How to model a rational choice theory of criminal action?  
Subjective expected utilities, norms, and interactions.

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Abstract

With reference to the classic modelling of criminal behaviour in Rational Choice Theory (e.g. Becker 1968), this paper presents an extended Subjective Expected Utility model for the explanation of criminality that is more in line with the requirements of theorizing and empirical testing than former approaches. In our model, the decision of an actor is influenced by the expected utility of the crime and the norms which prohibit the delinquent action. It is also suggested that there is an interaction between utility and norms which reflect different pattern of decision making that lead to different probabilities for the occurrence of crimes. The relevance of the model is shown by using survey data from Germany. By applying a new technique to uncover interaction effects in nonlinear models, different decision pattern are revealed. On the one hand, it is likely that norms restrict criminal behaviour by suppressing cost-benefit calculations. On the other hand, it is also possible that the influence of norms is absorbed by cost-benefit calculations.

Introduction

Gary S. Becker’s *Economic Theory of Crime* can be seen as the most prominent and influential work on the Rational Choice Theories of crime (see also McKenzie and Tullock 1984; Opp 1989; McCarthy 2002). According to Becker (1968), criminality is the consequence of rational actors` decisions that maximize their bene-
fit. Thus, offenders are not driven by social conditions but they precisely try to maximize their advantages such as physical well-being or social recognition through criminal acts so that their illegal behaviour does not yield adverse consequences for themselves. In this respect, criminal behaviour does logically not differ from legal behaviour (Voss and Abraham 2000: 72). Such an action theoretical approach which belongs to the family of rational-choice-theories is capable of explaining and empirically describing any social and everyday behaviour (Esser 1999).

But from the sociological perspective, it is theoretically insufficient to argue that criminality is primarily an individual problem. From a sociological point of view, Becker’s model (1968) is lacking social factors such as incentives in different social situations or socio-structurally varying opportunities (Piliavin & al. 1986, Birbeck and LaFree 1993) as well as the influence of societal norms. Sometimes, theoretical models in Economics tend also to neglect their empirical implications. There are still far too few empirical applications of such models of the theory of action which try to integrate sociological and empirical aspects when it comes to the explanation of criminal behaviour (see Homel 1983; Cornish and Clarke 1987; Paternoster 1989; Grasmick and Bursik 1990; Curti 1998; Mühlenfeld 1999).

Therefore, we will sketch the principal argumentation of rational choice theorists in the first part of this paper in order to identify their sociological requirements. It is shown that several older approaches do not properly regard the interdependence between explaining variables. In order to fathom the applicability of a rational choice model for criminal behaviour, a model including norms and utility based decision parameters is employed for the explanation of tax-fraud. The importance of linking theorizing and empirical testing in a proper way is shown by differentiating parameters of the model from variable weights (which was not correctly done in some previous studies). We also present a way to test the theoretically meaningful interaction effect of subjectively expected utility and internalized norms empirically. The final section concludes.

1 In this paper, we restrict ourselves to criminal behaviour patterns which are not demanded on a market. Criminal activities which comprise a market demand (e.g. ordered murder or drug distribution) undergo the same conditions as any other gainful occupation – except that they are carried out on an illegal market.
The classical theory of crime by Becker (1968)

Criminality within a society is the aggregated consequence of criminal behaviour of actors in different social conditions. “It is the conscious behaviour that violates rules of criminal law. The actors are absolutely aware of the majority of these violations being deviationists from the rules of criminal law. Therefore, actors also try to conceal their behaviour” (Haferkamp 1987: 171, our translation).

According to Becker (1968), a (sane) person commits a crime if the subjectively expected benefit is greater than the benefit that could be realized by spending time and further resources for other activities. Consequently, individuals do not become ‘criminals’ because they differ from other people in terms of their basic motivation but because of their different costs and benefits. Thus, an actor chooses legal or illegal actions which he subjectively expects to increase his benefit (Cornish and Clarke 1987: 933; Mühlenfeld 1999: 47).² Besides the Benefit B - we employ the abbreviation also used by Becker (1968) – which a person expects from his offence, both the subjectively expected probability of being caught or Probability p, as well as the Costs C for the subjectively expected level of penalty have to be considered in a person’s decision to commit a crime. The economic theory of crime seldom refers to sociological relevant reasons to explain crime like “socialization” or “lack of self-control” (Gottfredson and Hirschi 1990; McCarthy 2002: 437).³ According to Becker (1968, footnote 17), the Expected Utility (EU) for the offence S can be defined as follows:

\[ \text{EU} [S] = B - pC \] (1)

According to this expression, a crime is more likely to be committed if the expected utility is greater than the expected costs that result from detection and penalisation: \( B > pC \).

² Benefits and costs can be of physical as well as psychological value for the actor (Mühlenfeld 1999: 47). “Sex and excitement” are typical examples.

³ According to Becker (1968), the subjective assessment of these factors depends on the individual attitude towards risks. Thus, actors who are prepared to take risks are rather deterred by the probability of being caught than by the level of penalty. In the case of risk-neutral actors, the impacts of probability and penalty can compensate while actors who avoid risks are rather deterred by the impact of heavier penalties than by the probability of being caught. Becker draws the conclusion that criminal actors are more likely to take risks and that therefore the probability of being caught is generally more important than the penalty. The latter assumption may be supported by game-theoretical considerations (Bueno de Mesquita & Cohen 1995) and empirical studies, however, this psychological supplementary assumption is inconsistent with the economic approach of criminal behaviour and generally with the logic of rational choice theories since there would be a psychological disposition of criminals then, which distinguishes them from law-abiding citizens.
Since the probability p is no exogenous quantity but a subjective expectation of individuals, it can be assumed that it varies between individuals, i.e. if they belong to different social classes. Cornish and Clarke (1987: 935) point out that in the rational choice perspective the choice of an (illegal) action alternative is determined exactly by the varying assessments of utility, costs and risks by different potential offenders: “Rather than assuming that potential offenders are fueled by a general disposition to offend which makes them relatively indifferent to the nature of the offense they commit, the rational choice perspective asserts that specific crimes are chosen and committed for specific reasons. Decisions to offend, in other words, are influenced by the characteristics of both offenses and offenders”. The differing assessments between the actors can be explained by differences in the knowledge of the solving of particular offences. Thus individual more or less precise knowledge of control authorities’ work and success can evoke an under- or overestimation of the probabilities of being caught.

Member of lower social classes, for example, in contrast to the middle and upper classes, might overestimate the probability of being caught by the tax office in the case of tax fraud. Different criminal behaviour of different social classes can be explained within a rational choice framework without conducting problematic generalisations like in the theory of Anomie (Merton 1968; see Becker and Mehlkop 2006 for details). Experiences or differential associations (Sutherland & Cressey 1966) can also contribute to the formation of subjective expectations of being caught. Frequent contacts with successful bank robbers would make an individual assuming a low probability of being convicted.

The penalisation of a solved crime is the price of the criminal behaviour to which the opportunity and transaction costs have to be added. Thus a severe pen-

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4 Criminals can have an advantage here – in particular criminals who have repeatedly committed certain offences since they may be able to better assess the dark figure of crime (Curti 1998: 34). If these criminals additionally act in a criminal environment, they can also assess their accomplices’ probabilities of success relatively exactly. Thus the uncertainty of the parameter p for repeat offenders who act in a criminal environment (differential association) is relatively low. The calculation of the expected value for criminal acting is more successful. This is an explanation of criminal careers that is compatible with the economic approach. It is not even necessary to fall back on theoretically problematic constructions such as role adoption or the principle of secondary deviance as it is the case in the labeling approach (see thereto Keckeisen 1974). These reflections come to the obvious conclusion that – if it is not possible to solve every offence – the probability of being caught should be uncertain in order to keep the calculation of the expected values for criminal activities as uncertain as possible thus preventing criminal behaviour (see Mühlenfeld 1999: 56).

5 Opportunity costs comprise the missed benefit from all the other action alternatives not chosen (for example the missed income from legal activities which cannot be carried out during the criminal
alty for criminal behaviour is supposed to have a highly deterring effect. Since the degrees of penalty for different offences are often unknown, the subjective assessment of the sentence is most likely marked by inaccuracies and uncertainties and shows a broad variety of expected penalties. Measured by the objective rationality, these subjective assessments are probably often objectively wrong due to individuals’ bounded rationality (see Cornish and Clarke 1987; Simon 1993). Therefore, it makes sense to assume that decisions about criminal behaviour are influenced by the knowledge of the laws and possibly on account of own experiences with the prosecution by the revenue authorities. Under this assumption, members of the middle or upper class would assess the expected penalties for tax fraud more precisely than tax payers from the lower classes. Members from working or lower classes would systematically overrate the degree of penalty for tax fraud.\textsuperscript{6} Since tax fraud is normally sanctioned with high fines, the income situation of the lower social classes implies that they connect the revelation of the tax fraud with such high costs that they can hardly amortise them. Individuals from high-income social classes “prefer” these offences since monetary fines appear to be lower penalties for them than long imprisonments. From their perspective, the opportunity costs resulting from custodies are higher than the fines which are usually imposed (Becker 1968).

\textsuperscript{6} Generally, this point of view clarifies the existence of inconsistent findings regarding the relationship between rates of criminality and the degree of penalty. Apart from the methodical problems which are connected with the statistical analysis of the official statistics’ aggregate data, the concept of general deterrence often ignores that the objective probabilities of solving a crime and the degrees of penalty as exogenous factors are rather irrelevant for the description and explanation of criminal behaviour since they can possibly deviate considerably from the subjectively expected probabilities and degrees of penalty. Furthermore, the spread of secured knowledge of the degrees of penalty for diverse criminal offences remains out of consideration (see Opp 1973). Thus a variety of empirical studies show that rather the probability of being caught and punished than the degree of penalty are decisive for not taking into account a criminal offence (Grasmick and Bursik 1990: 840; Silberman 1976: 443; Niggli 1994: 92-93).
Extension of the classic Theory of Crime by the Theory of Subjectively Expected Utility

In reality, severe penalties per se do not appear to act as a deterrent. Some societies punish certain offences with capital punishment what does not reduce the likelihood of their occurrence, however.\textsuperscript{7} There have to be other determinants of criminal behaviour apart from the degree of penalty’s expectation and assessment. In view of this, one could argue with pathologies, personality traits (as for example in Gottfredson and Hirschi 1990) or heredity. From a Rational Choice perspective, criminal actors differ from law-abiding ones in the different evaluation of the same incentives (Mühlenfeld 1999: 48). A murderer, for example, does not care about the severity of sanction if he or she is convinced about not being detected. Although different offences realize different benefits, even identical benefits are evaluated differently by certain actors (Cornish and Clarke 1987: 935). An illegal income of 100 US Dollar might be attractive for poor actors but not for rich ones because of their higher legal income.

The decisive factor for the realisation of the benefit is whether an individual considers himself in the position of successfully carrying out a certain offence. For Gary Becker (1968), this probability of success is simply the opposite of the probability of being detected, $1 - p$. This is problematic due to several reasons. On the one hand, the actor needs knowledge both about whether the plan is able to realize the goal and how the plan itself is to be carried out. For this, the knowledge about the probability of being detected alone is not sufficient. Moreover, a person must also be sure to be in the position to carry out a criminal action, that is, he or she must dispose of control expectations and control beliefs (see Heckhausen and Schulz 1993).\textsuperscript{8} These expectations and beliefs correspond, on the other hand, with socially differential contacts and the socially conveyed access chances to illegitimate means (Cloward 1968; Merton 1968). At first sight, it seems to be trivial that only a person liable to pay income tax can actually cheat on taxes if he or she has the necessary knowledge to do so or that one can only raid a bank with a certain routine in the ne-
cessary plots and with weapons and a getaway car (see Opp 1989: 410). But for the decision process to cheat on taxes or to raid a bank these preconditions are not trivial because they are connected to the offenders’ social history, his actual living conditions and subjective estimations of his own abilities. These arguments imply that it is more reasonable to assume that the subjectively expected probability of success is independent from the probability of being detected.

From the perspective of a Theory of Subjective Utility (SEU), including aspects of internal/external control and differential association, success means that the benefits of an offence can be realised. The expected benefit of an offence is weighted with this probability of success \( q \). Thus, extending Becker’s (1968) economic model with this idea and referring to the Theory of Subjective Utility, the following decision condition is derived:

\[
\text{SEU}[S] = qB - pC
\]

(2)

where \( SEU[S] \) is the subjectively expected utility from the offence \( S \), \( q \) the expected probability of successfully carrying out the offence, \( B \) the value of the expected utility, \( p \) the probability of being caught and \( C \) the expected degree of penalty. A crime is committed if \( q\cdot B > p\cdot C \) and remains undone otherwise.  

Thus, four variables are identified to explain criminal behaviour. Differences in criminal behaviour between individuals are the result of different assessments of these four variables. The equation \( SEU[S] = qB - pC \) directly indicates the importance of the probability of being caught and punished \( p \). The value of \( p \) can vary between 0 (the person is not being caught for sure) and 1 (the person believes at any rate to be convicted). If the actor assumes the extreme case of \( p = 0 \), the expected utility \( SEU[S] = qB \) still remains and already a very low benefit (given \( q < 0 \)) provides an incentive for committing the crime. If the person assumes a value of \( p = 1 \), the utility function consists of the difference between costs and utility: \( SEU[S] = qB - C \). If the value of \( qB \) exceeds \( C \), the offence is carried out despite the certain punishment. Thus, it appears that committing an offence can also be rational under high risk without the urgent necessity of an appeal to psychological constructs such as attitude towards risk (willingness or aversion to take a risk or risk neutrality) for its explanation.

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According to game theoretic approaches (i.e. Tsebelis 1990), the formalization of not committing a crime as \( q^*b \leq p^*C \) is not correct since in the case of \( q^*B = p^*C \) a rational actor is indifferent to commit the crime or refrain from it. But in the framework of the modified theory of subjective expected utility it is plausible to assume that an offence is not committed if the costs exactly equal the benefits.
The economic approaches to the explanation of criminal behaviour (i.e. Becker 1968; McKenzie and Tullock 1984) are restricted to the maximising problem under risk, but do not consider sociological dimensions of subjective perception or assessments. Particularly, they do not refer to *norms and their internalisation*. From the perspective of the Theory of Subjectively Expected Utility, it is decisive how an individual defines its social situation. It is also of importance which action alternatives are actually being taken into consideration. Categorical and internalised norms, such as the “Golden Rule” or “You shall always obey the laws, no matter whether or not you agree with them” constitute action restrictions. They can be seen as part of the “framing”, which precedes the actual decision making process and integrates it into the respective cognitive frames and the knowledge stocks, beliefs, attitudes and values.\(^{10}\)

One of the most prominent theories about beliefs, attitudes, and intended behavior is the “Theory of Reasoned Action” by Fishbein (i.e. 1967) and Fishbein and Ajzen (1975; Ajzen and Fishbein 1980) which is integrated in our Theory of Subjective Expected Utility. Briefly summarized, Fishbein (1967) claimed that, firstly, any attitude object (i.e. tax fraud) contains certain characteristics that are recognized by the actor (for example, if an action is characterized as legal or illegal). These characteristics are crucial for the actor’s attitudes toward this object. Secondly, the attitude towards the attitude object is a function of the actor’s subjective knowledge about these characteristics (cognitive component) and the subjective evaluations of these characteristics (affective component). In the extended versions of this approach, Fishbein and Ajzen (1975; Ajzen and Fishbein 1980), integrated situational components and the effects of social norms. Intended action is a function of the attitude towards an action in a given situation (the function is defined as the probability that an attitude object is bonded to a characteristic, i.e. tax fraud as attitude object is characterized as illegal) and the social norms (that is, a certain action is expected by the social group and the willingness to abide these norms). These two components (attitudes towards an action and social norms) are independent from each other and therefore are interrelated in an additive way. A closer examination of this approach reveals that it can be integrated into the general framework of our theory of Subjective Expected Utility since the attitude towards an action consist of an evaluation of the consequences of these behaviour and the utility of the behaviour. And the component of social norms reflects the pressure of conformity. Actors choose a certain action if it is

\(^{10}\) Tyler (1990: 4) assumes that internalised norms prevent criminal behaviour – not dependent on external factors such as threat of punishment. He distinguishes between “personal morality” (the actor obeys the law since he considers it to be just) and “legitimacy” (the actor obeys the law since he believes in the legislature’s right to control individual behaviour).
positively evaluated by themselves and if they expect their peers to advocate this behaviour. The respective weights of the two components may vary.

This approach from social psychology is in accordance to other criminological and sociological theories. According to the Theory of Differential Association, the impact of social norms on decision processes is influenced by learning processes. If one belongs to social groups in which tax fraud is regarded as a self-evident, popular behaviour or the resistance against laws or civil disorder is considered to be socially obligatory, such norms lose their functions as perception filters or assessment factors for opportunities of law-abiding behaviour. Demands of reference groups and the liability of internalised norms can evoke individual conflicts, accordingly. Those conflicts complicate and prolong the process of evaluation and decision making. “It is particularly the reference groups of the everyday environment which create the necessary reference frame on the people’s behaviour thus – finally – filling the extended requirements of opportunities and institutional rules, the valid social interests and cultural ideas with sense, energy and life” (Esser 1999: 461, our translation). Actors who are ‘socialised’ in a law-abiding social environment obey the laws because they have internalised costs and utilities of corresponding norms (see Paternoster 1989; Tyler 1997: 222-223, who particularly emphasises the role of peer groups in the internalisation of law-abiding behaviour).

The implementation of norms within a rational choice framework is a rather complicated task. Some critics state that Rational Choice Theory has nothing to offer in explaining social norms because strictly rational actors should never feel obligated to any norm that conflicts with utility maximisation. Parsons (1937) argued that a stable social order cannot be generated by purely rational actors and be explained only through the recognition that there is a normative, non-rational element in individual contracts (see also Scott 2000). Also Elster (1989a; 1989b) held that Rational

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11 Niggli (1994: 86) shows that such a restriction can be consistent with the basic assumptions of the Theory of Expected Utility: “By such a definition rationality does not dictate what can be concluded, but only what cannot”. The actor’s learning processes (socialisation) provoke a restricted perceptual ability for – legal or illegal – action possibilities, which can be analytically interpreted as a change of preference towards illegal (legal) alternatives. In other words: Differential contacts with criminal actors generate a perception filter that systematically makes the opportunity costs for criminal activities appear lower (Kuntz 1993: 195).

12 According to the Theory of Learning, the peer group as the actor’s normative reference group is of great importance here. “(...) Informal reactions of the specific social network of which the actor is part should be much more important than general social ideals and formal reactions, because the latter do not concern the individual directly. Finally, to the extent that moral beliefs are part of the actor’s bond to his primary social network, they should be very important, too... Since these beliefs and morale take effect only as far as they are personally valued, it would in fact be “irrational”, that is inconsistent, to believe something but act contrary to it” (Niggli 1994: 92; see also McCarthy 2002: 426; Frey and Opp 1979: 289).
Choice and normative commitment are complementary processes in social action. There are important approaches in explaining social norms and norm-abiding behaviour within Rational Choice (for an overview see Scott 2000: 126-138). One could argue that norms simply are arbitrary preferences in which actors are socialized. Furthermore, it can be argued that following norms is a rational strategy in recurrent (exchange) relationships. Cooperation realises mutual benefits in the long run, even if it does not maximise the outcome of each single actor (Coleman 1990, Ridley 1996). Blau (1964) stated that rational actors are willing to accept present costs due to norm-abiding in order to realise benefits from stable social relationships in the future. Exploring the formation of a normative structure and the functioning of norms within Rational Choice would go far beyond the scope of this paper. We take as given that norms exist and that they do have an influence on the action of actors by reflecting internalised attitudinal constraints to social action.

**Modelling the rational decisions**

In empirical research, rational choice models of crime are often tested by conducting regression analysis to estimate the effects of the above described variables on the probability of committing a crime. The modelling is based on formalisations like, for example, Becker (1968). Therefore, the regression equation can be written as:

\[
\text{Crime Intention} = \beta_0 + \beta_1 q + \beta_2 B - \beta_3 p - \beta_4 C - \beta_5 N + \varepsilon
\]  
(3)

where \(N\) is the deterring effect of internalised norms and \(\varepsilon\) is an error term. This type of modelling can be found in Paternoster and Iovanni (1986), Slovic and Lichtenstein (1968) and Nagin and Pogarsky (2001). Also in a previous paper of one of the authors such a model was used (Becker and Mehlkop 2006). It is, however, "absurd" (Dahlbäck 2003: 39) to model these variables as linear and additive because "The utility of an outcome can be expected to be of interest to a decision-maker only to the extent that the outcome can occur, and therefore the placement of the probability and the utility values in different terms in additive models is absurd, to the extent that these models are assumed to describe the behavior of people who reflect on their choices" (Dahlbäck 2003: 39). To be more precise, such additive modelling implies that the effect of the severity of sanctions (C) is linear and independent
from the probability of being detected and sanctioned \((p)\). But the deterring effect of the severity of sanctions is in the real world dependent on its probability and is, therefore, weighted by it. While the additive model treats each variable as a parameter, it is more plausible to treat only \(B\) and \(C\) as parameters while \(q\) and \(p\) are simply weights (not parameters) for \(B\) and \(C\), respectively. A possible solution to that problem might be to model interaction effects between \(q\) and \(B\) and \(p\) and \(C\), respectively. The regression equation would change accordingly:

\[
\begin{align*}
\text{Crime Intention} &= \beta_0 + \beta_1 q + \beta_2 B + \beta_3 (qB) + \beta_4 p - \beta_5 C - \beta_6 (pC) - \beta_7 N + \varepsilon 
\end{align*}
\] (4)

This more sophisticated modelling is still plagued with the problem that each variable is treated as a parameter. This model implies that the probability of being detected and the severity of the sanction have as well independent and joint effects on crime. Recognising these problems, some papers conducted multiplicative models instead of additive models (Paternoster and Iovanni 1986; Becker and Mehlkop 2006) which can be formalised as follows:

\[
\begin{align*}
\text{Crime Intention} &= \beta_0 + \beta_1 (qB) - \beta_2 (pC) - \beta_3 N + \varepsilon
\end{align*}
\] (5)

While this model prevails the `absurdity´ of treating the utility of an act and its probability as independent factors, two problems are still remaining. Firstly, it can be doubted that actors treat the utility term and the costs term independently from each other. Secondly, this model implies that Utility can be compared across actors. The core argument against interpersonal comparability is that utility cannot be assessed on a particular scale level (Dahlbäck 2003: 50). Utility is assumed to be interval-scaled “for which comparisons cannot be made, since it is linearly transformable in an unrestricted, personally unique matter” (Dahlbäck 2003: 51). To put it simple, it is inconvincible that 100 US$ have the same utility for all actors. Or that a fine of 1 000 US$ is equally “bad” to a rich or to a poor actor. The problem of comparing subjectively valued utility can be (partly) ruled out by putting the benefits of a crime in ratio to its costs. Regardless of the “true” individual value of benefits it seems plausible to assume that actions are more attractive if their benefits exceed their costs and that they are less attractive (or not at all) if the expected costs exceed the benefits. This heuristic creates an individual point of reference. Utility is comparable among individuals
by the simple rule that positive numbers are generally more attractive than negative ones. Therefore, we suggest to calculate the subjective expected utility as $(q^*B - p^*C)$ instead of using $q^*B$ and $p^*C$ as independent parameters. The outcome of the former subtraction is comparable across actors if it is assumed that positive values are more attractive than negative ones. We also posit that larger positive values imply a greater distance to zero than smaller positive values.

Summing up, a model in line with the ideas mentions before turns out as:

$$
\text{Crime Intention} = \beta_0 + \beta_1 (qB - pC) - \beta_2 N + \epsilon
$$

(6)

Up to now, we only focuses on the SEU term and ignored the modelling of the expected negative effect of internalised norms. As discussed above we assume that internalised norms, like “You shall always obey the laws, no matter whether or not you agree with them” decrease the likelihood of committing a crime. By this, we refer to legal norms only which penalize crimes.

In order to complete the modelling, an interaction effect between norms and utility is added to the model. If influences of the personal history are relevant to the actual decision to conduct a crime or not, norms can be taken as crystallized hints how to proceed in the actual decision. If someone happens to be totally norm obedient, the normative thoughts hamper the emergence of different ways to proceed with criminal activities or to plan a crime. In that sense, norms are obstacles to the preparation and the conduction of crimes. They do not provide reasons why someone should totally refrain from a certain action, however. They just prescribe that it should not happen. If someone ponders the crimes’ possible benefits and costs, several good reasons may turn up why a crime could be committed. Then, the expected net-benefit of a crime might be bigger than the vague benefits from obeying a norm. The impact of norms on the decision may become smaller if someone falls prey to the clarity of the expected crime benefits.

These arguments imply an interaction effect between norms and utility, depicted in models 7.1 and 7.2:

$$
\text{Crime Intention} = \beta_0 + \beta_1 \text{Utility} - \beta_2 N + \beta_3 [\text{Utility Norm}] + \epsilon
$$

(7.1)

$$
Y = \beta_0 + \beta_1 (qB - pC) - \beta_2 N + \beta_3 [(qB - pC)N] + \epsilon
$$

(7.2)
This model allows us to estimate the main effects of the SEU term and of the internalised norms and to estimate the joint interaction effect. In the following section, we will test this model and demonstrate its applicability for real data.

**Data, Variables and Statistical Methods**

Since criminality as a social phenomenon is the aggregated consequence of intentional individual behaviour, a micro-analytic analysis of actors’ delinquent behaviour contributes to the understanding of the causes and reasons of this phenomenon (Haferkamp 1987: 174). Such micro-processes can only be scrutinised using individual data (Pilivan et al. 1986: 102).

For testing our theoretical propositions, the data from the German General Population Survey (ALLBUS) for the year 1990 are employed for the empirical analysis (for a detailed description of the data and methodology of ALLBUS see Wasmer et al. 1991; Koch et al. 2001). In the year 1990, 3,051 German citizens of full age living in private household in the Federal Republic were interviewed. The sampling was made according to the ADM design.

“Sanction and differing behaviour” is a main subject of the ALLBUS 1990. In order to avoid a refusal of answer on a larger scale, merely minor offences were under discussion. Thus, people were asked whether and how often they had already committed offences like tax evasion, shoplifting, dodging the fare or driving while intoxicated and if they would commit these offences in the future. Furthermore, those asked where not only supposed to assess these offences morally but also to subjectively evaluate the probability of being caught committing such offences. In the ALLBUS 1990 only, people were asked about the degree of penalty for offences like tax evasion or shoplifting. Since it is only possible to extensively test the action-theoretical model of criminal behaviour using this additional information, the multivariate analysis is restricted to the year 1990.

The collection of reliable and valid information about delinquency constitutes a methodical difficulty in population surveys. The refusal of answers or wrong information about the own delinquent behaviour are reasons for it (Hindelang et al. 1979). Biased samples with regard to criminal behaviour can also result from the fact that

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13 The questionnaires in the ALLBUS 1990 were split. With regard to delinquency, both groups were presented differently formulated questions. For the review of the theoretical model of tax fraud, the ALLBUS 1990 only allows an analysis with the 1461 interviewees from the second split. The multivariate analysis of shoplifting, however, comprises an intersection from both split groups.
detained offenders cannot be reached in population surveys. However, there are
good reasons that interviews which assure anonymity hardly bring forth systematic
false statements.

It is possible, however, that convicted citizens more likely tend to conceal their
offence. In order to minimise systematic losses owing to delicate questions about de-
linquent behaviour, the ALLBUS 1990 preserved the interviewees’ anonymity by ap-
plying the “sealed-envelope technique”. The questioned persons could respond to
the items about delinquency in writing and then hand over their answers to the inter-
viewer in a sealed envelope.\footnote{2812 out of the 3051 people asked in 1990 completed the questionnaire about their delinquent be-
aviour. Capturing the previous and future delinquent behaviour (except tax evasion), the pre-test,
conducted by the ZUMA in the preliminary stages of the ALLBUS 1990 survey, did not reveal significant
differences between the oral inquiry and the sealed-envelope technique (Warner et al. 1991: 11-
12). Thus the data on tax fraud should be interpreted cautiously, which, however, is advisable for all
studies of this topic.}

Although the ALLBUS studies comprise relevant information about people’s
delinquent behaviour, their cross-sectional character involves a further methodical
difficulty. If the inclination to criminal behaviour does not depend on exogenous
factors but subjective assessments of utilities, costs and probability of being caught,
it has to be taken into account that such subjective expectations and assessments
change over the years (see Curti 1998: 34; Davis 1988). Consequently, prospective
longitudinal data would be the ideal basis of analysis (see Niggli 1994: 96). To our
knowledge, such data are not available yet. In the ALLBUS, the intention to criminal
behaviour refers to possible action in the future. The causes of criminal behaviour
refer to the current situation of the individual. However, the problem that the inten-
tions for delinquent behaviour as well as the expectations and assessments relevant
to this behaviour are dependent on the context and the situation, remains unsolved
(see Niggli 1994: 93; Esser 1999). Thus, cross-sectional surveys can involve some
errors in measurement, whose extent and consequences are unknown for the empir-
ical analysis. With reference to delinquent behaviour, methodical reservations about
the ALLBUS data are at the same time plausible but also empirically unsecured.

The readiness to commit a criminal offence constitutes the dependent vari-
able. The interviewees were asked whether they could imagine to possibly (once
again) commit an offence in the future or if they would not do it (again) under any cir-
cumstances. In our analysis, we refer to tax fraud only (see table 1). Before this in-
quiry about their prospective behaviour, people were also asked whether and how of-
ten they had committed those offences before.
The ALLBUS also measures the subjective utilities, costs and assessments of the probabilities of success and being caught as well as the sanctions (Opp 1989: 426). Thus, the subjectively expected probability of being caught \( p \) constitutes an important independent variable in the economic model (see Paternoster et al. 1982: 1255). Those asked were to rate on a five-stage scale from “very likely” to “very unlikely” the subjective probability that the tax office will reveal their offence. For the multivariate analysis, the ordinal data were transformed into probability data in percentages (Reuband 2002: 52-54 points out potential problems of this approach).

The probability of success \( p \), the probability of realising an offence’s notified utility, is, contrary to Becker (1968), not defined as the complement to the probability of being caught but as independent value defining action competence. Due to a lack of an alternative measurement in the ALLBUS, it is only possible to operationalise this variable by the highest educational qualification. This is motivated by the fact that tax fraud mainly consist of giving false information within a form. Therefore the offender needs some cognitive abilities (i.e. dealing with forms and words) and some basic knowledge about the tax system. We assume that actors with higher schooling therefore estimate a higher probability of success.

The subjectively expected costs of offences are displayed indirectly through the demanded degree of penalty \( C \) for the corresponding offences. Those asked were to state whether offences like tax evasion should be punished. In case of the degree of penalty for tax evasion, the original scale was employed. Thereby the penalties were put into the order of their degree.\(^{15}\)

The subjectively expected utility \( B \) of an offence like tax evasion could also be measured only indirectly through the behaviour assessment in a scenario since the ALLBUS did not involve a direct measurement of an expected benefit from an offence. This moral assessment of delinquent behaviour “can ascertain whether a certain conduct norm is actually prevalent among the population or among particular subpopulations, in other words, whether certain behaviour is actually classified as deviating” (Wassmer et al. 1991: 25, our translation). One can, however, assume that

\(^{15}\) For this offence, the variable for the degree of penalty constitutes an approximation to the fact that, from the asked person’s perspective, this punishment is also expected for the corresponding offence (see Opp 1989: 426; Grasmick and Bursik 1990: 486). It underestimates the accruing costs since there is neither information about informal sanctions (see Grasmick and Bursik 1990; Bishop 1984, see also Meier and Johnson 1977) nor information about the opportunity costs – even if the height of the earned income is controlled (Davis 1988: 384). It remains unclear whether and to what extent the real penalties for tax fraud are known and whether appropriate degrees of penalty are demanded in the subjective assessment (see Erickson et al. 1977: 307). Due to a lack of information it also remains unsolved to what extent people take into account the possibility of an externalisation of the accruing costs in their consideration of action alternatives. Thus the consequences of individual tax evasion are generalised (see Friedrichs 1997: 477).
this normative deviation is connected with the expected benefits from this offence (Diekmann 1980: 86, 138). Therefore, the empirical analyses of tax fraud differentiate whether this offence is assessed rather positively than negatively.

The liability of internalised norms is assessed by the interviewees’ compliance with the opinion “One should always obey a law despite the fact whether one likes it or not.” (our translation). This variable measures the law obedience which constitutes both an incentive for compliant behaviour and a cognitive component of framing.
### Table 1: Variables and Descriptives

<table>
<thead>
<tr>
<th>Item Label (Allbus original label)</th>
<th>Item Description</th>
<th>Response Categories</th>
<th>Frequencies</th>
<th>Mean, Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td>Tax fraud in future (V201)</td>
<td>Would you give false details about your income situation to reduce your income tax?</td>
<td>0 = No, by no means</td>
<td>0: n = 901 (73.13%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 = yes, possibly</td>
<td>1: n = 331 (26.87%)</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td>B: Benefit from tax fraud (V164)</td>
<td>An employee receives due to his falsely reported details a 500 Euro tax refund. What is your opinion about this?</td>
<td>1 = this is dreadful</td>
<td>1: n = 180 (14.61%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = this is not dreadful at all</td>
<td>4: n = 12 (9.82%)</td>
</tr>
<tr>
<td></td>
<td>q: Probability of successfully carrying out the tax fraud (V221)</td>
<td>What is your (highest) school-leaving qualification?</td>
<td>No qualification = .166</td>
<td>.16: n = 37 (3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CSE = .333</td>
<td>.33: n = 560 (45.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sec. School Lev. 1 = .5</td>
<td>.50: n = 301 (24.4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Adv. Techn. College = .66</td>
<td>.66: n = 78 (6.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Abitur = .833</td>
<td>.83: n = 256 (20.8%)</td>
</tr>
<tr>
<td></td>
<td>p: Probability that crime is being discovered (V205)</td>
<td>If you cheated at taxes, how likely are you being discovered by the tax office?</td>
<td>Very unlikely = .166</td>
<td>.16: n = 151 (12.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>unlikely = .333</td>
<td>.33: n = 330 (26.8%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>partly = .5</td>
<td>.50: n = 270 (21.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>likely = .66</td>
<td>.66: n = 519 (42.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>very likely = .833</td>
<td>.83: n = 162 (13.2%)</td>
</tr>
<tr>
<td></td>
<td>(q<em>B – p</em>C) Utility of tax fraud</td>
<td>One should always obey a law despite the fact one likes it or not.</td>
<td>1: totally agree</td>
<td>1: n = 45 (3.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2: agree</td>
<td>2: n = 189 (15.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3: disagree</td>
<td>3: n = 596 (48.4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4: totally disagree</td>
<td>4: n = 402 (32.6%)</td>
</tr>
</tbody>
</table>

**Notes:** The probabilities in Item “Probability of successfully carrying out the tax fraud” were assigned monotonic according the quality of the school/high-school qualification.

### Statistical Analysis

The evaluation of the single determinants’ influence on the intention of committing a crime is made applying a binary logit regression. This method is employed for distribution-theoretical reasons as well as for decision-theoretical basics (Urban 1993: 108). Thus, the intended offence can be described with a decision and action theoretical approach of the subjectively expected utility and the cost-benefit evaluation of action alternatives. As an example, a probabilistic action model for the process of a criminal action can be combined with and examined by the logic and statistical of logit models (Urban 1993: 119).
If equations (6) and (7) are tested within a logit-regression design, the following results occur (see table 2).

<table>
<thead>
<tr>
<th>Table 2: Logit Regression of Tax Fraud Intention on Expected Utility of Tax Fraud, Rule of Law Norm and their Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model 1</strong></td>
</tr>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>Utility of Tax Fraud</td>
</tr>
<tr>
<td>Norm Obedience</td>
</tr>
<tr>
<td>Interaction: Utility*Norm Obedience</td>
</tr>
<tr>
<td>Pseudo-R²</td>
</tr>
<tr>
<td>LR chi² (p&gt;chi²)</td>
</tr>
<tr>
<td>N</td>
</tr>
</tbody>
</table>

Notes: First entrance: Logit-coefficient. Second entrance: Standard-Error. */**/***=10/5/1%-significance level, two-tailed.

The utility of tax fraud significantly increases the likelihood to commit such a crime in the future as can be seen in Model 1. The stronger someone agrees to the issue that laws should be obeyed, the lower is the likelihood that tax fraud is carried out. The empirical results meet the theoretical expectations.

If an interaction effect between utility and norm is also considered in the equation (Model 2), the results of model 1 remain the same albeit the utility logit coefficient is slightly reduced and the norm logit coefficient is slightly increased. The interaction effect itself does not show any significance.

The intuitive interpretation of an interaction effect in a linear regression model is not valid in non-linear models. An interaction effect in linear models simply means that the influence of one independent variable on the dependent variable hinges on the level of another independent variable, the ceteris paribus condition assumed for all other determinants (Jaccard & Turrisi 2003, 22).

In non-linear model, e.g. if the dependent variable is a dummy variable, interaction effects cannot simply be assessed by the magnitude, sign or significance of its coefficient (Ai & Norton 2003). This is due to several reasons. Firstly, it might happen that different observations come up with diverging signs in non-linear modelling, sum-
ming up to an overall number that does not represent a proper value of the interaction. If, for instance, a coefficient of virtually zero occurs (which is the case in our model 2) this does not imply that there is no observable interaction in the data. Secondly, the evaluation of the interaction coefficient is also spoiled by the fact that the interaction effect itself depends on the levels of other (non-interacting) variables, contrasting to interaction effects in linear models in which this dependence does not exist. Thirdly, the t- or z-statistic usually reported to learn the statistical significance of the coefficient is inadequate. Fourthly, in logit regression the odds-ratio are not comprehensively interpretable as they no longer represent a risk or odds ratio.

Succinctly, even with the insignificant interaction term in model 2 we can not be sure that no interaction between utility and norms exists. Norton, Wang & Ai (2004) suggested a technique for computing and testing the marginal effects in non-linear models.\textsuperscript{16} Regarding the interaction effect in model 2, there is a marginal effect for each of the 1.232 observations so that a distribution of magnitudes of marginal effects exists in which the interaction effect might change its direction of influence.

When we apply the technique derived by Norton and his colleagues, we learn that the reported interaction effect term in table 2 is misleading. In fact, the interaction between utility and norms varies widely (see figure 1).

Figure 1: Comparison between the reported incorrect marginal effect in table 2 and the correct interaction effect between utility and norm.

Figure 1 illustrates that the interaction effect in table 2 is positive and rather small but the true interaction effect is positive for some of the respondents and negative for the remainder.

We also learn that the “true” interaction is significant for many observations (see figure 2). If the predicted probability of each observation is plotted against its $z$-value, it can be seen that the results are strongest in significance and magnitude for values around .1 and .8.

Predicted values below .235 are (negatively) and values above .696 are (positively) significant. By this, we find three groups with different interaction between utility and norms.
The frequency in each group differs strongly (see table 3). In the first group, 655 persons occur revealing in the average a negative utility value for tax fraud and a positive (and high) value for norm obedience. For this group, the interaction between utility and norms must be considered as significant.

In the second group, tax fraud does not have a high positive utility on the average. Norms are moderately agreed upon. The interaction turns out to be insignificant.

In the third group with only 40 people, the average norm obedience is the smallest while the average utility to commit tax fraud is the highest.

Table 3: Descriptive statistics of different groups, categorized by the probability to commit tax fraud

<table>
<thead>
<tr>
<th>Group with likelihood to tax fraud</th>
<th>frequency</th>
<th>Mean of Utility</th>
<th>Mean of Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0.235 (significant)</td>
<td>655</td>
<td>-.6214</td>
<td>3.461</td>
</tr>
<tr>
<td>0.236-0.695 (insignificant)</td>
<td>537</td>
<td>.9327</td>
<td>2.775</td>
</tr>
<tr>
<td>0.696-1 (significant)</td>
<td>40</td>
<td>2.4208</td>
<td>1.55</td>
</tr>
</tbody>
</table>

These results show that at least for the groups with significant interaction effects interesting interpretations are implied.
For the first group with a low probability to commit a crime, there is significant interaction between utility and norm this way that the overwhelming norm negates any influence of utility when a tax fraud is considered. For this group, norms constitute an antagonistic force against planning tax frauds that involve comparing benefits and costs.

The third group also shows up with a significant interaction but contrasting to the first group, this interaction is positive and, so to say, reinforcing itself. The higher norm obedience, the stronger is the utility of tax fraud in its influence on the intention to commit that crime. Norms do not longer apply as obstacles for planning a crime. They are superseded by calculations that assess benefits and costs.

**Conclusion**

The aim of our paper is to suggest a tighter link between the modelling of rational decisions and its empirical testing. Rational Choice theories might have additional requirements to satisfy the conditions demanded in the philosophy of science (Herne & Setälä 2004), but they also need to improve their procedures of examination.

In our theoretical and empirical model we presented an extended Rational Choice model and constructed interdependence between the influence of norms and the influence of cost-benefit-calculations. We did not, however, imply anything about the procedures how norms are acquired. The empirical illustration gives only evidence of the actual degree of norm obedience. These aspects usually do not apply in theories and theoretical models which refer to rational decisions but they might be included when sociological influences come also into play (see Scott 2000). In the theoretical parts of this paper, we started from the economic model of criminal behaviour proposed by Gary S. Becker (1968) and extended it on the action-theoretical level. The subjective probability of success was – in addition to the subjectively expected probability of being caught and punished – *explicitly* introduced as an additional determinant of the individual process of evaluation and decision making, which is independent from the subjective probability of being convicted of the criminal offence. Furthermore, it was attempted to make the economic model more realistic by employing the sociologically-founded distribution of different incentives and opportunity structures. This succeeded by the systematic integration of constituents of the Anomie Theory by Merton (1968), the Theory of Differential Association by Suther-
land and Cressey (1966), and the Theory of Opportunity Structures by Cloward (1968). Finally, the mediation and the learning of norms – that is the subjective evaluation of justice and injustice as well as the felt obligation towards the law or authorities in general (see Tyler 1997: 223) – were included into the Model of Subjectively Expected Utility, which is important for the definition of the social situation and the intended behaviour but remains unconsidered in the economic theory by Becker (1968).

There are several features of our modelling which differ from older theoretical approaches and their operationalizations. In contrast to Opp (1989) and others (Paternoster and Iovanni 1986; Slovic and Lichtenstein 1968; Nagin and Pogarsky 2001; Becker and Mehlkop 2006), we explicitly distinguish between parameters and weights when the decision equation is considered. This is not only theoretically meaningful (Dahlbäck 2003) but also improves the operationalization considerably because variables which do not constitute an effect of their own do not longer appear on the right hand side of the equation. Instead of using an additive modelling of decision elements such as costs, benefits, and probabilities we depict a decisions’ actual utility outcome. This avoids several problems emerging from scaling individual costs or benefits and probability, accordingly. By this, it is also not longer necessary to assume an artificial reference point for the individual comparison of the decision parameters.

We illustrated our theoretical modelling by applying it to the situation of tax fraud. This white-collar crime\textsuperscript{17} is suitable for applying the theoretical propositions because it does not happen accidentally or on spur of the moment like occasional fare dodging. It can be assumed that tax fraud is committed deliberately which is also due to the complicated but necessary processes to fill out forms. It also gives little opportunity to enjoy additional thrills or benefits such as “a kick” like shoplifting or shoots of adrenaline in a pub fight.

We assume that potential offenders subjectively estimate the benefits, costs, and probabilities of being successful / being detected. These estimates vary between actors because of varying knowledge about the tax system, about the severity of sanctions, about the capabilities of the tax authorities, and because of differential as-

\textsuperscript{17} We define White-Collar Crimes in accordance to James W. Coleman (1985: 5): “Thus, we will define white collar crime as a violation of the law committed by a person or a group of persons in the course of an otherwise respected and legitimate occupation or financial activity”. The characteristics of White-Collar Crimes are: illegal act(s), committed by non-violent means in order to gain financial advantage or to avoid the payment of money (see Edelhertz 1980: 112). White-Collar Crimes differ from Blue-Collar or Street-Crimes because they do not contain physical violence, offender and victim are not confronted directly, and they are committed in an otherwise legal setting (i.e. the tax system).
sociation with other tax cheaters. These influences are reflected in the varying estimates of costs, benefits, and probabilities. Actors evaluate the utility of committing tax fraud in a single SEU value and we assume that these subjective expected utility is interacted with the (deterring) effect of attitudes towards norm obeying. To test the interaction effect we conduct the methodology developed by Norton et al. (2003, 2004) with data from the German Population Survey (ALLBUS).

The empirical results confirm the expectations: positive utility expectations increase the likelihood of intended tax fraud significantly. General obedience to the law reduces this likelihood, and there is an interaction effect between these two variables that varies between actors.

But the results are preliminary and have to be interpreted with caution. Firstly, a proper design would be panel data which is not at hand yet (see Curti 1998: 34; Davis 1988). Secondly, the operationalizations of the variables are suboptimal at best, as usual if one has to use secondary data. Thirdly, the interrelation between subjectively expected utility and norms is theoretically not fully analysed.

These deficits of this pilot study have to be removed by future research.

References


