Criminal Victims, Victimized Criminals, or both? An Econometric Analysis of the Victim-Offender Overlap

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(preliminary)

Summary: Offenders are more likely than non-offenders to be victims, and victims are more likely than non-victims to be offenders. So far, the overlap between offenders and victims is not well understood in criminology, and in the economics of crime this stylized empirical fact is even widely ignored. One of the major limiting problems seems to be the lack of adequate individual data. This paper tries to fill this gap by, a) summarizing previous theoretical arguments underlying the overlap found in the criminological and economic literature, and, b) by analyzing a unique survey data set, originally collected as control group to the *German Inmate Survey*. Bivariate Probit results show that both criminal and victimization risks are partly driven by common observed and unobserved factors. Moreover, exogeneity tests are in line with the hypothesis that the joint bivariate process can be characterized by exogenous variation of offending and an endogenous role of victimization.

1. Introduction

Though generally neglected by economists, retaliation is often the cause of crime, in particular violent crime. By contrast, the overlap between offenders and victims has been well documented in the criminological literature since the early contributions by von Hentig (1941, 1948) and Wolfgang (1958). Prominent explanations are given by routine activity/lifestyle theories (e.g. Cohen and Felson 1979), the subculture-of-violence approach (Singer 1981), general strain theory (Agnew 1992), and low-self control (Gottfredson and Hirschi, 1990). In recent surveys on behavioral economics of crime, McAdams and Ulen(2009) point at the preference for fairness which may underlie certain crimes of "self-help" retaliations against their perpetrators: People gain utility by acting altruistically toward those who treat them fairly and by acting spitefully against those who treat them unfairly (see also Fehr and Gächter, 2002, and Garoupa, 2003). Nevertheless, econometric evidence on the overlap of victims and offenders is scarce. Deadman and McDonald (2004) and Foreman-Peck and Moore (2010) are rare exceptions. In the field of quantitative criminology, interactions of criminals and victims are analyzed in a considerable number of articles, in particular in recent years (see, for instance, Ousey et al., 2011, and Silver et al., 2011). Lauritsen et al. (1991) represents an early seminal work.

Using survey data of the German resident population and inmate data of the *German Inmate Survey* (Entorf et al. 2008), this paper provides some new econometric evidence on the mutual dependence of victimization and offending. Results indicate that both variables are affected by a long list of (common and specific), social, demographic, economic and further criminological factors. However, it turns out that offending and victimization are also subject to remaining unobserved factors whose correlation may be caused by their common dependence on the same underlying factors. Preliminary results indicate a strong connection between such unobserved factors and parents/ family.

This paper is organized as follows. Chapter 2 gives a brief survey on theoretical considerations in criminology, economics and other fields. Chapter 3 presents some empirical results found in the literature. The data description can be found in Chapter 4. In Chapter 5, econometric evidence is provided. Chapter 5 concludes.

2. General Considerations of the Victim-Offender Overlap

Survey of the criminological research

Offenders are more likely than non-offenders to be victims, and victims are more likely than non-victims to be offenders.[1] For more than 60 years, the overlap between offenders and victims has been documented in the criminological literature (see von Hentig 1941, 1948, Wolfgang 1958).[2] Early systematical research (Hindelang 1976, Hindelang et al. 1978, Gottfredson 1984) focuses on the socio-demographic similarities of victims and offenders (male, young, black, urban) and suggests theoretical "explanations"[3] given by routine activity/lifestyles theories (Hindelang et al. 1978, Cohen and Felson 1979): Daily risky activity brings attractive and poorly guarded targets for crime into close proximity and interaction with potential offenders.[4] A further prominent explanation of the victim-offender overlap is the subculture-of-violence approach (Singer 1981), according to which individuals who attack others risk retaliations from former victims, something often reinforced by subculture norms such as the 'code of the street' of gang behavior (see Anderson 1999, Levitt and Venkatesch 2000). In-debth-interviews with street criminals (Jacobs and Wright, 2010) have

[1] According to a survey provided by Shaffer (2004), results in the literature indicate that offenders are 1.5 to 7 times more likely than non-offenders to be victims, and victims are 2 to 7 times more likely than non-victims to be offenders.

[2] See Schreck et al. (2008) and Shaffer (2004) for recent surveys on theories considering the offender-victim overlap.

[3] Note, however, that these theories are not explicitly dealing with victimization but are focusing on criminal behavior.

[4] Sampson and Lauritsen (1990) and Lauritsen et al. (1991) refine routine activity/lifestyle theory by also considering indicators such as extensive drinking, drug use, or partying.

shown that retaliation is not necessarily addressed against the perpetrator but that random redirection might lash out at any available victim, leading to and reinforcing a climate of urban violence. Laboratory experiments have shown that this adverse effect of social interaction is not limited to violence. Falk and Fischbacher (2000) report that on average individuals steal the more, the more others steal. Agnew's (1992) general strain and Akers' (1985) social learning theory, too, emphasize the role of former victimization within (sub-) societies which provide motivation and specific training to commit crimes. The fifth prominent theory providing a foundation for the correlation of victimization and offending is low-self control (Gottfredson and Hirschi, 1990). The authors argue that crime is developed from sensation-seeking behavior that ignores long-term consequences. Individuals who find themselves in places and situations of low self control might become a victim as likely as to commit a crime.[5]

The rational choice approach to victimization and offending

Some criminological theories of criminal behavior might be considered observationally equivalent to economic theories of crime. The same applies to explanations of the victim-offender overlap. Merton's strain theory (Merton 1938), for instance, proposes that crime is an illegal attempt to be economically and socially successful: 'Offenders are essentially strivers for the American dream' (Schreck et al. 2008, p. 878) who became frustrated because of their relative weak position within the social structure which interferes with the achievement of their expectations (see also Agnew, 1992). Schreck et al. (2008) argue that according to strain theory victimizing people who are lower in the social status hierarchy would produce little gain. Although Merton as well as other founders of criminological theory such as Hirschi (1969) or Becker (1968) did not intend to explain victimization, one can infer that preferred victims would be the more wealthy and high status people. However, the same prediction would follow from rational choice theory in the tradition of Becker (1968): Given utility-maximizing behavior, potential (expected) risks of being detected and punished, would-be offenders choose *attractive* targets in order to maximize net awards. Thus, according potential victims of rational offenders are typically the economically and socially successful people, the less guarded, those in the proximity of offenders, and those who are visible and available ('exposed'). Papadopoulos (2011) points out that this description also fits basic elements of routine/lifestyle theory (Hindelang et al. 1978, Nelson and Felson 1979). As basic economic theory seems to be closely related to

[5] Contrary to Gottfredson and Hirschi's (1990) theory of self-control, Hirschi's (1969) theory of social control could only explain offending. According to this approach, individuals would have a natural tendency towards crime; weakening social bonds would lower this tendency. Thus, there is a link to offending but not to victimization (Schreck et al., 2008).

criminological views, Papadopoulos (2011) presents ideas of a two-stage theory of offending and victimization which borrows from the early economic modes by Becker (1968) and Ehrlich (1973). In the same vein, Foreman-Peck and Moore (2010), consider the behavior of rational potential victims of violence who minimize the probability of injury, subject to constraints and the achievement of other objectives. However, a clear weakness of this reasoning – and of classical rational choice theory in general – is that it ignores the possibility of being a victim and an offender in the same person.

Rational choice theory seems to be generally questioned by 'irrational' retaliatory behavior of victims and criminals. However, retaliation can be seen as rational deterrence strategy in a 'pre-legal', 'pre-societal' or 'natural state" (Hume, 1739) community. Given lacking access or trust in the public institution of criminal law systems in modern societies, victims might be tempted to take the law in their own hands. In particular in disadvantaged neighborhoods and sub-cultural societies where the retaliatory ethic of the 'code of the street' (Anderson 1999) is used au lieu of criminal codes, the credible threat of punishing by strong retaliation might deter potential future perpetrators. As already stated above (Jacobs and Wright 2010, Levitt and Venkatesch 2000), rational retaliation would imply that the deterrent signal to the sub-society can be (random) redirection to the detriment of any available victim. For would-be victims the potential threat of future retaliation by any other member of sub-cultural groups might be an incentive to join the group and prevents violent crimes that would have otherwise taken place. Sobel and Osaba (2009) argue that youth gangs form in response to government's failure to protect youths against violence. Indeed, their empirical results based on gang membership data suggest that the effect of gangs is to reduce the level of violence (which is contradicting Peterson et al. 2004). Jacobs and Wright (2010) point at the increased specific deterrence effect when retaliation is addressed within a close micro-structural or relational space: Violators may be deterred even though they have suffered no direct punishment.

Explanations motivated by bounded rationality and behavioral economics

Rational choice models are often criticized because they ignore that cognitive restrictions and emotional factors such as time-pressure, peer group influence or anger restrict the long-run 'optimality' of individual decisions.[6] They clearly lack the explicit consideration of the

[6] Proponents of rational choice theory would argue that rational behavior does not literally imply that would-be criminals weight all risks and costs at the very moment of a potential crime, but that situational decisions under pressure may be based on heuristics, rules-of-thumb and cognitive experience, but are developed and trained under trial-and-error situations over previous life-time, and under the prevailing maxim of individual long-run rationality. Thus, even under cognitive and emotional stress 'rationality may crystallize in the moment that a specific crime is contemplated' (Jacobs and Wright, p. 1741).

human cognitive decision process. Recent developments in economics emphasize the particular role of neuroscience and the 'human brain's general-purpose problem-solving machinery' (van Winden and Ash 2009, p.7) on 'behavioral economics' (see, e.g., Camerer et al. 2005, Glimcher et al. 2009). Van Winden and Ash (2009) discuss some implications of the cognition system, in particular the role of emotional stimuli, for the behavioral economics of crime. So far, however, innovative insights from neuroscience for behavioral economics seem to be rare. Their survey presents interesting findings on, e.g., anger and social norms (see also below), which, however are based on 'traditional' empirical or experimental research in the field of behavioral economics, not from neuroscience. Hence, as also suggested by Van Winden and Ash (2009), one might be tempted to conceptualize the cognitive component in economic crime modes as an approximation of economically rational decision making.

This preliminary conclusion does not diminish the importance of findings related to 'bounded rationality' and 'behavioral economics'. As was first pointed out by Simon (1957; see also Simon 1982 for an overview of his models), the complexity of situations and limitations of both available information and cognitive capacity would lead to decisions under 'bounded rationality' rather than optimal ones, and humans are rather 'satisficer' seeking satisfactory solutions which make her or him happy enough. Bounded rationality is at the heart of modern behavioral economics. Of crucial importance for 'behavioral' explanations of crime are anger, 'uncertainty' (dealing with small probabilities and loss-aversion), hyperbolic discounting (discounting future events), time pressure and shame/guilt (norms); see Garoupa 2003, Van Winden and Ash 2009, McAdams and Ulen (2009) and Englerth (2010) for recent surveys of these findings.[7] As regards the overlap of victimization and offending, anger seems to be a major motivation of retaliatory behavior, as also stressed by many criminological and psychological research papers (see, e.g., Agnew 1992, Kubrin and Weitzer 2003, Jacobs and Wright 2010, Simon and Burt 2011). Anger in response to perpetrated injury, frustration and unfair treatment is a triggering event that motivates 'striking back', not necessarily to the perpetrator himself but also to non-involved bystanders and other available victims, also at some later point in time. Such behavior is often consequence and origin of norms of honor and respect (or fear of dishonor and shame, respectively), prevailing and potentially escalating in sub-cultural societies (Anderson 1999, Kubrin and Weitzer 2003). As described in more detail above, the threat of retaliation can serve as a deterrent factor when trust in criminal-justice systems is absent. However, as

[7] Jacobs and Wright (2010) present anger, uncertainty and 'time' as bounds of rationality. However, their notion of uncertainty differs from the usual meaning in behavioral economics. They refer to uncertainty and time pressure as motivation of (randomly) redirected retaliation at available targets, and anger as both source of asymmetric (exaggerated) strike intensity and target choice.

suggested by findings in Fehr and Gächter (2002), punishing 'unkind' behavior of others or 'negative reciprocity' seems to be a social norm rooted in general human behavior, not just deprived sub-groups. Participants in their experiments revealed some 'altruistic punishment' behavior, i.e. they punished defectors even when they had costly disadvantages from the retaliation. This so-called pro-social behavior has its origin in the notion of fairness as can be seen from the outcome of many ultimatum-game experiments: Responders often destroy any portion of their (guaranteed) gains when they perceive the proposal of the proposer as unfairly low. Thus, anger about unfair treatment is the individual motivation, but its social effect is deterrence.

3. Empirical Studies on the Victim-Offender Overlap

Empirical evidence of most published studies on the victim-offender overlap focus on how offending is influencing victimization. This can be seen from the example of one of the most quoted articles in the literature on the victim-offending overlap, Lauritsen et al. (1991). Main conclusions of this seminal study are based on least squares regressions with victimization as dependent variable, and current[8] and lagged delinquent life styles as regressors (controlling for lagged victimization and socioeconomic factors). A second strand of empirical literature following Singer (1981), Akers (1985) and Agnew (1992) employ the explanatory power of former victimization on offending. In a survey of existing results on 'victimization causes subsequent offending' Ousey et al. (2011) report mixed results regarding this direction of influence. Hay and Evans (2006), Cullen et al. (2008) and studies characterized as 'intergenerational transmission of violence'[9] find that former victimization is positively related to future offending, whereas other authors conclude that victimization *decreases* subsequent offending. Ousey et al. (2008) and Jacques and Wright (2008), for instance, propose a 'victimization-termination' rationale according to which victimization represents a seminal traumatic turning point which causes individual to reassess their involvement in risky activities (frequenting bars, alcohol and drug abuse et.) and ultimately curtail committing property and violent crimes.

[8] The authors draw very strong conclusions regarding the impact of delinquent lifestyle from the fact that in 15 out of 16 cases current delinquency has a positive and significant sign. From a methodological point of view, statistical evidence has to the questioned due to problems of unobserved heterogeneity, endogeneity and a potential statistical simultaneous equation bias (see below).

[9] The psychometric literature on the 'intergenerational transmission' is subsumed under 'cycle of violence' (Widom 1989a, 1989b) and goes rather undetected by the criminological literature (as, for instance, in the survey by Schreck et al. 2008). Recent contributions to this strand of literature are, e.g., Kim (2008), Mas et al. 2008, and Yun et al. 2011).

However, it is seems more realistic to view the victimization-offending relationship as simultaneous or at least reciprocal. It is only recently that research widens its perspective to the study both the influence of victimization on offending and the reverse causation. In their review of the 'reciprocal' literature, Ousey et al (2011) mainly refer to two studies, Schreck et al. (2006) and Wilcox et al. (2006), who both use repeated panel waves to study the dynamics of the victimization-offending-victimization feedback. Both studies confirm what Ousey et al. call the 'reciprocal escalation hypothesis', i.e. victimization increases offending, which in turn provokes higher victimization. By contrast, results by Ousey et al. (2011) based on dynamic panel data from four follow-up surveys among 12 to 15 years-old students are in line with the conclusion that offending is reduced by own previous victimization.

Silver et al. (2011), Foreman-Peck and Moore (2010) and Shaffer (2004), independently of each other, follow a different approach that considers victimization and offending as a joint process, i.e. both variables are treated as dependent variables which are determined by exogenous factors. These explanatory variables might consist of common factors X related to both dependent variables, but they may also be partly (or even completely) disjunct, i.e. testing the influences of X,Z (or just Z) on victimization and of X,W (or just W) on offending are potential research strategies. A crucial element of the so-called seeming-unrelated-regressions model (SUR), or, if dependent variables are dichotomous (or binary), in the bivariate Probit model used in quoted papers, is the consideration of correlated residuals, or, non-technically speaking, latent factors that cover unobserved heterogeneity influencing the joint victimization-offending process (see Chapter 4 for technical details). Silver et al. (2011) consider violent offending and victimization within a sample of psychiatric patients. The authors confirm previous results that most significant factors of victimization would also hold for offending. Their important finding is that both offending and victimization are affected by some positively correlated unobserved factors that are not accounted for in the data. The authors presume that violence and victimization may be linked though interactional processes such as provocation and retaliation, or chronic relationship conflicts. The same positive interrelationship between unobserved drivers of victimization and offending has been documented by Shaffer (2004) and Foreman-Peck and Moore (2010). Their empirical models only differ with respect to included explanatory variables: Shaffer (2004) has a strong focus on the significant role of peer effects, whereas Foreman-Peck and Moore (2010) highlight the importance of risk aversion (low-risk aversion increases the likelihood of becoming a victim) and time-preference (more impatient people are more likely to be violent). The strong positive effect of a joint latent factor found in all three articles is highly significant after controlling for a rich list of socioeconomic, parental, life-style/routine activity, peer groups, and clinical variables, as well as time preferences and risk aversion. The

robustness of these results suggests that despite the long list of well-known factors both victimization and offending are still subject to positively associated latent factors.

A further example of bivariate Probit not covered above is Deadman and McDonald (2004). Their approach is atypical in that they estimate a recursive bivariate Probit system (without naming it as such). They consider offending as the equation of interest and treat offending as one of its explanatory factors. Offending is explained in a second equation using variables which the authors consider truly exogenous to the system of victimization and offending (such as expulsion from school and truancy, excessive drinking and drug use), i.e. these variables are significantly associated with the offending variable but not the victimization variables. Contrary to Silver et al. (2011), Foreman-Peck and Moore (2010) and Shaffer (2004), they find a negative correlation between the latent factors of offending and victimization. Thus, unobserved factors (possibly personal characteristics) which raise the probability of offending seem to lower the probability of being a victim. However, this result cannot be compared to seemingly unrelated Probit results, because unobserved residual factors of victimization from the recursive Probit model are conditional on observed offending factors.

4. Data and Descriptive Statistics

Background information

The econometric analysis (see below) is based on a survey of 1.163 residents drawn from the German population. The data has been collected in 2004 using a questionnaire on socioeconomic and parental backgrounds, criminal experience (offending and victimization), education, professional experience, peers and social capital, as well as assessment and expectations regarding specific and general deterrence. This sample represents the control group of the *German Inmate Survey* (GIS, see Entorf et al., 2008, and Entorf, 2009, for details).[10]

The control group was designed such that its stratification resembles the inmate survey.[11] The relevant guidelines to interviewers[12] referred to education, age, gender, and

[10] Further research based on this data set is Meyer (2007), Entorf and Sieger (2010), Entorf (2011), Römer and Pichler (2011), Loureiro and Alvarez (2011). The GIS itself further includes questions regarding prison conditions, rehabilitation programs and recidivism. It comprises data on 1,771 German inmates in 31 German prisons.

[11] Some detailed analyses of the composition of the control group reveals that the education of foreign citizens in the sample is well above its population counterpart (see also my comments on estimation results).

[12] The population survey has been performed by tns-Infratest.

nationality/migration background.[13] Both inmates and participants of the control group filled in identical questionnaires, except questions regarding current and former imprisonment.

Descriptive statistics on dependent variables: the victimization-offender overlap

To compare offending and victimization rates of the resident population with those of prison inmates, descriptive statistics presented below (Tables 1 and 2) are based on both control group and prison survey data. The complete dataset can be grouped into four subsamples. Inmates in pretrial custody, inmates sentenced under juvenile law, and inmates sentenced under criminal law comprise the inmate survey, whereas the control group consists of a survey of non-imprisoned citizens without evident involvement in criminal activities. As a clear legal status about former convictions only exists for inmates under criminal law, juvenile custody and for a subgroup of about ten percent of the control group, about 500 inmates of pretrial custody are excluded from subsequent comparisons. Moreover, I only consider adults of at least 18 years of age.

Evidence on victimization is based on the following survey question:

Did you yourself once or more often become the victim of an offence before the present term in custody?
O No
O Yes, relatively petty (victim of common theft or similar)
O Yes, quite massively, as the victim of the following offence(s): _

The same survey question has also been addressed to the non-imprisoned control group, of course without referring to any present custody.

Descriptive evidence on the victim-offender overlap based on German data (Table 1) confirms results found in earlier research. A substantial share of both inmates and of the non-imprisoned population experienced previous victimization. The smallest share of victimization is reported for the control group without previous conviction. It amounts to 26.4 percent, of which the large majority of 23.5 percent was perceived as petty crime. In line with previous research, convicted offenders report much higher rates of victimization,

[13] So the survey is not a representative sample of the German resident population but a non-imprisoned match of the German prison population.

namely 45.5% (control group offenders) and 52.9% (inmates), respectively. The gap becomes even more pronounced when massive victimization is compared. This share is only 2.9 percent among the non-convicted control group, but 9.1 percent for participants of the control group with a criminal record, and even 18.8 percent for prison inmates.

The reverse situation, i.e. offending by victims, is described in Table 2. Reciprocal behaviour seems to be a relevant covariate of crime: Non-victimized survey participants have a crime rate of 7.3 percent, whereas it is 15.5 percent for previous victims, i.e. more than doubled. If participants report being massively victimized, even one out of four reports a criminal record. The large majority of them have been convicted for property crimes.

Table 1: Victimization of offenders versus non-offenders

	Share of respondents reporting victimization of ...		
	Petty crime	Severe crime	Total
Non-imprisoned control group:			
• Non-offenders (1.031)	23.5	2.9	26.4
• convicted subsample (110)	36.4	9.1	45.5
Total sample of control group (1.141)	24.7	3.5	28.2
Sample of prison inmates (GIS) (1.239)	24.2	18.8	52.9

Data: German Inmate Survey, control group interviews, number of observations in parentheses.

Table 2: Offending by victims versus non-victims

	Share of respondents reporting ...			
	Property crime	Violent crime	Other crime	Total
Non-imprisoned control group:				
• Non-victims (819)	2.3	1.2	3.9	7.3
• Victims (322)	7.1	2.8	6.2	15.5
o Severe crime (40)	15.0	5.0	5.0	25.0
o Petty crime (282)	6.0	2.5	6.4	14.2
Total sample of control group (1.141)	3.7	1.7	4.6	9.6

Data: German Inmate Survey, control group interviews. Note that rows do not sum up to marginal values because some respondents had convictions for more than one crime. Number of observations in parentheses.

Descriptive statistics: covariates

The theoretical foundation underlying the victim-offender overlap often grounds on anger and other motivations rooted in behavioral sciences and, particularly, bounded rationality. In order to capture risky environments and the social osmosis of crime (Sah, 1991), empirical studies are often based on narrative in debth interviews with criminals (see, in particular, Jacques and Wright, 2008, or Jacobs and Wright, 2010). While such interviews have the advantage that experienced interviewers can go further into relevant questions asked to relevant players, their disadvantage is that the rather small number of observations[14] limits their external validity and statistical inference.[15] This study follows the alternative way by using relatively large samples from relevant subpopulation; see, e.g., Ousey et al. (2011) and Deadman and McDonald (2004), who use sample of adolescents, for similar strategies. The disadvantage of this approach is the lacking identification of disastrous individual conflicts between offenders and their victims. Thus, the milieu of victims and offenders has to be approximated by some rich information on age, education, parents, alcohol and drug abuse, peers, health conditions, labour market status etc.

This study is based on the the control group survey of the GIS (Entorf et al., 2008). Table 3 provides descriptive statistics of employed explanatory variables (common sample of both *offending* and *victimization*). Reported criminogenic factors are subsumed under categorizing headings. As already pointed out before, not all variables can be assigned to theories in an unambiguous one-to-one relation, but may be subject to observational equivalence. According to the economic focus of the study, *indicators of potential and realized economic success* are taken as point of departure. As expected from previous research on testing causal effects of education on crime (Lochner and Moretti, 2004, Machin et al. 2011, Entorf and Sieger 2010), absence of school degrees ('no school') and finishing only some basic school ('Hauptschule', ISCED 2) should increase the probability of a criminal career, whereas higher degrees 'Realschule/FOS' and top degrees 'Abitur/University' (ISCED 4 or higher) are expected to reduce criminal risk factors.

[14] Jacobs and Wright (2010), for instance, interviewed 52 active street criminals.

[15] As a thought experiment, assume that only age, education and parental situation comprise criminal risk factors; further assume that for each of these three factors just three categorical groups are needed to capture the heterogeneity of data. Even under such minimum conditions, conclusions drawn on the whole range of dimensions would require a high number of observations in order to fill all 27 cells. Even when conclusions for extreme categories might be considered of no importance such that only two categories remain (young/old, educated/non educated, criminal record of parents/no such record), 8 cells would remain. Employing the textbook example of 30 observations as minimum approximation of asymptotic normality, this extreme simplification illustrates that at least 240 observations were needed when cross-sectional studies should meet minimum standards of statistical inference.

Table 3: Descriptive Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Offending	1085	.0940092	.2919761	0	1
Victimization	1078	.2866419	.4524027	0	1
Indicators of (potential) economic success					
No school	1095	.0922374	.2894931	0	1
Hauptschule	1095	.4383562	.4964122	0	1
Realschule or FOS	1095	.267	.442	0	1
Abitur or University	1095	.2164384	.4120046	0	1
Unemployed	1095	.1908676	.3931645	0	1
Net income > 2000€	1095	.5196347	.4998426	0	1
Excessive indebtedess	1095	.0703196	.2558018	0	1
Good health condition	1095	.7031963	.457058	0	1
Routine Activity/ Lifestyle					
Age	1095	38.45205	11.9267	18	68
Male	1095	.8858447	.318145	0	1
Married	1095	.6164384	.4864753	0	1
Has children	1095	.6109589	.4877555	0	1
Foreign citizenship	1088	.1167279	.3212435	0	1
Muslim	1095	.0146119	.120048	0	1
No confession	1095	.2721461	.4452681	0	1
Village	1095	.3926941	.4885729	0	1
Peer, family and sub-cultural influence					
Has more than 20 loose friends	1095	.5324201	.4991758	0	1
Has no close friend	1095	.0684932	.2527057	0	1
Has one close friend	1095	.1388128	.345909	0	1
Criminal record of parents or siblings	1095	.0356164	.1854166	0	1
Parents divorced or separated	1095	.1050228	.3067229	0	1
Low self control					
Dropout of vocational training	1095	.030137	.1710423	0	1
Serious drug or alcohol problem	1095	.0292237	.1685101	0	1

Notes: Descriptive statistics under the restriction that variables show valid observations on both offending and victimization. *Source:* Author's calculation based on the control group survey to the *German Inmate Survey* (Entorf et al., 2008).

According to classical economic of crime arguments, *unemployed* persons should be less attractive targets of crime but might have incentives for (property) crime. Along the same lines, (relatively) high *net income* may be considered as risk factor of victimization and would represent low risk of illegal activities. *Good health* might lead to high self esteem and physical fitness such that it should reduce the probability of victimization. The problem of

excessive debt obligations is subsumed under the list of economic variables, because they bring about incentives for property crimes. However, as such problems might also be the outcome of a hedonistic lifestyle, it could likewise be assigned to the second category 'Routine Activity/ Lifestyle'.

Further classic factors of crime are age gender, marital status and urbanity. According to many studies found in the literature (see Baier and Wright, 2001, for a survey), religious affiliation has a crime reducing effect. In this study, "religion" is covered by 'no confession' (German: 'konfessionslos')[16] and *Muslim*.

Among the factors representing 'peers, family and sub-cultural influence', a very strong effect is expected from *criminal family background* (parents or siblings with criminal record, i.e. previous conviction in a court) *Friends* and *peers,* too*,* should be of relevance for both offending and victimization. A large number of *loose friends* seem to be a good indicator of sub-cultural influences, whereas *one close friend* should have the opposite effect of protecting from 'bad' risky lifestyles.

Finally, the significance of two indicators of low self-control has been tested. *Serious drinking or illicit drug problems* is often found of one of most severe predictors of offending. The second variable is *dropping out of vocational training* indicating lacking perseverance of goals.

5. Econometric Evidence

Preliminary univariate Probit analysis

To analyse main factors as well as similarities and differences among the determinants of offending and victimization, the first step is to treat both potentially interdependent devariables as two separate and independent equations. The second step will then be using a more efficient estimation strategy that takes the potential correlation between the residuals of both equations into account. This correlation, if found significant, would indicate that - even after controlling for the list of relevant covariates to be shown below - further unobserved common factors underlying both offending and victimization do exist.

In the following, 'victimization' is defined as any event of individual victimization, irrespective of its severity, and 'offending' refers to the existence of a criminal record, i.e. a

[16] This implies that individuals do not consider themselves as members of any religious community, first and foremost not as member of the catholic or protestant churches.

previous conviction.[17] As both offending and victimization are measured as binary variables, the statistical analysis is using (univariate) Probit respectively bivariate Probit models.

The univariate Probit model describes the probabilty *P* of the occurence of an event *Y* (i.e. offending or victimization take the value Y=1) using a normally distributed link function Φ, i.e.

$$(1) \qquad P(Y_i=1) = \Phi (X_i \beta) ,$$

where Y_i represents the outcome variable of 'victimization' and 'offending', respectively, of individual i, X_i represents a vector of explanatory factors, and β is the vector of corresponding weights estimated by maximum likelihood methods (see, e.g, Wooldridge, 2002).

Results of the univariate Probit analysis (ignoring problems of endogeneity of offending and victimization as well as joint dependencies) are presented in Table 4. Reported coefficients are so-called marginal effects, i.e. the change of the endogenous probabilty in response to a one-unit change of the explanatory variable. For explanatory variables binary (1/0) dummy variables, the reported marginal effect is the average change of individual probabilties (in being a victim or an offender) in response to a status change from 0 to 1 (for example from being employed to 'unemployed=1').

At this stage, results are still to be considered preliminary and are only briefly discussed. As expected from previous research on testing causal effects of education on crime, absence of school degrees ('no school') and finishing only some basic school ('Hauptschule') increase the probability of a criminal career (see Table 4, column 1), although only 'Hauptschule' has a statistically significant effect (degrees higher than *Hauptschule* serve as reference category). The alternative situation is covered in column (3), where the upper degrees 'Realschule/FOS' and 'Abitur/University' and the lowest 'no school degree' are included, whereas *Hauptschule* is employed as comparison category. This specification confirms significant crime reducing effects of higher education.

However, the more pronounced effect of education seems to the one on victimization. The estimation result in column (2) implies a reduced victimization risk of about 16 percent (10 percent) for individuals with *no school degree* (*Hauptschule*) compared to those who achieved *Realschule* or better.

[17] 'Victimization =1' means that the individual has been a victim, 'victimization =0' implies that he or she did not report any victimization. 'Offending' is defined analogously.

Table 4: Results of univariate Probit estimations

	Marginal effects				
	(1)	(2)	(3)	(4)	(5)
	Offending	Victim-ization	Offending	Victim-ization	Severely victimized
Indicators of (potential) economic success					
No school	0.043 (0.036)	-0.163** (0.037)	-0.004 (0.023)	-0.084 (0.045)	-0.014 (0.013)
'Hauptschule'	0.047* (0.018)	-0.100** (0.029)	_	_	_
'Realschule' or 'FOS'	_	_	-0.021 (0.016)	0.069* (0.034)	0.000 (0.011)
‚Abitur' or 'University'	_	_	-0.045** (0.015)	0.195** (0.040)	0.039* (0.018)
Unemployed	-0.003 (0.020)	-0.081* (0.034)	-0.004 (0.020)	-0.081* (0.034)	-0.011 (0.010)
Net income > 2000€	0.003 (0.015)	0.054 (0.029)	0.005 (0.015)	0.042 (0.030)	0.004 (0.010)
Good health condition	-0.016 (0.018)	-0.105** (0.033)	-0.016 (0.018)	-0.111** (0.033)	-0.015 (0.012)
Excessive indebtedess	0.159** (0.050)	0.094 (0.052)	0.155** (0.050)	0.102* (0.053)	0.007 (0.018)
Routine Activity/ Lifestyle					
Male	0.063** (0.012)	0.019 (0.043)	0.063** (0.012)	0.015 (0.044)	-0.037 (0.022)
Married	-0.026 (0.022)	-0.129** (0.039)	-0.026 (0.022)	-0.122** (0.040)	-0.033* (0.015)
Has children	0.016 (0.020)	-0.051 (0.039)	0.024 (0.019)	-0.047 (0.040)	0.010 (0.013)
Foreign Citizenship	-0.032 (0.019)	-0.029 (0.044)	-0.033 (0.019)	-0.034 (0.044)	-0.001 (0.015)
Muslim	0.157 (0.129)	0.212 (0.114)	0.158 (0.128)	0.213 (0.114)	0.072 (0.071)
No confession	0.035 (0.019)	0.056 (0.033)	0.031 (0.019)	0.055 (0.033)	0.013 (0.012)
Village	-0.017 (0.015)	0.003 (0.029)	-0.017 (0.014)	0.008 (0.030)	-0.002 (0.010)
Peer, family and sub-cultural influence					
Has more than 20 loose friends	-0.007 (0.015)	0.074** (0.028)	-0.005 (0.014)	0.067* (0.028)	0.006 (0.010)
Has no single close friend	-0.041* (0.017)	0.053 (0.059)	-0.041* (0.017)	0.063 (0.060)	0.008 (0.022)

Table 4 Cont.	Marginal effects				
	(1)	(2)	(3)	(4)	(5)
	Offending	Victim-ization	Offending	Victim-ization	Severely victimized
Has one close friend	-0.030 (0.016)	-0.082* (0.037)	-0.030 (0.016)	-0.074* (0.037)	-0.028** (0.008)
Criminal record of parents or siblings	0.185** (0.071)	0.178** (0.072)	0.170** (0.069)	0.200** (0.072)	0.004 (0.021)
Parents divorced or separated	0.090** (0.035)	0.079 (0.046)	0.086** (0.034)	0.091* (0.047)	0.047* (0.023)
Low self control					
Serious drug or alcohol problem	0.208** (0.083)	0.068 (0.067)	0.210** (0.083)	0.081 (0.068)	0.059 (0.036)
Dropout of vocational training	0.058 (0.054)	0.043 (0.081)	0.058 (0.054)	0.045 (0.082)	0.021 (0.034)
Pseudo-R^2	0.201	0.078	0.201	0.091	0.123
Number of observations	1.078	1.156	1.078	1.156	1.182

Notes: Standard errors in parentheses; **) and *) represent significance at the 1 and 5 percent level, respectively. Age and age-squared are added as further controls. Marginal effects are obtained as average partial effects, standard errors are computed using the delta method. State effects have been tested but proved insignificant.

Good health is found as one of the most important personal characteristics protecting against victimization, whereas *excessive debt* seems to entail one of the strongest incentives for criminal activities. It also correlates with victimization (Table 4, column 4).

Male and *married* are associated with disjoint consequences: Being male is associated with a significantly higher probability of being an offender, whereas *married* people seem to avoid risky lifestyle such that their probability of being victimized is reduced by about 12 to 13 percent compared to single, divorced or widowed individuals.

Among the factors of 'peer, family and sub-cultural influence' the most obvious and strongest effect arises from the presence or absence of a *criminal family background*. Among the indicators of low self-control, only *serious drinking or illicit drug problems* turn out as a (severe) predictor of offending. However, as regards victimization, contrary to results by Jensen and Brownfield (1986) and Lauritsen et al. (1991), drinking and drug abuse have no significant effect. The reason might be that its influence is already covered by other variables such as parental influence, peer pressure or excessive indebtedness.

Table 3, column (5) is restricted to the subgroup of massively victimized individuals. As this refers to a relatively small number of survey participants, parameter estimates are smaller and statistical significance is less pronounced. Summarizing results, most significant conclusions drawn above can be confirmed: Low education, marriage status, existence of one close friend, non-divorced or non-separated parents, and absence of illicit drug and alcohol problems are associated with lower risk of severe victimization. The only diverging (though non-significant) result is the sign of the gender variable: Females report a *higher* probability of having been the victim of a severe crime, whereas it was lower in case of overall victimization.

Seemingly unrelated bivariate Probit analysis

Before turning to the estimation of the reciprocal influence of victimization and offending in more detail, the important intermediate step is to test whether common latent factors underlying both victimization and offending do exist and whether they persist even after controlling for observed factors employed in Table 4. For this purpose, a (seemingly unrelated) bivariate Probit model is estimated (see Silver et al., 2011, and Foreman-Peck and Moore, 2010, Shaffer, 2004, for similar testing strategies). The empirical specification of the bivariate Probit modeling of offending, O, and victimization, V, is

$$\begin{aligned} O_i^* &= X_i\beta_1 + \varepsilon_{1i} \\ V_i^* &= X_i\beta_2 + \varepsilon_{2i} \end{aligned}, \tag{2}$$

where the residuals ε_{1i} and ε_{2i} are jointly distributed as bivariate normal with means 0 and unit variances. O_i^* and V_i^* are latent indicators of observed binary realizations of O_i and V_i, respectively.[18] The difference between univariate and bivariate Probit is the potential nonzero correlation ρ between the unobserved explanatory factors in the two equations.

A first test is to run model (2) without further controls X_i. Thus, any correlation between ε_{1i} and ε_{2i} would arise from common unobserved factors *and* from misspecification due to omitting observables if these were potentially common factors of both endogenous variables. The estimate of the naïve model gives $\rho = 0.247$ with a standard error of 0.065.

[18] $O_i = 1$ if the propensity to offend, i.e. O_i^*, exceeds a certain but latent threshold, $O_i = 0$ otherwise. The same applies to V_i^*. See econometric or statistical textbooks (e.g. Wooldridge 2002) for details.

The likelihood-ratio test of the hypothesis $\rho = 0$ corresponds to a highly significant p-value of 0.0002.

Including a full set of control variables to the bivariate Probit models reveals that that the correlation remains high and significant. In Table 5, models (1) and (2), the ρ-estimates turn out to be 0.211 and 0.225, respectively. Thus, it can be concluded that the correlation of the residuals is not due to some spurious relationship, but it remains valid after controlling for an array of demographic, economic, demographic, and social variables. Similar findings are reported by Silver et al. (2011) and Schaffer (2004).

Table 5, model (1), is covering the specification of the previous univariate Probit estimation (see Table 4, columns 3 and 4; highly insignificant factors omitted). Skipping further insignificant and weakly significant factors leads to results in Table 5, model (2). Magnitude and statistical significance of variables is rather unchanged compared to univariate estimations, with few exceptions: The parental background appears to be even more important for both offending and victimization, and also the effect of drug problems (on offending) is magnified. Somewhat surprising and not found elsewhere in the literature is the significantly negative effect of foreign citizenship on offending.[19] The effect of peers has lost its significance; it seems to be covered by the latent joint factor.

To summarize previous findings, bivariate Probit models confirm previous results in the literature that despite a rich amount of explanatory factors offending and victimization depend on positively correlated latent factors, resulting from a joint influence not covered by the observables.

Recursive bivariate Probit analysis

The final step is to run a *recursive* bivariate Probit approach which allows estimating a 'causal' estimation structure despite the endogenous nature of both on victimization and offending:

$$V_i^* = X_i\beta_1 + \delta O_i + \upsilon_{1i}$$
$$O_i^* = X_i\beta_2 + Z_i\beta_3 + \upsilon_{2i} \quad . \tag{3}$$

[19] Evidently, the control group survey of the GIS suffers from a sampling error. Interviewers were asked to map the share of foreigners of the German prison population, but while realizing this restriction they ignored the education level of interviewed foreigners. As a result the education level of foreigners is strongly biased upward. To give an example, the subsample used in this paper has 15% of all Germans with 'Abitur', whereas 23% of all foreigners in the sample achieved this degree. Thus, results based on the foreigner variable should be considered with care.

Table 5: Estimation of seemingly unrelated bivariate Probit equations

	Marginal Effects of Bivariate Probit parameter estimates			
	(1)		(2)	
	Offending	Victimization	Offending	Victimization
Indicators of (potential) economic success				
No school	0.005 (0.025)	-0.065 (0.049)	_	_
'Realschule' or 'FOS'	-0.022 (0.016)	0.063 (0.034)	-0.023 (0.016)	0.071* (0.033)
‚Abitur' or 'University'	-0.048** (0.015)	0.187** (0.039)	-0.050** (0.015)	0.216** (0.038)
Unemployed	-0.006 (0.020)	-0.077* (0.035)	-0.000 (0.020)	-0.071* (0.035)
Net income > 2000€	0.008 (0.016)	0.038 (0.030)	_	_
Good health condition	-0.013 (0.018)	-0.105** (0.034)	-0.013 (0.018)	-0.101** (0.034)
Excessive indebtedess	0.155** (0.050)	0.060 (0.059)	0.164** (0.051)	0.058 (0.059)
Routine Activity/ Lifestyle				
Male	0.064** (0.012)	0.056 (0.043)	0.066** (0.013)	0.045 (0.043)
Married	-0.015 (0.019)	-0.133** (0.036)	-0.020 (0.019)	-0.135** (0.036)
Non- German Citizenship	-0.037* (0.018)	-0.042 (0.044)	_	_
Muslim	0.168 (0.131)	0.131 (0.141)	_	_
No confession	0.036 (0.020)	0.057 (0.033)	_	_
Peer, family and sub-cultural influence				
Has more than 20 loose friends	-0.005 (0.015)	0.055 (0.029)	_	_
Has no single close friend	-0.037* (0.018)	0.054 (0.060)	-0.036 (0.020)	0.046 (0.059)
Has one close friend	-0.033* (0.015)	-0.054 (0.039)	-0.030 (0.017)	-0.055 (0.039)
Criminal record of parents or siblings	0.193** (0.074)	0.246** (0.089)	0.188** (0.072)	0.226** (0.087)
Parents divorced or separated	0.098** (0.037)	0.057 (0.050)	0.093** (0.036)	0.053 (0.049)
Low self control				
Serious drug or alcohol problem	0.297** (0.095)	0.097 (0.096)	0.307** (0.096)	0.094 (0.096)
ρ	0.211** (0.079)		0.225** (0.077)	
Log-Likelihood	-853.09		-868.44	
Number of observations	1063		1070	

Notes: Standard errors in parentheses; **), *) and +) represent significance at the 1, 5 and 10 percent level, respectively; significance of rho is tested using a likelihood-ratio test. Age and age-squared are added as further controls. Marginal effects (marginal outcomes of *P(O=1)* and *P(V=1)*, respectively) are obtained as average partial effects, standard errors are computed using the delta method. State effects have been tested but proved insignificant.

Given $\delta \neq 0$, equation (3) imposes the hypotheses that offending has an influence on victimization but not vice versa.[20] Thus, the result $\delta \neq 0$ would be consistent with $\theta = 0$ in

(4)
$$O_i^* = X_i\lambda_1 + \theta V_i + \omega_{1i}$$
$$V_i^* = X_i\lambda_2 + Z_i\lambda_3 + \omega_{2i} \ ,$$

i.e. with results testing the alternative hypothesis that victimization does not cause offending. This strategy of testing logical consistency will be followed below. A further interesting aspect is the estimation and significance level of ρ. Its insignificance after including offending into the victimization equation ρ would imply that the victimization equation could be treated independent of the second equation and that offending could be treated as exogenous to victimization anyway (see Maddala, 1983, Monfardini and Radice, 2008).

Models (3) and (4) are estimated using maximum-likelihood methods. Note that the endogenous nature of *O* on the right-hand side variable of the victimization equation can be ignored in nonlinear maximum likelihood estimations (see Imbens and Wooldridge 2009, lecture 6, p. 28, Greene and Henscher 2010, p. 90-91, and Greene 2008, p 823, for details). Another advantage of the recursive Bivariate Probit model is that (different) exogenous variables may appear in both equations. The only restriction is that there needs to be at least one exclusion restriction in victimization equation. This requires at least one variable which is relevant for offending but not for victimization. The corresponding vector of variables is represented by Z (see equation (3)). In model (3) Z includes d*rug abuse and alcohol problems*, *parents divorced or separated*, *excessive indebtedness* and *male*. These variables are significantly associated with offending but not with victimization.[21]

Results are presented in Table 6, model (1), corresponding marginal values are reported in Table 7.[22] The most striking effect is the insignificance of *criminal record of parents or siblings* in the victimization equation, whereas broken homes have been of crucial importance according to previous specifications (see Tables 4 and 5). Hence own criminal careers seem to be a major source of victimization risks, masking potential family influences

[20] This recursive structure has also been estimated by Deadman and MacDonald (2004).
[21] The exclusion is confirmed using a likelihood ratio test.
[22] Variables which have been insignificant at the 10 percent levels for both variables and for models have been skipped and the model was re-estimated without these variables.

or rendering them of second order importance. Moreover, after controlling for offending in the victimization equation the correlation between unobserved residuals is at the margin of significance (p=0.054) and it becomes negative. Similar findings are reported by Deadman and MacDonald (2004). Thus, including offender characteristics into the victimization equations seems to overcompensate the effect of unobservables.[23]

Testing the reverse recursive equation system (5) requires finding exogenous variables Z, i.e. variables which are significant predictors of victimization but not of offending. Inspecting results from Tables 4 and 5, 'good health condition' and 'married' seem to be adequate candidates which has been confirmed by a likelihood-ratio test. Results (Table 6, model 2; see Table 7 for marginal effects) are in line with the hypothesis that victimization does not cause offending: The parameter estimate on *victimization* is insignificant. The correlation coefficient ρ, too, is not significantly different from zero such that the offending equation could be estimated independent of *victimization*.

The crucial factor driving the difference between the results in Table 6, model (1) (i.e. equations system 3) and Table 6, model (2) (i.e. system (4)) is the role of the parental background. Including it into the offending equation of the bivariate Probit system leads to insignificance of *victimization* in system (4), whereas in the analogous case of system (3) the inclusion of parental background has not affected the high significance of *offending* for victimization. This can be further seen from an alternative estimations of system (4) *without* the parental background as explanatory factor (results not reported) which yielded a magnified parameter on victimization and high significance at the one percent level. Note, however, that this alternative specification would be invalid because it would cause a severe omitted variable bias, as can be seen from a likelihood ratio test (test statistic = 4.58, p=0.032).

[23] Note that previous residuals ε_{1i} are replaced by $\delta V_i^* + \upsilon_{1i}$.

Table 6: Estimation of recursive bivariate Probit models

	Bivariate Probit parameter estimates			
	(1)		(2)	
	Offending	Victimization	Offending	Victimization
Offending	_	1.276** (0.386)	_	_
Victimization	_	_	1.000 (0.674)	_
Indicators of (potential) economic success				
No school	-0.005 (0.192)	-0.240 (0.165)	0.067 (0.196)	-0.231 (0.165)
'Realschule' or 'FOS'	-0.229 (0.146)	0.209* (0.096)	-0.277+ (0.144)	0.165+ (0.096)
‚Abitur' or 'University'	-0.403* (0.184)	0.617** (0.103)	-0.662** (0.207)	0.557** (0.103)
Unemployed	0.018 (0.156)	-0.210+ (0.113)	0.073 (0.161)	-0.201+ (0.114)
Good health condition	-0.144 (0.133)	-0.262** (0.097)	_	-0.299** (0.095)
Excessive indebtedess	*0.775** (0.175*)	_	0.693** (0.221)	0.173 (0.169)
Routine Activity/ Lifestyle				
Male	0.858** (0.301)	_	0.770* (0.317)	0.142 (0.138)
Married	-0.086 (0.145)	-0.332** (0.106)	_	-0.368** (0.104)
No confession	*0.273* (0.129)*	0.107 (0.095)	0.182 (0.135)	0.159+ (0.095)
Peer, family and sub-cultural influence				
Has more than 20 loose friends	-0.086 (0.121)	0.173* (0.085)	-0.097 (0.122)	0.155+ (0.087)
Has no single close friend	-0.430 (0.269)	0.241 (0.165)	-0.376 (0.254)	0.191 (0.166)
Criminal record of parents or siblings	0.885** (0.238)	0.331 (0.252)	0.621+ (0.326)	0.655** (0.222)
Parents divorced or separated	*0.528** (0.156)*	_	0.451** (0.176)	0.136 (0.137)
Low self control				
Serious drug or alcohol problem	*1.157 ** (0.256)*	_	1.072** (0.310)	0.298 (0.255)
ρ	-0.454 (0.212)		-0.373 (0.389)	
Likelihood-ratio test of ρ=0 (p-value)	3.70 (0.054)		0.626 (0.429)	
Log-Likelihood	-862.92		-864.60	
Number of observations	1070		1070	

Notes: Standard errors in parentheses; **), *) and +) represent significance at the 1, 5 and 10 percent level, respectively; significance of rho is tested using a likelihood-ratio test. Age and age-squared are added as further controls. Marginal effects (marginal outcomes of *P(O=1)* and *P(V=1)*, respectively) are obtained as average partial effects, standard errors are computed using the delta method. State effects have been tested but proved insignificant.

Table 7: Estimation of recursive bivariate Probit models, Marginal Effects

	Bivariate Probit parameter estimates			
	(1) Offending => Victimization		(2) Victimization => Offending	
	P(offending)	P(victimization)	P(Offending)	P(victimization)
Offending	_	0.475** (0.130)	_	_
Victimization	_	_	0.182 (0.182)	_
Indicators of (potential) economic success				
No school	-0.001 (0.024)	-0.076 (0.048)	0.009 (0.028)	-0.072 (0.048)
'Realschule' or 'FOS'	-0.026+ (0.016)	0.072* (0.034)	-0.033+ (0.017)	0.056+ (0.033)
‚Abitur' or 'University'	-0.042** (0.016)	0.223** (0.039)	-0.067** (0.024)	0.200** (0.039)
Unemployed	0.002 (0.020)	-0.068* (0.035)	0.010 (0.023)	-0.064+ (0.035)
Good health condition	-0.019 (0.018)	-0.091** (0.034)	_	-0.103** (0.034)
Excessive indebtedess	0.153** (0.048)	_	0.138** (0.050)	0.059 (0.060)
Routine Activity/ Lifestyle				
Male	0.066** (0.012)	_	0.066** (0.017)	0.046 (0.043)
Married	-0.011 (0.019)	-0.114** (0.036)	_	-0.125** (0.036)
No confession	0.038* (0.019)	0.037 (0.033)	0.026 (0.019)	0.054+ (0.033)
Peer, family and sub-cultural influence				
Has more than 20 loose friends	-0.011 (0.015)	0.058* (0.028)	-0.013 0.017)	0.051+ (0.017)
Has no single close friend	-0.040* (0.018)	0.085 (0.061)	-0.039+ (0.021)	0.067 (0.060)
Criminal record of parents or siblings	0.191** (0.074)	0.120 (0.096)	0.122 (0.076)	0.246** (0.088)
Parents divorced or separated	0.090** (0.034)	_	0.077* (0.034)	0.047 (0.049)
Low self control				
Serious drug or alcohol problem	0.285 ** (0.092)	_	0.264** (0.098)	0.107 (0.097)

Notes: Standard errors in parentheses; **), *) and +) represent significance at the 1, 5 and 10 percent level, respectively; significance of rho is tested using a likelihood-ratio test. Age and age-squared are added as further controls.

In conclusion, sign, magnitude and significance levels of explanatory factors are worth being discussed. Using marginal effect of Table 7, model (1) as "final" results, the estimation confirms that better schooling represented by 'Abitur' would lower the probability of a

criminal career by 4.2 percent (reference category: 'Hauptschule'). The effect of education on victimization is much more pronounced: Achievement of 'Abitur' or higher implies an increase of risk by about 22 percent. Thus, taking higher education as proxy for wealth and income, results confirm predictions from the economics of crime: Higher legal income opportunities and better living conditions lead to lower criminal incentives, whereas individuals endowed with characteristics of economic success are attractive targets to criminals. Along the same line of argument, *unemployed* persons should be less attractive targets. Indeed, Table 7 reveals smaller victimization risks (-6.8%) compared to their comparison group (employed, retired, etc.). However, unemployed persons are not prominent as criminals. A (relatively) high *net income* remained insignificant, possibly because its effect is covered by education and other economic indicators, and was not skipped in final specifications.

Good health is one of the most important personal characteristics protecting against victimization. *Excessive debt* entails one of the strongest incentives (+15.3%) for criminal activities, but was not confirmed as factor of victimisation. This corroborates its role as economic factor (instead of indicating risky lifestyles).

Among the factors gender, marital status and urbanity, only male and married have significant effects, whereas urban factors (covered by 'village'), Muslim religion and 'foreign citizenship' remain insignificant (and have not been further considered). Being male is associated with a 6.6 percent higher probability of being an offender, whereas the probability of being victimized as a *married* person is reduced by about 11 percent compared to single, divorced or widowed individuals. Having *children* has no further influence.

In accordance with other publications (see Baier and Wright, 2001), religious affiliation has a crime reducing effect. Individuals who have chosen to tick 'no confession' (German: 'konfessionslos') have a 3.8 percent higher propensity of being convicted for an offense.

Among the factors of 'peer, family and sub-cultural influence' the most obvious and strongest effect arises from the presence or absence of a *criminal family background*. In the ranking of parameter magnitudes, the magnitude of the parameter (+ 19.1%) ranks second for offending, only *serious drinking or illicit drug problems* exceed this effect size (+28.5%). *Friends* and *peers* are found of some importance: More than 20 loose friends increase the

risk of victimization by almost 6 percent, whereas the existence of *one close friend* has the opposite effect; it helps to avoid the risk of victimization by 4 percent.

Finally, whereas s*erious drinking or illicit drug problems* turn out as the most severe predictor of offending, it has no significant effect on victimization. This finding is contrary to results by Jensen and Brownfield (1986) and Lauritsen et al. (1991). The reason might be that the influence is already covered by other variables such as parental influence, peer pressure or excessive indebtedness.

5. Summary and Conclusions

Contrary to explanations of criminal behavior, coherent theoretical explanations of the empirically well documented fact of individual victim-offender overlaps are extremely rare. This paper discusses and extends existent theoretical considerations, which are mainly influenced by contributions in criminology. From the economic point of view, 'behavioral' explanations are obvious, and anger seems to be of crucial importance for retaliatory crimes, possibly triggering future victimization and even leading to cycles of offending and victimization. This paper employs German survey data and uses retrospective information on individual offending and victimization to test factors of offending and of victimization, as well as reciprocal effects. Exogeneity tests do not contradict exogeneity of criminal activities and endogenity of victimization. Among the most important factors of crime, broken homes (covered by any previous conviction of parents or siblings as well as by divorce of parents) and alcohol/drug abuse are the most important factors of crimes, but also excessive debt problems play a significant role. Besides criminal involvement, very large peer groups and high education increase the risk of victimization, whereas married and healthy people have a significantly lower risk of becoming a victim of crime.

A major problem of research on the victim-offender overlap is the lack of panel data which would follow individuals over time in order to measure any criminal activity after the event of victimization, and any victimization following crimes. Moreover, unobserved heterogeneity is an important issue when studying crime. Thus, a limitation of the cross sectional data used in this study is that it has to rely on retrospective information. It is hoped that the study will encourage more research with better data on this interesting and widely neglected subject.

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