly helps to understand the negative correlation between absolute wealth and murder found in studies using international data (Brantingham & Easton, 1998; Entorf, 1996).

Tables 4 and 5 show that higher values of the relative income measure (i.e., improvements of a state's GDP *per capita* in comparison to the federal average) consistently result in decreasing property crime rates. It is striking that the impact of relative wealth on robbery and theft UAC—the crime categories presumably most closely related to the pursuit of material gains—turns out to be negative and significant across all specifications. Thus, the effects of relative income are in accordance with our expectations; i.e., relative income measured in the way described above represents a legal income opportunity.

Finally, two rather technical remarks are in order. First, it has to be noted that the estimated coefficients of the relative income variable have to be interpreted as “semi-elasticities,” not as elasticities (the latter case holds for all other coefficients of non-dummy variables). Due to the occurrence of negative values (see Fig. 5), it is not possible to take logarithms of relative values. Instead, the coefficients have to be understood as the *proportional* rate of change of the particular crime rate with respect to *absolute* changes of relative income.¹⁶ Second, we want to dispel potential concerns that the opposite signs of both

¹⁵ According to the penal code, robbery is a violent crime. This is obviously correct because robbery, per definition, contains personal violence or at least the threat of it (see the Appendix). Nevertheless, for the further course of the present article, we find it more appropriate to subsume robbery under property crime, because the predominant intention of robbers is greed for money. Violence against the person is just a mean to that end.

¹⁶ Assume, for instance, an estimated coefficient of -0.90 and an increase of relative income from 0.20 to 0.21 (note that relative income is defined as a ratio). According to the semi-log-specification, this estimation would imply a reduction of crime by -0.9% . However, in terms of elasticities the increase from 0.20 to 0.21 would imply an increase of 5% , so that the (dimensionless) elasticity would amount to only -0.18 .

income variables are the result of collinearity. We have run regressions in which either absolute or relative income was excluded and found robust signs of both income variables. Of course, there were different parameters because of the omitted variable bias.¹⁷

Unemployment shows small, often insignificant, and ambiguous signs. In the ECM, only theft WAC, fraud, and rape are significant, but the signs (negative for rape and theft) are hard to explain in a conventional framework. There are, however, explanations given by criminologists (Sutherland & Cressey, 1974) predicting that employment increases illegal behavior by exposing individuals to a wider network of delinquent peers (see Ploeger, 1997, for empirical evidence).

Completing our conclusions based on the long panel, we observe significant and consistently negative error correction parameters (i.e., the parameter g in Eq. [3]). They range between -0.25 (assault) and -0.68 (aggregate category), indicating a relatively quick convergence to equilibrium (see Table 5). Differenced variables representing short-run corrections of disequilibrium situations mostly reveal no significant differences when compared to the long-run equilibrium behavior. An exception is the lack of significance of absolute and relative income variables. Evidently, the perceptions of potential offenders of legal and illegal income opportunities do not change with temporary income fluctuations. Only permanent income changes determine the (long-run) development of crime.

Table 6 contains results from a unified Germany (1993–1996). In these data, the impact of unemployment becomes higher and unambiguously positive. Moreover, economic motivations shine through more clearly than in the previous sample, particularly because the “economic” categories robbery and theft UAC have high elasticities with respect to unemployment of about one or higher.¹⁸ As can be gathered from the surveys of Chiricos (1987) and Freeman (1995), the performance of general unemployment in crime regressions based on aggregated data heavily depends on the structure of the employed data set. It is reported that inconclusive results are the rule in time-series studies, whereas cross-sectional data reveal a positive link between unemployment and crime. Thus, the “good” performance of the unemployment rate in our short-panel investigations may be attributable to the fact that the latter has a dominant cross-sectional dimension. By analogy, the inconsistent results based on the long panel might arise due to the dominant time-series dimension of this data set.

Table 6 distinguishes between being “young” and being “young and unemployed.” There is no clear result indicating that it is exclusively the fact of being “young and unemployed” that leads to crime. Even after controlling for the possibility of being in the group of young unemployed persons, simply being young is more often associated with theft UAC and WAC, rape, and assault than being in other age groups. Nevertheless, there are clear signs that being young and unemployed increases the probability of committing a crime. In all categories, this variable has positive effects, and in five of eight categories the t -value is above 1.94.

With respect to the probability of being detected, the deterrence parameter seems to be

¹⁷ For the estimation results, the interested reader is again referred to Entorf & Spengler (1998).

¹⁸ We only ran static regressions, so corresponding t -values could be misleading. However, because we only have 4 years of observations and only small variation in some of the variables, error correction modeling would not make sense.

higher than in Tables 4 and 5 (theft UAC, -0.60 ; theft WAC, -0.91 ; robbery, -1.20). With the exception of the surprisingly high estimate for murder (-1.94), the estimates confirm the better performance of the deterrence hypothesis for crime against property.

In the short panel, income is measured only in terms of absolute income because the relative income of single states has insufficient variance. The missing variable might be the reason for the very small and insignificant effect for the aggregate category. However, the positive signs for crimes against property (robbery, theft, and fraud) are confirmed.

The comparison of East Germany with West Germany reveals higher crime rates in the east (with the exception of assault¹⁹). Crimes against property are also the “favorite” crimes in East Germany, as can be seen from the high parameter estimates of the *EAST* dummies in regressions (2)–(5) (Table 6). The biggest difference can be detected for robbery, where, *ceteris paribus*, East German states have a $>120\%$ higher crime rates than West German non-city-states.

The remaining variables do not reveal any surprises. *CITY* measures the (higher) crime premium in “city-states” (Berlin, Bremen, and Hamburg). As before, *FOREIGN* is associated with positive, but not necessarily significant, crime effects.

6. Conclusions

In this article, we estimate supply-of-offenses functions for aggregated crime and for eight different crime categories using panel data from the German Laender. We consider three groups of independent variables in our econometric/criminometric specifications: deterrence, economic, and sociodemographic. The results confirm the deterrence hypothesis for crime against property of Becker (1968), though only weak support can be observed for crime against the person.

Economic variables that are used to measure legal and illegal income opportunities perform as expected regarding crime against property. As already suggested by Ehrlich (1973), absolute income turns out to be a measure of illegal rather than legal income opportunities (i.e., higher income is associated with higher crime rates). Results based on relative income show that a widening income gap with respect to the federal average affects the incidence of crime via a change of legal income opportunities. Both income variables exercise a much higher explanatory power in regressions of property crime than in those of violent crime.

As regards crime in the eastern and western parts of Germany, there remains a higher crime rate in the east, even after considering differences in legal and illegal income opportunities and other factors of crime. The reason for this is not clear. Possibly, the prosecution of crime and the administration of justice are still organized inefficiently in eastern Germany. Another explanation might be that the newly gained freedom has led to a (temporarily?) higher violation of social norms. However, a reasonable explanation of the east-west crime differential would need further research.

¹⁹ Inspecting simple descriptive statistics, it is interesting to see that within the period under investigation the East German rate for dangerous and serious assault is, on average, 30% lower than the corresponding West German rate (see Bundeskriminalamt, 1996).

Demographic factors reveal important and significant influences. As usually found in the literature, we observe higher crime rates in highly urbanized areas. Moreover, we confirm the ambiguous result for general unemployment. However, being young and unemployed increases the probability of committing crimes. Additionally, also simply being young aggravates the propensity toward delinquent behavior. Interpreting the influence of the aggregate share of foreigners is difficult in aggregate studies and can only be tentative. Our results suggest that the share of foreigners in Germany is positively associated with crime against property, in particular theft.

Our analysis has left us with many new questions. Future research should pay more attention to the social and demographic influences of crime, especially in the light of family background and social interactions. The practicability of this task is, of course, closely related to, and limited by, the need for less aggregated data.

Appendix

Definitions of crime categories

In this part of the Appendix, we present the definitions of the eight crime categories used in the estimations according to the German “Strafgesetzbuch” (StGB), i.e., the penal code.²⁰ If categories consist of several related offenses, all relevant sections of the penal code will be presented.

Murder and manslaughter

- *Murder*: (§211 StGB) the killing of a human being to satisfy homicidal desires, sexual instincts, greed, or other low motives in ways that are malicious, cruel, or dangerous to the public, or to make another criminal act possible or to conceal it.
- *Manslaughter*: (§212 & 213 StGB) the killing of a human being without intention or malice; also if provoked by actions and insults of the victim.
- *Assisted suicide*: (§216 StGB; homicide on demand) the killing of a human being at the express and earnest request of that person.

Rape

- *Rape*: (§177 StGB) the forcing of a woman to sexual intercourse outside of her marriage with the perpetrator or a third person through the use or threat of a present danger to her body or life. (Sexual intercourse without valid consent.)

Robbery

- *Robbery*: (§249 StGB) the taking away of someone else’s property through the use or threat of a present danger to the body or life.

²⁰ Definitions refer to the penal code that was valid up to 1996 (i.e., the end of our sample period).

- *Aggravated Robbery*: (§250 StGB) if the perpetrator of the robbery or another participant in the robbery carries a firearm, or carries a weapon or other tools to overcome the resistance of another person by force or the threat of force, or puts someone in danger of death or serious bodily harm through the robbery, or commits robbery as a member of or with a member of a gang formed for the purpose of committing theft or robbery.
- *Robbery resulting in death*: (§251 StGB) if the perpetrator of the robbery leads to the careless death of another.
- *Theft with elements of robbery*: (§252 StGB) if a perpetrator, discovered in the act of theft, takes possession of stolen goods through the use or threat of a present danger to the body or life of another.
- *Blackmail with elements of robbery*: (§255 StGB) if the perpetrator blackmails a person through the use or threat of a present danger to the body or life of another.

Dangerous and serious assault

- *Dangerous assault*: (§223a StGB) assault using a weapon, especially a knife or other dangerous tool, or using a deceitful attack, or a group, or methods to endanger the life of someone.
- *Serious assault*: (§224 StGB; maiming) assault resulting in: the loss of a limb, the sight of one or both eyes, hearing, speech, or the ability to procreate; or, the long-term distortion of such; or, a state of sickness, paralysis, or mental illness. Includes both (§225 parts 1&2 StGB; “particularly serious assault”) negligent/unintentional and intentional bodily harm.
- *Participation in a fight*: (§227 StGB) the participation in a fight or an attack by several perpetrators that resulted in the death of a person or in serious bodily harm (§224 StGB).
- *Poisoning*: (§229 StGB) the administration of a poison or other substances that can destroy one’s health to someone with the intention of damaging his/her health.

Theft WAC (without aggravating circumstances)

- *Theft*: (§242 StGB) the taking away of someone else’s property with the intention of illegally appropriating the item.
- *Home and family theft*: (§247 StGB) if the victims of theft or embezzlement are relatives, guardians, or members of the perpetrator’s household, the case is prosecuted only if a claim is filed.
- *Petty theft and embezzlement*: (§248a StGB) if the items stolen or embezzled are of minute value, the case is pursued only if a claim is filed.
- *Unauthorized use of a vehicle*: (§248b StGB) the use of a motor vehicle or bicycle without the consent of the authorized user/owner.
- *Tapping of electrical power*: (§248c StGB) the tapping of electrical systems or installations with the intention of illegally appropriating electrical power.

Theft UAC (under aggravating circumstances)

- *Aggravated theft*: (§243 StGB, “particularly serious case of theft”) if the perpetrator of a theft: 1) breaks into, climbs into, or otherwise enters a building, a residence, an office,

a business, or another closed space, or if the perpetrator uses a fake key or other tools to gain entry or hide in the space; or 2) steals an item that had been protected against theft by a closed container or other security measures; or 3) steals as a vocation; or 4) steals an item used in religious ceremonies or services from a church, or other building, or space used for religious purposes; or 5) steals an item of scientific, artistic, or historical significance or an item of importance to technological developments found in a public collection or on public display; or 6) steals by taking advantage of someone's helplessness or an accident or other danger; or 7) steals a firearm for which a permit is necessary, or a machine gun, or a fully or semiautomatic rifle, or explosive weapons of war (as defined by the War Weapons Control Law).

- *Theft with weapons, gang theft*: (§244 StGB) theft in which: 1) the perpetrator or another participant carries a firearm; or 2) the perpetrator or another participant carries a weapon or other tools or items to prevent or overcome the resistance of another person through force or the threat of force; or 3) the perpetrator, as a member of a gang formed to steal and rob, steals with the assistance of another gang member.
- *Serious gang theft*: (§244a StGB) theft in which the perpetrator, as a member of a gang formed to steal and rob, with the assistance of another gang member meets the requirements of §243 paragraph 1, part 2 StGB or §244 paragraph 1, number 1 or 2, StGB.

Fraud

- *Fraud*: (§263 StGB) the acquisition of someone else's property for one's own illegal enrichment or that of a third party by deception or by suppression of true facts.
- *Computer fraud*: (§263a StGB) the acquisition of someone else's property for one's own illegal enrichment or that of a third party through the results of a computerized process by means of the incorrect creation of a program, the use of inaccurate or incomplete data, the unauthorized use of data, or the unauthorized influence on the course of a computerized process.
- *Subsidy fraud*: (§264 StGB) the acquisition of subsidies by reporting deceptive, incorrect, or incomplete facts or by withholding information. The abuse of office or the assistance through the abuse of office is considered *serious subsidy fraud*. Subsidies are payments out of public moneys to businesses or entrepreneurs that are based on federal, state, or European Community rights and are, in part, granted without an exchange of services and are meant to promote the economic activity.
- *Investment fraud*: (§264a StGB) the misrepresentation of material facts or the withholding of negative material facts necessary to the investment decision in prospectuses, presentations, or overviews in the sales and offerings of stocks, options, or shares that allow the participation in the results of a company.
- *Insurance fraud*: (§265 StGB) the intentional, fraudulent damage to a fire-insured property through arson or to an insured ship or its cargo through sinking or beaching.
- *Fraudulent acquisition of services*: (§265a StGB) the acquisition of the services of a vending machine or of public broadcasting installations or of public transportation or the acquisition of free admission to an event or exhibit.

- *Credit fraud*: (§265b StGB) the misrepresentation of business facts or the use of false or incomplete information to obtain credit for a business.

Vandalism (damage to property)

- *Vandalism*: (§303 StGB) the illegal damage to or destruction of someone else's property.
- *Data manipulation*: (§303a StGB) the illegal erasure, suppression, change, or making unusable of data.
- *Computer sabotage*: (§303b StGB) the disruption of data processing that is of considerable significance to someone else's firm, business, or office through illegal erasure, suppression, change, or making unusable of data.
- *Claims*: (§303c StGB) the crimes described in sections 303–303b are only prosecuted if a claim is filed, unless the prosecutor finds a particular public interest in pursuing the case.
- *Vandalism of public or community property*: (§304 StGB) the illegal damage to or destruction of: items in tribute to a state-recognized church or items used in religious services; or grave markers, public monuments, natural monuments; or artistic, scientific, or trade works that are part of public collections or public exhibits; or items meant to serve the public good or the beautification of public paths, places, or parks.
- *Destruction of public works or buildings*: (§305 StGB) the illegal complete or partial destruction of a building, bridge, dam, paved road, railway, or other structure that is someone else's property.

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References

- Akerlof, G. A. (1997). Social distance and social decisions. *Econometrica* 65, 1005–1027.
- Becker, G. S. (1968). Crime and punishment: an economic approach. *J Political Econ* 76, 169–217.
- Bhargava, A., Franzini, L., & Narendranathan, W. (1982). Serial correlation and fixed effects model, *Rev Econ Studies* 58, 129–140.
- Brantingham, P., & Easton, T. (1998). *The Costs of Crime: Who Pays and How Much? 1998 Update*. Fraser Institute. Vancouver, Canada.

- Bundesanstalt für Arbeit, Jahreszahlen (various issues, 1975–1996), Nürnberg, Germany.
- Bundesanstalt für Arbeit, Strukturanalyse (various issues, 1975–1996), Nürnberg, Germany.
- Bundeskriminalamt, Polizeiliche Kriminalstatistik (various issues, 1975–1996), Wiesbaden, Germany.
- Chiricos, T. G. (1987). Rates of crime and unemployment: an analysis of aggregate research evidence. *Soc Problems* 34, 187–211.
- DiIulio, J. J., Jr. (1996). Help wanted: economists, crime and public policy *J Econ Perspect* 10, 43–67.
- Ehrlich, I. (1973). Participation in illegitimate activities: a theoretical and empirical investigation. *J Political Econ* 81, 521–565.
- Ehrlich, I. (1996). Crime, punishment, and the market for offenses. *J Econ Perspect* 10, 43–67.
- Eide, E. (1994). *Economics of Crime: Deterrence and the Rational Offender*. Amsterdam: North-Holland.
- Eide, E. (1997). Economics of criminal behavior: survey and bibliography. Working paper law and economics C No. 5, Institutt for privatrett, Universitetet i Oslo.
- Entorf, H. (1996). Kriminalität und ökonomie: übersicht und neue evidenz. *Zeitschrift für Wirtschafts-und Sozialwissenschaften* 116, 417–450.
- Entorf, H. (1999). Ökonomische theorie der kriminalität. In C. Ott & H.-B. Schäfer (Eds.), *Die Präventivwirkung zivil-und strafrechtlicher Sanktionen: Beiträge zum 6. Travemünder Symposium zur Ökonomischen Analyse des Rechts vom 25–28. März 1998*. Tübingen, Germany: Mohr Siebeck.
- Entorf, H., & Spengler, H. (1998). Socio-economic and demographic factors of crime in germany: evidence from panel data of the german states. Zentrum für Europäische Wirtschaftsforschung, Discussion paper No. 98-16. Available at: http://papers.ssrn.com/paper.taf?abstract_id=155274.
- Freeman, R. B. (1995). The labor market. In J.Q. Wilson & J. Petersilia (Eds.), *Crime*. Oakland, CA: ICS Press.
- Freeman, R. B. (1996). Why do so many young American men commit crimes and what might we do about it? *J Econ Perspect* 10, 25–42.
- Glaeser, E. L., Sacerdote, B., & Scheinkman, J. A. (1996). Crime and social interactions. *Q J Econ* 111, 507–548.
- Grogger, J. (1995). The effect of arrest on the employment and earnings of young men. *Q J Econ* 110, 51–72.
- Grogger, J. (1998). Market wages and youth crime. *J Labor Econ* 16, 756–791.
- Interpol, International Crime Statistics (various issues, 1975–1996), Lyon.
- Krueger, A. B., & Pischke, J.-S. (1996). A statistical analysis of crime against foreigners in unified Germany. *J Hum Resources* 32, 182–209.
- Levitt, S. D. (1997). Using electoral cycles in police hiring to estimate the effect of police on crime. *Am Econ Rev* 87, 270–290.
- Levitt, S. D. (1998). Juvenile crime and punishment. *J Political Econ* 106, 1156–1185.
- Miller, T. R., Cohen, M. A., & Wiersema, B. (1996). *Victim Costs and Consequences: A New Look*. Washington, DC: National Institute of Justice.
- Pfeiffer, C., Brettfeld, K., & Delzer, I. (1996). Kriminalität in Niedersachsen: eine analyse auf der basis der polizeilichen kriminalstatistik 1988–1995. Kriminologisches Forschungsinstitut Niedersachsen, Forschungsbericht Nr. 56.
- Ploeger, M. (1997). Youth employment and delinquency: reconsidering a problematic relationship. *Criminology* 35, 659–675.
- Sampson, R. J. (1995). The community. In J. Q. Wilson & J. Petersilia (Eds.), *Crime*. Oakland, CA: ICS Press.
- Spengler, H. (1996). Sozioökonomische Ursachen und Wirkungen der Kriminalität in der Bundesrepublik Deutschland, Diplomarbeit, Fakultät für Volkswirtschaftslehre, Universität Mannheim, Germany.
- Statistisches Bundesamt, Statistisches Jahrbuch (various issues, 1975–1996), Wiesbaden.
- Sutherland, E. H., & Cressey, D. R. (1974). *Criminology*. Philadelphia, PA: J. B. Lippincott.
- United Nations (2000). The Fifth United Nations Surveys of Crime Trends and Operations of Criminal Justice Systems. Available at: <http://www.uncjin.org/statistics/statistics.html>.
- Williams, J., & Sickles, C. R. (1997). The role of social capital in youth crime: a dynamic structural approach. Working paper.
- Wolpin, K. I. (1978). An economic analysis of crime and punishment in England and Wales 1894–1967. *J Political Econ* 86, 815–840.