The Impact of Direct Democracy on Crime: Is the Median Voter Boundedly Rational?

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Is the Median Voter Boundedly Rational? *

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Abstract

Direct democracy is believed to lead to an allocation of resources that is closer to the median voter's preferences. If, however, the median voter suffers from bounded rationality, the allocation of public goods actually achieved should be affected. Based on recent empirical findings by economic psychologists, optimism bias and availability heuristic are assumed to influence the median voter's preferences for public safety; particularly, (1) a preference for lower spending on crime prevention and (2) a preference for fighting property crime to fighting violent crime is hypothesized. In consequence, in more direct democratic systems, a re-allocation of scarce means in favor of property crimes should be observed. Estimation of a structural economic model of crime using Swiss cantonal crime rates from 1986 to 2001 corroborates these hypotheses.

Keywords

Direct Democracy, Bounded Rationality, Economic Model of Crime

JEL Classification

K42, D80, D70

1 Introduction

Direct democracy is conjectured to lead to an allocation of resources that comes closer to the preferences of the median voter than does that in a representative democracy. In contrast to traditional economic theory, however, this study assumes that the median voter is subject to bounded rationality. Based on these two assumptions particularly, it is hypothesized that the voter (1) prefers that less money be spent on crime prevention measures and (2) favors protection against property crime over fighting violent crime. In this contribution, these hypotheses are developed in detail and empirically tested for the case of Switzerland, a country with strong variation in the degree of direct democracy and public safety at the cantonal level.

Based on an extensive review of the literature, it appears that this investigation is one of the first to combine and empirically test the median voter theorem of public choice with the theorem of bounded rationality developed by behavioral economists and economic psychologists. It is also the first analysis of an economic model of crime for Switzerland using an econometric panel method for cantonal-level data that employs a rich set of explanatory variables[1].

Theoretical models of political economy demonstrate that institutions of direct democracy lead to an allocation of goods and resources that comes closer to the median voter's preferences than the allocation achieved in a representative democratic system. Empirical studies for both the U.S. and Switzerland provide evidence that the provision of public goods is more efficient in direct democracies and government spending is lower. In the theoretical model world of political economy, the median voter is assumed to be a perfectly rational *homo economicus* who, on average, makes unerroneous predictions of event probabilities. On the other hand, economic psychologists have found that the rationality of an average human being is bounded: i.e., an individual's predicted probabilities differ systematically from actual average probabilities. An *optimism bias* induces the underestimation of the subjective probability for a bad event to occur, with, according to the literature on the *availability*

[1] Using Swiss data, a purely time-series analysis can be found in FUNK and KUGLER (2002, 2003), who used as explanatory variables only two deterrents and either the number of unemployed (2003) or lagged crime rates (2002). A partial correlation analysis for two cross sections of 1960 and 1970 can be found in ZWICKY (1982).

heuristic, the bias becoming stronger when an event is less frequently observed than other events.

This study combines economic and psychological approaches by applying them simultaneously to the supply of the public good, 'public safety', defined by the level of crime in a specific region. Depending on the type of felony, some crimes are committed more often than others. Based on this observation and applying the 'optimism bias' theory and 'availability heuristic' of economic psychology, it is conjectured that voters prefer the prevention of more frequently occurring property crime relative to less frequently occurring violent crime. Therefore, it is hypothesized that direct democratic systems will reallocate given budgetary resources for police issues in favor of the protection of property at the expense of personal integrity. Further, since studies in economic psychology have shown that the true average likelihood for the whole society is also systematically underestimated, it is also conjectured that fewer financial means will be allocated through institutions of direct legislation to crime prevention and crime protection measures.

This study also assumes that governmental and administrative decision makers are better at forecasting than the common citizen, because empirical investigations by economic psychologists have detected that *debiasing strategies* – linked to bureaucratic procedures, continuous training, statistical information and continuous feedback – may reduce the underestimation of true probability. Because these findings seem consistent with the initial hypotheses, it is further conjectured that in more representative democracies, more resources will be devoted to public safety in general and, more specifically, available means allocated between several crimes will reflect the actual probability of their occurrence more closely than in direct democracies.

These hypotheses are tested using a synthetic panel of Swiss data on cantonal police expenditure and crime rates between 1986 and 2001. The regressors are selected according to the economic model of crime and public choice models of government expenditure. In anticipation of the empirical results, support is found for the boundedly rational median voter theorem: First, subfederal police expenditure is observed to be dampened by the degree of direct democracy, which subsequently translates also into a lower relative number of cantonal policemen. Second, if the model takes the impact of direct democracy on police expenditure explicitly into account, property crime rates are shown to be considerably lower in direct

democratic cantons than in more representative democratic ones, and, the assault rate is shown to be significantly higher. Finally, executive efficiency gains are detected in state provision of public safety against those crimes that are of lower priority to the median voter. These empirical results are interpreted as supporting this study's hypothesis of the strongly bounded rationality of the median voter and bureaucratic efforts to partly compensate for its redistributive effect on crime.

The rest of the paper is organized as follows. Section 2 reviews relevant theoretical and empirical literature – particularly that by economic psychologists and behavioral economists, with which a public choice economist might not be too familiar – from which testable hypotheses are derived. Section 3 outlines the specification of the economic model of crime, and section 4 describes the data. The estimation results are then presented and discussed in section 5. Finally, section 6 concludes the report.

2 Political Economy and the Behavioral Economic Context: Derivation of Hypotheses

2.1. The Median Voter Theorem

Economic theory predicts that in a direct democracy, an allocation of resources is achieved that more closely approximates median voter preferences than such allocation in a representative democracy. Using a model with a one-dimensional ideology space, FELD and KIRCHGÄSSNER (2001) show that institutions of direct legislation force politicians to shift their policies toward the median voter's position[2]. In general, the stronger the institution of direct legislation (i.e. the easier it is for voters to make use of it), the stronger its influence on the decision-making process and the greater the size of this shift. In other words, bureaucrats of a Niskanen type (NISKANEN 1975, WILLIAMSON 1964) and politicians interested only in reelection are considerably limited in their budget maximizing or spending behavior. Accordingly, resources should be wasted less in more direct democratic systems than in more representative democratic systems, and the provision of public good should be more efficient at the societal level. In this context, it must be noted that the mere existence of such a direct legislative institution itself serves as a sufficiently credible threat to influence the allocation of resources.

[2] This effect is found for both the mandatory and optional referendum, as well as the (statutory) initiative.

Empirical analyses of the impact of direct democracy for the U.S. and Switzerland on the provision of public goods provide evidence consistent with the median voter theorem. Investigations of a budgetary effect show a revenue and spending restraining influence (FELD and KIRCHGÄSSNER 2001, MATSUSAKA 1995), and POMMEREHNE (1983) provides empirical evidence for Switzerland that garbage collection is more efficient in direct democratic municipalities than in more representative democratic ones. Most recent research on welfare payments also shows them to be more efficiently targeted in direct democracies than in more representative ones (FELD et al., 2004). In sum, there exists ample empirical support for the median voter theorem (for a literature review and overview, see KIRCHGÄSSNER, 2000, 2001, 2002a, KIRCHGÄSSNER et al. 1999). Based on these findings, it is quite probable that, in more direct democracies, the allocation of goods and resources for the provision of the public good 'public safety' should also be closer to the median voter's preferences.

2.2 Optimism Bias

A preferred allocation of goods and resources may depend not only on the present economic situation but also on median voter predictions about the future and opinion of what is required to meet personal needs. Hence, a misprediction about future developments will also affect the demanded state production of public goods: the stronger the influence of a boundedly rational median voter on the political decision-making process, the more biased away from a (theoretically optimal) fully rational median voter's position the actual allocation of goods and resources will be. However, the typical model of the median voter assumes perfect rationality, which also implies perfect foresight. In this paper, in contrast, based on recent developments in the fields of behavioral economics and economic psychology, this traditional approach will be extended to assume only a partially rational voter.

One type of bounded rationality hypothesized by behavioral economists and particularly economic psychologists is *human judgment error*, meaning that actual judgments show systematic differences from unbiased forecasts (KAHNEMAN et al., 1982). Among these, there also exists an *optimism bias*, which means that individuals underestimate their own probability of experiencing a bad event relative to the predicted risk for the average person[3].

[3] A possible cause for positive and negative biases can be emotions such as anger or fear (LERNER et al. 2003).

In other words, the estimated ratio of the subjective to the societal likelihood is biased downwards.

Empirical studies conducted mostly by psychologists show the validity of the optimism bias hypothesis. In particular, empirical evidence supports the conjecture that human beings would rather systematically underestimate their own likelihood than overestimate the average person's risk. In other words, people assume their own probability to be lower than that of their peers (ARNOULD and GRABOWSKI 1981, CAMERER and KUNREUTHER 1989). Such an optimism bias is observed among college-age drivers for the estimated likelihood of being involved in a car accident (DEJOY 1989)[4], among college students for being sued after having committed a felony (WEINSTEIN 1980), or among male drivers (aged 17 – 72 years) for being caught after having committed felony drunk driving (GUPPY 1993), and among smokers for the health risk of smoking (HAMMAR and JOHANSSON-STENMAN 2004, PROKHOROV et al. 2003). In all, over 250 empirical studies provide support for the existence of the optimism bias (JOLLS 2004). Moreover, this bias can be quite substantial: test subjects' own estimated likelihoods are observed to be 20% to 80% lower than the predicted risk in society (JOLLS 1998). Based on this empirical evidence, the likelihood of becoming a crime victim should be systematically underestimated by a typical human being, making it systematically lower than the estimated risk for the average person.

In addition to the misprediction of personal probability, the general probability in the population of experiencing a negative event is systematically misjudged. An early study by LICHTENSTEIN et al. (1978) asked test subjects to assess annual relative average frequencies of various causes of death in the United States, including diseases, accidents, and natural disasters. Most interesting for this present study, the relative risk for an average person becoming the victim of murder or manslaughter was underestimated despite extensive coverage of this topic in the mass media (see section 2.4). However, the frequencies of bad events that affect many people simultaneously (e.g. natural disasters) or are connected to accidents evoked by (uncontrollable) technology (e.g. nuclear meltdowns) tended to be systematically overestimated. Apparently, test subjects deemed these crime related causes of death less probable than other causes (FISCHHOFF 2002)[5]. Following this argument, and

[4] See also SVENSON et al. (1985); for motorcyclists see RUTTER et al. (1998).

[5] The probabilities of nuclear power accidents and other environmental catastrophes are usually overestimated (see also Viscusi 1992; Kuran and Sunstein 1999), which might be explainable by mass media coverage

assuming a high correlation between the estimated frequencies and predicted societal probabilities, the average person should also mispredict the average likelihood of any 'normal' property or violent crime occurring in society. Consequently, given the misjudgment about both personal and peer probability of becoming a crime victim, a boundedly rational median voter can be conjectured to prefer a lower level of crime prevention measures than if the decision-making process were unbiased.

Finally, the size of the optimism bias seems to depend on the rareness of the event. JOLLS (2004) and FISCHHOFF (2002) argue in the tradition of the literature on the *availability heuristic*[6] that infrequent events, those not often heard of or seen, are not easily imagined or kept in mind. Therefore, the likelihood of their occurrence is underestimated. As a result, there exists a causal relation between the degree of misprediction and the frequency of an event: the less frequently an event occurs, the lower its 'availability' and the higher the underestimation of its probability of occurrence[7] by a boundedly rational individual. Some empirical evidence supports this hypothesis. For example, availability heuristic helps explain the fact that people do not insure against natural disasters and car accidents – their subjective estimation of likelihood is negatively affected by absence of such experience in their own life or that of their friends, neighbors, and relatives (KUNREUTHER 1976). On the other hand, people are observed to update their estimated probabilities after experiencing a negative event either personally or in their immediate environment. For example, after being arrested once, offenders appear to substantially correct the subjective probability of arrest (LOCHNER 2003).[8] Therefore, the probability predicted for the types of events that occur more often should be closer to actuality than predictions for very rare events. In the case of this study, the probability of being murdered should be underestimated to a stronger degree than the risk of being burglarized. Hence, the relative subjective probabilities for different crimes would be biased in favor of the more frequent crime[9].

(COMBS and SLOVIC 1979). Most particularly, the likelihood of disease is strongly underestimated, a little less than the likelihood of accidents.

[6] See TVERSKY and KAHNEMAN (1973).

[7] In particular, the accuracy of subjective estimates depends on whether "(1) the exposures are proportional to actual frequencies; (2) the events are equally memorable; and (3) [the] people have reliable mental techniques for converting the availability of instances into summary estimates" (FISCHHOFF 2002). According to SCHWARZ and VAUGHN (2002), people usually do not investigate official statistics before answering a question on the likelihood of an event but rather rely on their own memory.

[8] However, this same study finds no impact of the experience of random individuals or their local surroundings, friends included, which contradicts the previous empirical finding of KUNREUTHER (1976).

[9] A similar conclusion can be drawn from application of a variation of the *availability hypothesis*: According to this theory, only those probabilities are underestimated that do not exceed a particular critical level

2.3 Debiasing Strategies

Biases, such as misprediction of event probabilities, can be mitigated through *debiasing strategies* such as the influence of the social environment, available factual information, and bureaucratic decision making. For example, the use of protocols that prescribe a step-by-step procedure for experts can help alleviate these experts' judgment bias (MERKHOFER 1987, MORGAN and HENRION 1990, MORGAN and KEITH 1995) as can specific instructions on how to assess particular information (that might otherwise give rise to a bias or not lead to debiasing by itself) (CLARKSON et al. 2002). Peer reviews are also suitable for mitigating judgment errors: people tend to be more critical of other person's statements than of their own estimates (TAYLOR and BROWN 1988). Most particularly, according to psychological evidence, one potential remedy is to make more objective information available to test subjects (DASGUPTA and GREENWALD 2001) or provide training in research methods and statistics (LEHMAN et al. 1988). Other debiasing techniques are abundant practice and/or training, task restructuring, and feedback on performance (FISCHHOFF 1982). Such feedback may be thought of as the provision of appropriate statistical information on frequencies of rare events: individuals might then use this information to objectively evaluate their own estimate of probability[10]. In this specific case, such objective statistical information might address crime rates, clear-up rates, and conviction rates that could debias criminologists, police administrators, and politicians specializing in this issue. According to the empirical evidence, once given specialized training, daily practice, and bureaucratic procedures for assessing such information, these experts will probably be less subject to an optimism bias and/or availability heuristic than the average person.

2.4 The Role of Mass Media[11]

It is often argued that the biased reporting of particularly severe and spectacular crimes in the mass media influences how people assess both the personal and societal risk of becoming a victim (SLOVIC 1986, JOHNSON and COVELLO 1987). Based on this argument, we would

(JOLLS, 2004). An alternative explanation is given by *prospect theory*: a certainty effect can lead to an increase in the difference between the perceived probability of an infrequent and very frequent event. This theory leaves open whether one of the probabilities is underestimated or the other overestimated; what is important is that the gap in subjective likelihoods of occurrence is greater than the actual gap (KAHNEMAN and TVERSKY 1983).

[10] Experiments do indeed show that overconfidence is decreased if the framing for an assessment is generated by a random process and is thus not based on the subject's own prior beliefs, i.e. when the subject's own naiveté creates the framing for the next evaluation (WINMAN et al. 2004).

[11] This section is draws upon a survey written by WÅHLBERG and SJÖBERG (2000).

expect an increase in the availability of such crimes (KALICHMAN 1994), which might (partly) offset the low-frequency effect (see section 2.2). An assessment of the empirical psychological literature on the impact of mass media on risk perception, however, gives a rather mixed picture.

First, at least in some studies on mass media content, the reporting was shown to be less biased than usually conjectured (e.g., FREUDENBERG, et al. 1996).[12] Second, it is likely that the correlation between media content and risk perception found in earlier studies[13] was subject to a reversed causality[14]. Furthermore, even if media coverage increases availability of events[15], this effect might be rather short-term, but studies on the duration aspect are still missing. In general, influences can only be permanent if an event is recalled on a regular basis.[16] Third, as already mentioned in section 2.2, the two main important sources of information for forming an opinion are one's personal experience and that of relatives and friends (TYLER 1984), whereas third-hand information, such as media content, is suppressed by higher-order information (WIEGMAN and GUTTELING 1995)[17]. Finally, media coverage tends to influence the perception of societal risk more than individual risk, with individual risk remaining significantly underestimated (TYLER and COOK 1984, COLEMAN 1993)[18]. This finding is in line with the *impersonal impact hypothesis* (TYLER 1980).

Overall, the available literature on the impact of mass media on people's perception of risk suggests that this field of research is still under development. Empirical findings are inconsistent and contradicting. For this reason, no final conclusion can be made with respect to the development of my hypotheses.

[12] The study by COMBS and SLOVIC (1979) is traditionally cited as evidence for a mass media bias in reporting.
[13] Particularly studies that are based on *cultivation theory* propose a link between the amount of media consumption and assessment of risks. However, more recent studies showed no link (Hirsch 1980).
[14] More recent research reveals that persons with higher apprehension tend to select more frequently programs with a crime-related content (WAKSHLAG et al. 1983). For more potential explanations, see WÅHLBERG and SJÖBERG (2000).
[15] MILBURN and MCGRAIL (1992) showed that news can be recalled more easily when it contained some dramatic parts. But both positive and negative coverage can lead to more concern and thus to higher risk perception (MORGAN et al. 1985).
[16] See the references cited in WÅHLBERG and SJÖBERG (2000). There is also a related literature on the relation between media coverage and fear of crime. It is, however, questionable how much fear of crime and estimation of probabilities of its occurrence are correlated.
[17] For the marginality of the impact of mass media on people's opinion, see e.g. VALLONE et al. (1985).
[18] Some correlation between the two probabilities, however, pertains (SJÖBERG et al. 1996).

Based on all of the above, the following hypotheses can be formulated:

Hypothesis 1:

> Institutions of direct democracy induce an allocation of scarce means for crime prevention which is in accordance with median voter preferences to a higher degree than in political systems without such institutions.

Hypothesis 2:

> Assuming the median voter to be on average boundedly rational, she or he systematically underestimates the probability of personally becoming a victim of a crime. Further, the median voter systematically mispredicts the risk of a less frequent crime to a higher degree than the risk of a more frequent crime.

Hypothesis 3:

> The median voter also systematically underestimates the average probability of the occurrence of one crime in society.

Hypothesis 4:

> Because of the bureaucratic manner of information gathering, processing, and decision making, trained administrators and experienced politicians tend to suffer less from optimism bias and availability heuristic than the electorate.

2.5 Derivation of Empirically Testable Hypotheses

The hypotheses developed above are not directly empirically testable using data on crime rates, police expenditure, and political institutions. However, combining the fundamental *Hypothesis 1* with the remaining three leads to the following *Testable Hypotheses*:

Testable Hypothesis 1:

The financial means available for the prevention and detection of crime is considerably lower in more direct democracies than in more representative democracies.
(Combination of hypotheses 1, and 3 or 2)

Testable Hypothesis 2:

In systems with strong direct democratic institutions, the median voter, because of his or her bounded rationality, induces a reallocation of given means towards those crimes that seem (subjectively) to occur more frequently than other crimes. Debiasing on the part of trained bureaucrats or experienced politicians, however, mitigates this effect in more representative democratic systems.
(Combination of hypotheses 1, 2, and 4)

Available for the empirical testing of these hypotheses are Swiss cantonal data on crimes against person, sexual integrity, and property between 1986 and 2001. Table 1 gives an overview of their occurrences in Switzerland.

Table 1: Summary Statistics of Cantonal Crime Rates, 1986 – 2001

Crime	Obs.	Mean	Std. Dev.	Min	Max
Homicide	416	2.016582	1.918033	0	13.55932
Rape	416	4.377733	3.602149	0	26.00049
Pickpocketing	416	16.58696	20.19978	0	111.4252
Robbery	416	18.32574	20.73591	0	121.2102
Other sex crimes	416	33.00213	23.91515	0	139.8345
Defalcation	416	33.16078	47.2319	0	734.2105
Assault	416	52.52116	36.77527	2.164346	232.4125
Fraud	416	111.9786	143.2382	0	2296.57
Burglary	416	784.0628	458.3655	80.68312	2577.983
Auto theft	416	1214.325	591.9845	54.63459	3243.841

A mean crime rate of 100 in a population of 100,000 equals a probability of 0.1% that one particular individual in this society will be victimized. Setting an (admittedly arbitrary) threshold at this level and defining crimes with probabilities above this level as frequent produces the following observations. According to this threshold, most violent and hate

crimes, such as killing, assault, rape, and other sex crimes, have a low average frequency. However, pickpocketing does not appear to occur as often as usually presumed, which might be caused by a low reporting rate. In addition, the crime rates of robbery and defalcation are quite low, at a probability of 0.018% and 0.033%, respectively.

The most frequent crimes reported are auto theft, with an objective probability of 1.214%, and burglary, with 0.78%. Fraud also exhibits a 0.11% likelihood of occurrence, but with a large standard deviation that reflects a strong variation over time and/or between cantons. The probability of becoming a victim of a property crime (e.g. burglary) is 15 times higher than the likelihood of being assaulted, and the risk of having a car stolen or misappropriated 607 times greater than the probability of being killed. Nevertheless, this latter pair of crimes is subject to a very low level of underreporting[19], so the data-derived ratio may be close to the actuality. In sum, the frequency ratios of the most prominent violent crimes to property crimes are considerably biased towards the latter.

Combining these mean levels of Swiss cantonal crime rates and their likelihood with the hypotheses developed above allows the formulation of the following testable hypothesis:

Testable Hypothesis 2a:

> In political systems with institutions of direct legislation, the median voter prefers and induces an allocation of relatively more resources for fighting most types of property crime than for fighting crime against persons.

3 Model

To test the hypotheses, the economic model of crime is estimated based on the work of BECKER (1968) and EHRLICH (1973)[20] and subsequent empirical contributions. This model can be formulated in a "structural form" but may also be reduced to a single equation (the "reduced form"). The analysis is carried out for both forms. In the structural form of the economic model of crime, the following two equations must be estimated:

[19] See footnote 31.

[20] Whereas BECKER's original model aimed to identify a socially optimal crime rate by equating the marginal cost of crime prevention and the marginal societal loss through criminal activities, it was EHRLICH (1973) who derived an individual's supply curve of offences.

$$(1) \qquad log\ O = f\,(D_1, D_2, Y, X_1, E_1, cult, inst) + \varepsilon.$$

$$(2) \qquad D_1 = f\,(Y, X_2, E_2, F, cult, inst) + \varepsilon,$$

where equation (1) represents a typical specification to estimate the supply of crime and equation (2) an auxiliary regression to determine the endogenous variable.

D_1 denotes the endogenous deterrence variable linked to the probability of punishment; in this case, the number of policemen per capita, which is driven by subfederal police expenditure[21]. D_2 represents the second deterrent related to the severity of punishment, measured by the share of suspended sentences among total sentences, which is treated as exogenous in this system[22]. The term *inst* stands for the degree of direct democracy in the respective canton, the variable of interest, whereas *cult* represents the cantonal main language as a cultural covariate. Traditionally, the wealth of the society, measured by national income (Y) is employed in both equations. In equation (1), the usual further exogenous sociodemographic (X_1) and economic determinants of crime (E_1) are added: welfare transfers per capita, income inequality in society, unemployment rate, closeness to an important border crossing, interaction of population between cantons, cantonal population, urbanization, and the share of 15 to 24-year-old and 25 to 29-year-old residents. Also included in equation (2) are mostly typical fiscal and political determinants (F) used in the field of public finance for government expenditure models. Here, they consist of fiscal decentralization, tax competition, federal transfers, a constitutional constraint that aims to balance the state budget, a measure of the ideology of the cantonal government, the size of the coalition in the cantonal executive. Also included are economic and sociodemographic determinants (E_2, X_2) like urbanization, cantonal population, the share of young residents between the age of 0 and 14, the share of

[21] Clear-up rates are not collected throughout the whole of Switzerland and are therefore not available. FUNK and KUGLER (2003) employ and proxy a conviction rate for mass crimes theft and robbery by dividing the number of convictions by the number of reported offenses. According to the experts in the crime section of the BFS, using this variable is not advisable since convictions are measured by sentences and offenses by either persons or cases. Further, heterogeneity in data collection (persons or cases) between Swiss cantons makes this 'conviction' rate incomparable. Moreover, this approximation does not work with infrequently observed crimes like homicides (years with 0 offense rates but positive conviction rates).

[22] For an alternative specification as a two-way causation model incorporating two different endogenous deterrence variables, see EIDE (1994) and CAMERON (1988). Assuming the severity of punishment as exogenous takes into account that no valid instrument exists in the data; furthermore, this approach follows the classical tradition applied in most of the criminometric literature.

residents between 15 and 24, and the share of persons aged 60 or older[23]. Since D_1 is endogenous in equation (1), it is instrumented with the determinants of police force size used in equation (2) to prevent bias in the whole coefficient vector[24].

In the reduced form, the endogenous variable D_1 is replaced with the exogenous determinants of equation (2). Hence, the complex model of crime shrinks to one single equation:

$$(3) \quad log\ O = f\ (D_2, Y, X_1, X_2, E_1, E_2\ , F, cult, inst) + \varepsilon,$$

where the crime supply depends on all exogenous determinants of both equations (1) and (2).

The chosen approach of estimating both a structural form and a reduced form is useful because direct democracy, the variable of interest, is an exogenous determinant in both equations (1) and (2) of the structural form and also of the reduced form (3). Analyzing both forms allows separation of the direct institutional impact from its indirect impact: Whereas the structural form of the model allows observation of the direct impact of direct democracy on the endogenous deterrent (2) and also its direct influence on the crime rate (1), the reduced form permits an analysis of its combined direct and indirect institutional effect (3). With respect to the *Testable Hypotheses*, the first can be assessed with the help of equation (2) because it determines the institutional impact on expenditure. The second (2 and particularly 2a) must be tested using equation (1) since this specification takes into account the allocation of given means for crime prevention and crime detection (this specification analyzes only the reallocation between crimes). Finally, a comparison of the estimates of equations (1) and (3) help reveal the efficiency gains in the provision of public safety at the cantonal police level that might hint at the validity of the not directly testable *Hypothesis 4* (section 2.3).

According to the traditional economic model of crime, the potential criminal weighs the expected costs and expected gains of committing a [property] crime (EHRLICH 1973). Therefore, crime prevention policies can influence both sides of this decision-making process.

[23] Splitting up the share of young residents into the share of foreigners and the share of Swiss citizens for both younger age groups did not seem appropriate because the shares of foreigners are too highly correlated between them (rho = 0.93). The main results for the democracy variable, however, are robust to such an alteration in specification. Estimation results are available from the author.

[24] In the traditional model specification, probability of punishment depends on the financial resources available, the crime rate, and some determinant of effective usage of these financial means like urbanization or level of education. For a discussion of the endogeneity problem, see WOLPIN (1980) and CAMERON (1988).

Higher clear-up and detection rates, here proxied by the number of police per capita, and a stricter severity of punishment increase the expected costs (BECKER 1986), whereas higher wealth raises the expected illegal income opportunities (EHRLICH 1973). The effect of income inequality appears to be undecided in the criminometric literature (FAJNZYLBER et al. 2002, BOURGUIGNON et al. 2003)[25], although criminal theory does predict an increasing impact of inequality on crime rates (CHIU and MADDEN 1998). Unemployment rate as a measure of missing legal income opportunities is supposed to raise the expected (net) gains from crime (WITTE and TAUCHEN 1994, DOYLE et al. 1999)[26]; however, welfare transfers increase the costs (loss of secure legal income) (STEVANS 1988). Agglomerations provide greater opportunities for committing a crime and ensuring greater anonymity, thus affecting both sides of the criminal's cost-benefit analysis equally in favor of the felony (GLAESER and SACERDOTE 1999). Young people below the age of 24 who are not yet part of the labor market or who have only a low (starting) income are found to be particularly prone to committing property and violent felonies (COHEN and LAND 1987)[27]. For Switzerland, this current study includes additionally the share of 25 to 29-year-olds because they constitute an important age group among convicted persons in some cantons[28]. This specification also includes the size of each cantonal population to take into account that smaller cantons might be systematically safer. In addition, to account for the geographic proximity of Swiss cantons, the model employs an econogeographic variable that measures the interaction between centers: interaction of canton *i* is defined as the sum of the population of canton *i* multiplied with the population of canton *j* weighted with the inverse of the absolute distance between the two cantons. In accordance with SAH (1991) and KELLY (2000), I assume that a higher degree of interaction between populations leads to more spillovers of criminality across groups and more potential offenders in a canton, more opportunities for committing a felony through greater anonymity, and a lower probability of neighborhood watch, thus raising the crime rate.

[25] These proxies for legal and illegal income opportunities appear to be interchangeable. Inequality in income can both be interpreted in terms of legal and illegal income opportunities (see ENTORF and SPENGLER 2000 for further literature). Even in the most recent contributions, the empirical evidence only partly corroborates the positive impact of inequality on crime. See BOURGIGNON et al. (2003) and DYOLE et al. (1999) for a description of the various ambiguous results and differences in interpretation. The authors also emphasize that the results depend on the measure of inequality used.

[26] FUNK and KUGLER (2003) employ the absolute number of unemployed persons in a Swiss canton, which may be misspecified.

[27] Their analysis was carried out for motor vehicle theft and homicide. In addition, DOYLE et al. (1999) found a significant positive impact of level of wages in the low-skilled sector on various crimes, particularly on property crime, which this age group might proxy.

[28] In addition, COHEN and LAND (1987) found the age group of 25 – 29 particularly decisive for killings in the U.S. It should be noted that young persons below the age of 29 are also more prone to victimization than higher age groups and therefore form a substantial part of crime demand (COHEN et al. 1981).

In addition, since Switzerland is a small country surrounded by several neighboring countries, the relatively greater wealth of Switzerland might attract an influx of foreign criminals who might exert a deleterious influence on public safety. Therefore, a dichotomous variable is included indicating that a canton is closely situated to a border crossing rich in traffic.

4 Data

Available for this study are Swiss macro data at the cantonal level, which can be used to estimate the aggregate supply of offense function. Crime rates are calculated on the basis of data provided by the Federal Office of Police (BAP) on cantonal occurrences of infractions and attempted infractions of criminal law from 1986 to 2001 per 100,000 residents[29]. Following the procedure of CHERRY and LIST (2002) and WEEDE (1981), the number of offenses is augmented by 1 to avoid the problem of crime rates of zero. The types of crime included in the study are crime against persons, property, morality, and decency, as well as white collar property crimes. In order to take into account measurement errors in the dependent variable and huge differences in relative numbers, all crime rates are logarithmized, as is common in the criminometric literature[30]. The latest theoretical and simulation-based findings show that this transformation ensures that the estimates will be reasonably accurate and not overly biased[31]. A detailed description of the crime categorization of felonies (as defined by the articles of the Swiss Criminal Code, *StGB*) is provided in the Appendix (table A.1).

[29] In Switzerland, centralized collection of reliable cantonal data on crime started in 1984, and since 1986 they have been available electronically. Swiss cantonal police forces either count the number of victims or the number of cases. For example, a murder with four victims is recorded as a 'four' in some cantons and in the rest as 'one'. Also definitions of auto theft differ to a great extent. Therefore, cantonal crime levels are not directly comparable. Heterogeneity in reporting behavior was identified through a survey of the 26 cantonal police forces in cooperation with the Swiss conference of chiefs of cantonal police. These results are subject to strict confidentiality. Based on these findings, dichotomous control variables are constructed and included in equations (1) and (3). Most are highly significant.

[30] To reduce the detrimental impact of measurement errors, also the number of policemen as proxy for clear-up rates was logarithmized. See also footnote 31.

[31] Regarding underreporting and the resulting measurement error which might bias the coefficients see EHRLICH (1996) and FAJNZYLBER (2002) for a theoretical investigation. For empirical evidence on reporting behavior depending on the victim's characteristics and the nature of the crime, see MACDONALD (2002). PUDNEY et al. (2000) show through a Monte Carlo simulation that simple OLS estimates are not seriously biased due to measurement errors in the dependent variable or the clear-up rates (see also LEVITT (1998) for similar results). In general, the smallest degree of underreporting can be expected for murder and robbery (see FAJNZYLBER et al. 2002) and, in the case of Switzerland, auto theft and burglary for reasons of car and household insurance. High underreporting is observed for crimes with a social stigma, such as rape (MACDONALD 2002).

Among deterrents, the severity of punishment is measured by the share of unsuspended sentences in total sentences[32], which is available from the Swiss Federal Statistical Office (BFS) only for several major crimes (theft, robbery, fraud, murder, bodily assault, sexual abuse, and rape). Swiss criminal law specifies minimum and/or maximum levels of punishment and allows for suspended and unsuspended sentences, hence still leaving room for the discretion of individual judges. There is reason to believe that the different cantons have developed distinguishable cultures in the local application of the Swiss Criminal Code, so that not only a variation over time but also between the 26 Swiss cantons can be expected[33]. As a second deterrent, the model uses the cantonal police force per capita, based on confidential data provided by the Federal Office of Police (BAP)[34], which proxies the probability of being detected and arrested[35]. These data allow an identification of ordinary cantonal policemen and criminal detectives in charge of the detection of the more severe crimes[36]. Since the size of the police force is determined by cantonal policies, a considerable cross-sectional variation is expected[37]. The institutional measure of direct democracy is constructed based on STUTZER (1999). This measure is a composite index that ranges from 1 to 6, with 1 indicating the lowest degree of direct democracy. It encompasses all direct legislative institutions, such as the statutory initiative, the constitutional initiative, and the fiscal and statutory referendum.

All sociodemographic and expenditure information was obtained from the BFS. All monetary variables are deflated to the base year 1980 using the GDP deflator series provided by the State Secretariat for Economic Affairs (SECO). The remaining econogeographic, economic, and fiscal determinants are calculated using data from the BFS, the Swiss Federal Tax Administration (FTA), the Swiss Household Panel (SHP), the Federal Office of Spatial

[32] Severe crimes, which are under consideration here, do not allow for fining the convicted.

[33] This assumption can be concluded from the fact that first, until recently, there was no mutual acknowledgment of advocate's licenses between cantons; second, criminal procedural law consists of cantonal laws that prevent intercantonal mobility of judicial personnel (EXPERTENKOMMISSION 1997, p. 25); third, it is mostly local long-term residents who are elected as judges in cantonal and local courts; and finally, there is a continuous effort by the Swiss Supreme Court to eliminate systematic differences in the sentencing practice of the Swiss cantonal courts (GIGER 2002, p. 257ff., ROTH 2003, 3.3.7).

[34] Data were obtained with the explicit permission of all chiefs of cantonal police forces.

[35] See e.g. CORNWELL and TRUMBULL (1994) for the use of police per capita as a measure of the county's ability to detect crime.

[36] As in the U.S., there exists a communal and a state (i.e. cantonal) police force. According to MARTIN JÄGGI, chief commander of the cantonal police of *Solothurn* and President of the Swiss Conference of Cantonal Chiefs of Police, local police forces deal mainly with traffic issues and their contribution to crime detection is negligible.

[37] In Switzerland, not all cantons seem to report clear-up rates in their cantonal criminal statistics, and data on conviction rates have not been found. Data on the length of sentence are also unavailable.

Development, and yearly issues of *L'Année politique Suisse*[38]. A more detailed description of all variables and their construction and descriptive statistics can be found in the Appendix (tables A.1, A.2, and A.11).

5 Empirical Results

5.1. Structural Equation I: Determinants of Police Expenditure

The first computational step – using a times-series cross-sectional panel of 26 cantons from 1986 to 2001 – analyzes the impact of direct democracy on combined cantonal and local spending on security issues (per capita), and particularly on the size of cantonal police forces (per capita)[39]. In this specification, the fiscal decentralization variable is instrumented with cantonal fixed effects[40], and standard errors are robust and also adjusted for serial autocorrelation. Table 2 reports the results for different budgetary components of security expenditure. The first column represents the police expenditure estimation, while columns (2) to (4) represent more specifically the regressions on the size of the cantonal police force and its subcategories 'ordinary policemen' and 'criminal detectives'. Also included for reasons of comparison are the results for the aggregate total security expenditure and the judicial system and national defense expenditure, which are reported in columns (5) to (8) in the Appendix (table A.3).

The variable of interest, the degree of cantonal direct democracy, appears to exert an expenditure-lowering influence on police expenditure in the subfederal budgets in Switzerland (at the 1% level). In addition, with respect to the actual size of the cantonal police force, a considerable decreasing impact can be observed for all three police force size variables (at the 1% and 5% levels, respectively). Since work on crime prevention and detection is divided among the several types of policemen, which depends on the type of crime, a deterrence-lowering impact of direct democracy on all the different crime categories

[38] *L' Année politique Suisse*, HANS HIRTER et al., Institut für Politikwissenschaft an der Universität Bern (ed.), Bern: Institut für Politikwissenschaft, 1986–2001. For the years 1986 to 2001, some of the fiscal and political variables were obtained courtesy of my colleagues G. KIRCHGÄSSNER, L.P. FELD, and Ch.A. SCHALTEGGER.

[39] This time span is chosen to make it comparable with crime equation (1). Estimation of the widest time span possible (1984–2001) does not alter the results significantly. The identical results found here also hold for cantonal expenses only.

[40] Because of the way this variable is constructed, the dependent variable might influence its size.

analyzed can be conjectured. Additionally, it is observed that in more direct democratic cantons fewer financial means are available for total security spending and judicial system expenditure. As regards national defense expenditure only, no such impact is detected, which might be the result of regulations at the federal level. A high (centered) R2 indicates a good fit of the model to the time-series cross-sectional data. For corroborating estimation results with outliers excluded, see table A.5 of the Appendix.

Table 2: Security Expenditure 1986 – 2001

	(1) Police expenditure	(2) Police force	(3) Ordinary policemen	(4) Criminal detectives
Direct democracy	-0.115**	-0.093**	-0.068*	-0.210**
	(4.03)	(3.64)	(2.56)	(4.65)
Fiscal decentralization	-0.514**	-0.23	-0.23	-0.29
	(2.70)	(1.26)	(1.39)	(0.74)
Tax competition	-0.272**	-0.059	-0.102	0.113
	(3.55)	(0.88)	(1.49)	(0.87)
Federal transfers	0.145*	0.172**	0.115*	0.397**
	(2.26)	(2.87)	(2.03)	(3.31)
Constitutional constraint	-0.024(*)	-0.001	0.012	-0.033
	(1.72)	(0.03)	(0.66)	(1.10)
Conservative ideology	0.02	0.017	-0.123	0.549*
	(0.14)	(0.13)	(0.95)	(2.22)
Size of coalition	-0.013	-0.052*	-0.054*	-0.065
	(0.42)	(2.00)	(2.22)	(1.12)
Romance canton	-0.26*	-0.086	-0.063	-0.173
	(2.37)	(0.94)	(0.71)	(0.99)
Urbanization	0.00	-0.002(*)	-0.004**	0.004(*)
	(0.20)	(1.69)	(2.86)	(1.75)
National income	0.719**	0.579**	0.518**	0.860**
	(3.99)	(3.87)	(3.55)	(3.22)
Cantonal population	0.019	0.002	0.009	-0.012
	(0.57)	(0.08)	(0.30)	(0.28)
Residents 0 – 14	-0.044(*)	-0.081**	-0.102**	0.004
	(1.96)	(4.09)	(4.79)	(0.14)
Residents 15 – 24	0.049*	0.045*	0.024	0.099*
	(2.07)	(2.03)	(1.02)	(2.54)
Residents over 60	0.037**	0.047**	0.040**	0.068**
	(2.74)	(3.77)	(2.89)	(3.46)
Constant	-5.185**	-8.577**	-7.617**	-14.474**
	(3.50)	(6.83)	(5.63)	(7.33)
Observations	416	416	416	416
Centered R2	0.82	0.83	0.82	0.51
Jarque-Bera χ-value	40.05***	1.69	1.57	210.50***

2SLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. Endogenous variable: fiscal decentralization. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects are included but not reported.

These empirical results are perfectly in line with the conjecture made in *Testable Hypothesis 1*. By systematically underestimating the average person's (or their own) probability of becoming victimized, median voters induce a police expenditure budget constraint in cantons whose institutional setup allows the voter to exert a stronger influence on the political decision-making process. The fewer means then available for crime prevention and crime detection translate directly into a lower number of police per capita. In more representative democracies, however, in which trained bureaucrats and specialized politicians, who make more accurate predictions about crime rates, exert more influence on budgets, more money is spent on fighting crime[41].

Regarding the additional fiscal, political, and sociodemographic predictors in the model, an expenditure-lowering impact of fiscal decentralization and the fiscal break is observed on police expenditure but not on the number of policemen. Tax competition causes a decline only in the expenditure for police but not in the number of policemen. Financial lumpsum transfers from the federal government lead to both significantly higher police expenditure and a larger cantonal police force. Interestingly, a more conservative ideology of cantonal executives is associated with more criminal detectives per capita but is insignificant with respect to police expenditure and the remaining measures of cantonal police force. In contrast to the usual expectation, the size of the coalition, which measures government fragmentation, appears to cause a lower number of policemen, particularly ordinary policemen. In cantons in which the main culture is French or Italian, significantly less money is spent on police, leaving the number of policemen seemingly unaffected[42]. On average, a higher degree of urbanization is associated (albeit weakly) with a lower number of ordinary policemen and total policemen but also (weakly) with more criminal detectives. Moreover, wealthier cantons (in terms of national income) show a higher spending on police that appears to translate into significantly higher numbers of all types of policemen. Further, there is no significant linkage between the size of the cantonal population and police-related variables. Regarding the demographic structure of the canton, a significant negative relation is observed between almost all police variables (except criminal detectives) and the share of young residents below the age of 14[43],

[41] These empirical findings are in line with all the U.S American and Swiss efficiency literature on the impact of institutions of direct legislation on budgets (see section 2.1). Most particularly, SCHALTEGGER (2001), using a different specification, also finds a limiting institutional impact on subfederal total security spending for Swiss data between 1980 and 1989. The innovative contribution of this section lies in the theoretical argument.

[42] A possible interpretation is that the (unobservable) technical equipment might be negatively affected.

[43] In Switzerland, the age of criminal responsibility is 7, but until the age of 16 no prison terms are applicable, but only measures according to art. 82 – 88 *StGB*.

but a positive one (except ordinary policemen) is found for the share of 15 to 24-year-old residents, criminally the most active period in life (e.g. COHEN and LAND 1987). Finally, in this model, senior residents appear to either demand or require more of the good 'public safety': their share is significantly positively associated with higher levels of spending on police issues and also with higher numbers of all types of police.

As a robustness test, this same analysis is performed with a specification that includes the natural log of the theft and assault crime rate lagged by two periods, because both police expenditure and the size of the police force might be determined also by cantonal crime rates. As expected, both crime rates affect the independent police-related variables strongly and positively. Most important, the police expenditure and police force lowering impact of direct democracy remains unchanged (all at the 1% level). The estimation outcomes for this specification can be found in the Appendix (table A.4). In addition, estimation results of the original model with outliers excluded are displayed in table A.5 of the Appendix.

5.2 Structural Equation II: Determinants of Crime Rates

In the second step, structural equation (1) is estimated to determine the impact of direct democracy on cantonal crime rates based on an economic model of crime but taking into account that it also reduces the means available for cantonal police forces. Therefore, the (endogenous) police force variables are explicitly included in the crime regression, which makes the direct impact of direct democracy on various crime rates observable. Since these deterrents are subject to a potential simultaneity[44], they are instrumented with the exogenous variables in equation (2). This relation is analyzed for various categories of property crime, including 'white collar' property crime like fraud and defalcation, and violent crime[45]. All regressions include dichotomous determinants that control for heterogeneity in recording behavior by cantonal police forces, and the standard errors are robust and adjusted for serial autocorrelation.

[44] The significant impact of theft and assault crime rates on these deterrents in the empirical analysis in section 5.1 corroborates this conjecture.

[45] Robbery is counted among property crimes because its primary goal is to generate illegal income.

Property Crime

Table 3 displays the estimation results for property crime, particularly burglary, pickpocketing, auto theft, robbery, fraud, and defalcation. Regarding the variable of interest, in this model, the direct impact of direct democracy is observed to significantly decrease property crimes of burglary and auto theft and robbery (all at the 5% level or above). It does not, however, affect pickpocketing, fraud, and defalcation rates.

These important empirical results are perfectly in line with *Testable Hypothesis 2*. Auto theft and burglary offense rates are the two highest in the list of crime rates (see table 1). Based on this finding, it can be concluded that due to the high frequency of these property crimes, the median voter overestimates their true probabilities of occurrence (in comparison to violent crimes) and demands that more of the available resources be allocated to the prevention of auto theft and burglary. Rather puzzling, however, is the result for robbery because, based on its quite rare occurrence, there should be no overestimation of its relative probability.

Nevertheless, given that, according to availability heuristic frequencies, more severe and damaging crimes are more persistent in people's memories than simple crimes like pickpocketing, the optimism bias for robbery rates might not be as great as for simple theft, thus leading to higher efforts in more direct democratic cantons to fight robbery.

In line with the predictions, the deterrent 'criminal detectives' exerts a crime dampening influence on burglary, auto theft, and robbery. No such effect, however, is prominent for the remaining property crimes, and for defalcation even a crime enhancing effect is revealed. The number of ordinary policemen also appears to increase property crime for the first five categories, but exerts an insignificant impact on defalcation.[46] In all six property crime categories, the coefficients of the severity of punishment are always rendered insignificant, which might be caused by the unsolved potential endogeneity[47]. For burglary and defalcation, however, the coefficients show at least the expected sign.

[46] It is generally known that a higher frequency of patrolling policemen and higher efforts to detect crime lead to higher reported and recorded crime rates in criminal statistics, even when the true crime rate might not have changed over time.

[47] Given that higher crime rates increase the severity of punishment, which, again, lowers the crime rate, the 'simultaneous' effect will be zero (insignificant).

Table 3: Property Crime 1986 – 2001 Structural Form

	(1) Burglary	(2) Pickpocketing	(3) Auto theft	(4) Robbery	(5) Fraud	(6) Defalcation
Criminal detectives	-0.574*	0.164	-0.840*	-0.734*	0.735	1.141*
	(2.58)	(0.45)	(2.36)	(2.20)	(1.34)	(2.01)
Ordinary policemen	0.429**	1.121**	0.710**	1.219**	1.255**	-0.04
	(2.88)	(4.33)	(2.83)	(4.41)	(3.80)	(0.11)
Severity 139	-0.005	0.006	0.001			
	(1.62)	(1.20)	(0.17)			
Severity 140				0.000		
				(0.103)		
Severity 146					0.000	
					(0.019)	
Severity 138						-0.005
						(1.57)
Direct democracy	-0.204**	0.137	-0.214*	-0.186*	-0.008	-0.001
	(2.87)	(1.30)	(2.06)	(2.16)	(0.05)	(0.01)
Welfare transfers	0.283**	0.302*	0.304*	0.376**	-0.126	-0.349(*)
	(3.05)	(2.03)	(1.99)	(2.75)	(0.70)	(1.96)
Income inequality	0.14	0.169	0.028	0.004	-0.197	-0.263
	(1.33)	(1.00)	(0.20)	(0.02)	(0.92)	(1.08)
National income	0.545*	-0.857*	0.409	-0.216	-1.628**	-0.82
	(2.48)	(2.00)	(0.89)	(0.59)	(3.82)	(1.51)
Unemployment rate	0.032	0.043	-0.004	0.006	0.006	-0.039
	(0.97)	(0.61)	(0.07)	(0.11)	(0.07)	(0.46)
Closeness to border	-0.255**	0.494**	0.093	0.166(*)	0.019	-0.365*
	(3.19)	(4.72)	(0.80)	(1.70)	(0.11)	(2.23)
Interaction b. cantons	0.001	0.012(*)	0.011	0.035**	-0.009	-0.004
	(0.11)	(1.79)	(1.57)	(4.92)	(0.85)	(0.36)
Urbanization	0.010**	0.012**	0.006*	0.012**	0.010*	0.011*
	(4.41)	(3.73)	(1.97)	(3.99)	(2.37)	(2.43)
Cantonal population	0.121	0.22	-0.206	-0.401**	0.217	0.128
	(1.23)	(1.61)	(1.43)	(2.82)	(1.02)	(0.57)
Residents 15 – 24	0.139**	0.178**	0.174**	0.05	0.074	-0.136(*)
	(3.73)	(2.67)	(2.92)	(0.80)	(1.01)	(1.72)
Residents 25 – 29	0.045	-0.045	0.077	0.138	0.068	0.097
	(0.67)	(0.51)	(0.95)	(1.52)	(0.52)	(0.68)
Romance canton	-0.033	-0.307	-1.050**	-0.362*	-1.146**	0.102
	(0.27)	(1.44)	(5.74)	(2.08)	(3.75)	(0.29)
Constant	-0.179	7.210**	3.983*	8.456**	19.308**	13.934**
	(0.11)	(3.14)	(2.05)	(4.05)	(4.89)	(2.95)
Observations	416	416	416	416	416	416
Centered R^2	0.71	0.65	0.30	0.53	0.41	0.05
Jarque-Bera χ-value	0.20	48.20***	800.60***	9.57**	36.29***	75.30***

2SLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. Endogenous variables: Criminal detectives and ordinary policemen. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects and measures of recording behavior are included but not reported.

Table 4: Violent Crime and Sex Crime 1986–2001 Structural Form

	(1) Homicide	(2) Assault	(3) Hate Crime	(4) Rape	(5) Sex Crime
Criminal detectives	-0.037	0.516**	0.518**	-0.54	-0.610(*)
	(0.21)	(2.72)	(2.70)	(1.59)	(1.66)
Ordinary policemen	0.528**	0.753**	0.745***	1.581**	1.433**
	(2.73)	(3.96)	(3.71)	(4.23)	(3.51)
Severity 111	0.001				
	(0.97)				
Severity 122 123		0.003			
		(1.41)			
Severity			0.001		
			(0.70)		
Severity 187				-0.002	0.001
				(1.20)	(0.33)
Direct democracy	-0.042	0.191**	0.160*	-0.014	0.145
	(0.63)	(2.59)	(2.31)	(0.18)	(1.48)
Welfare transfers	0.023	0.361**	0.323***	0.075	0.102
	(0.21)	(3.38)	(3.33)	(0.75)	(0.84)
Income inequality	0.088	-0.108	-0.077	0.058	-0.180
	(0.69)	(0.91)	(0.69)	(0.39)	(1.14)
National income	-0.298	-0.738**	-0.772**	-0.578(*)	-0.559(*)
	(1.09)	(2.66)	(2.90)	(1.81)	(1.87)
Unemployment rate	-0.016	0.024	0.012	0.027	-0.064
	(0.40)	(0.53)	(0.29)	(0.58)	(1.19)
Closeness to border	0.197(*)	-0.346**	-0.299***	0.136	-0.006
	(1.96)	(3.68)	(3.55)	(1.27)	(0.06)
Interaction between cantons	0.009	-0.002	-0.002	0.030**	0.016*
	(1.56)	(0.48)	(0.27)	(3.91)	(2.07)
Urbanization	0.000	-0.006*	-0.005(*)	0.003	0.012**
	(0.01)	(2.12)	(1.93)	(1.17)	(3.82)
Cantonal population	-0.195(*)	0.047	0.034	-0.536**	0.006
	(1.68)	(0.47)	(0.23)	(4.12)	(0.04)
Residents 15 – 24	-0.021	-0.100*	-0.075	0.169*	0.226*
	(0.45)	(1.97)	(1.56)	(2.15)	(2.44)
Residents 25 – 29	0.043	0.025	0.005	0.163*	-0.034
	(0.61)	(0.24)	(0.05)	(1.97)	(0.35)
Romance canton	-0.330(*)	0.025	0.001	-0.412*	-0.088
	(1.90)	(0.15)	(0.01)	(2.05)	(0.42)
Constant	7.243**	16.007**	16.040***	11.727**	5.371*
	(4.16)	(8.32)	(7.81)	(5.74)	(2.45)
Observations	384	416	416	416	416
Centered R2	0.29	0.57	0.57	0.33	0.33
Jarque-Bera χ-value	2.41	44.84***	19.56***	19.06***	33.99***

See table 3.

The economic determinants, however, reveal a different pattern of behavior. Welfare transfers are associated with higher levels of burglary, pickpocketing, auto theft and robbery, but not fraud and defalcation, which it decreases. This offense-raising result contradicts expectations[48]. The coefficient of income inequality is always rendered insignificant, but with the predicted sign in the first four crime categories. National income, the measure of a society's wealth, leads – as anticipated – to significantly higher burglary rates but, contrary to expectations, to lower pickpocketing and fraud rates. In this specification, the unemployment rate appears to be insignificant for all six types of property crime.

The impact of the econogeographic determinant of proximity of a canton to important border crossings, which measures the exposure of a canton to an influx of foreigners, unexpectedly decreases crimes of burglary and defalcation, but increases crimes of pickpocketing and robbery. This result indicates that although cases of serial burglaries committed by foreign gangs of thieves have occasionally been prominent in the Swiss media, in the synthetic panel from 1986 to 2001, it is pickpocketing and robbery rather than burglary that is induced from abroad. Moreover, a more intense interaction between cantonal populations within Switzerland is associated with higher cantonal pickpocketing and robbery rates, which supports the prediction about this determinant.

As regards the sociodemographic determinants, as expected, a higher degree of urbanization is associated with higher levels of property crime for all categories. Robbery rates decrease in the size of the canton measured by cantonal population. However, no such effect can be detected for the remaining property crimes. Also in line with the original BECKER model, a higher share of young persons between the age of 15 and 24 causes higher rates of the 'blue collar' property crimes of burglary, pickpocketing and auto theft, but weakly lower rates of the 'white collar' offenses of defalcation[49]. The coefficients of the share of 25 to 29-year-old persons appear to be insignificant for all property crimes, which is also in line with the traditional economic theory of crime.

[48] One possible explanation is that this variable serves as a proxy for the share of poor, uneducated persons in a canton who might be more prone to commit a crime. The tax data (until 1998) on which the inequality variable is based excludes persons with nontaxable income. Alternatively, welfare transfers might directly increase the propensity to commit crimes through the creation of disincentives for regular work, as shown in an economic model by Imrohoroglu et al. (2000).

[49] The exclusion from the labor market of persons of this age might serve as one explanation.

Finally, Romance culture, as measured by the main cantonal language being Italian or French, leads to significantly less auto theft, robbery, and fraud. As people's reporting behavior may be shaped by the dominant cantonal culture, it is possible that this variable captures such differences. In general, the centered R^2 of between 0.30 and 0.71 indicates quite a good fit of the model for all crimes reported in columns (1) through (5). For defalcation, however, no such statement can be made (based on a centered R^2 of 0.052). Table A.6 of the Appendix reports estimation results with outliers excluded[50].

Violent Crime

Table 4 reports the estimation results for crimes against persons and against morality and decency. Columns (1) to (3) indicate the hate crimes of homicide and assault and a combined category for both crimes, while columns (4) and (5) show the results for two types of sexual offenses: rape and crimes against sexual integrity. The combined category (3) is constructed to take into account the fact that in some cantons attempted homicides (category 1) might be counted as completed severe assaults (category 2)[51].

The variable of interest, direct democracy, appears to have an offense-raising impact on assault (2) and the combined assault and homicide rate (at the 1% and 5% levels, respectively). The remaining types of offenses are not affected by direct democracy. Only in the other sex crime regression is a t-value close to the 10% level of significance observed, again with a positive sign of the coefficient[52].

This empirical result is also in line with *Testable Hypothesis 2*. Obviously, in direct democratic cantons, available means for public safety are allocated in such a way that higher rates of assault and (possibly) other sex crimes are admitted. Thus, the median voter appears to particularly disfavor the prevention of assault, possibly because of its low frequency, which induces the systematic underestimation of its occurrence (compared to property crime). Unexpectedly, homicide and rape rates do not appear to 'dis-benefit' from reallocation of given means in direct democratic cantons despite their low probability of occurrence. One

[50] As table A.6 shows, a significant crime lowering impact of direct democracy on defalcation rates can be observed (at the 5% level).

[51] Because CHERRY and LIST (2002) and WITHERS (1988) show that aggregation of different crimes can lead to a bias in the coefficients, the estimation results for this artificial category must be interpreted with caution.

[52] Excluding outliers, however, the coefficients for both sex crime categories become positive, but are not significant (see table A.7 of the Appendix).

possible explanation is that they are both rather severe crimes always reported by the media and therefore the severity might exert an increasing influence on the subjective assessment of their probability of occurrence, somewhat offsetting the low-frequency impact on risk perception (see also section 2.4).

Among the deterrents in general, the police force variables do not appear to influence the offense rate in the predicted manner: For all types of hate and sex crimes, the number of ordinary policemen per capita is associated with higher crime levels. In addition, criminal detectives affect hate and assault crime rates positively, but a weak decreasing tendency emerges for their impact on sex crimes[53]. As with property crime, the coefficients of the severity of punishment variables for homicide, assault, rape, and sexual offenses are insignificant in all estimations, which might be the result of its endogeneity.

As regards the economic determinants, an offense rate enhancing influence of welfare payments on assault and hate crime is observed. Again, this effect is contrary to prediction by the economic model of crime[54]. Also contrary to expectations, the coefficients of income inequality are rendered insignificant, while national income exerts a crime decreasing impact on assault, hate crime, and all sexual offenses. Thus, again contrary to BECKER's model of crime, the unemployment rate does not appear to be of any importance for the type of offenses under investigation. Proximity to traffic-rich border crossings to neighboring countries appears to be weakly associated with higher homicide rates (at the 10% level) but significantly lower assault and hate crime rates (at the1% level, respectively). Interestingly, more interaction between the cantonal populations does not affect any crime against person, but does exert a strong raising influence on both sexual offense rates (at the 1% and 5% level, respectively). These last finding is in line with the prediction that higher mobility increases the opportunities for committing a crime, as well as the anonymity that in turn lowers detection probability.

Regarding the sociodemographic variables, a higher degree of urbanization is associated with lower assault and hate crime rates[55] but higher sex crime rates, this last being perfectly in line with the economic theory of crime. Cantonal population exerts a crime decreasing influence

[53] See also footnote 46.

[54] For an explanation, see footnote 48.

[55] It is possible that in urbanized areas, reporting rates of less severe cases of assaults are lower.

on homicide and rape. The share of 15 to 24-year-old residents is associated with fewer assault offences but a more frequent occurrence of sexual offenses, which latter finding is supported by economic theory[56]. As conjectured, the share of 25 to 29-year-old residents appears only to positively affect rape rates.

As regards Romance culture, a negative linkage between Latin language and homicide and rape rates is observed. Again, unobserved reporting or recording behavior could be captured by this variable. With respect to the goodness of fit of the model, on average lower levels of the centered R^2 are observed for these crimes than for property crimes. This finding is not surprising as the economic rational choice model of crime was developed to explain property crime rather than violent crimes, whose emotional aspects it may not capture. Again, estimation results with outliers excluded can be found in table A.7 of the Appendix.

In sum, in the structural model, direct democracy appears to exert a reducing impact on property crime and an increasing impact on offenses against person, particularly assault. Obviously, even taking into account that protection of person against assaults will be neglected, the median voter prefers that relatively more of the available means be devoted to fighting the property crimes of auto theft, burglary, and robbery. This finding corroborates *Testable Hypothesis 2a* that postulates a reallocation of available means for fighting more frequently occurring property crime at the expense of less frequent crimes against person.

5.3 Reduced Form: Determinants of Crime

In the reduced form, presented in equation (3), the endogenous variables for police per capita are replaced with their exogenous determinants; hence, this specification also includes fisco-political variables that determine government expenditure. This makes it possible to observe the combined direct and indirect impact of direct democracy on public safety as well as the total effect of those variables which form part of both the auxiliary and the main regression in the structural version of the model.

The reduced form of the model is, again, estimated for all the types of property, hate, and sex crimes under investigation. The replacement of the endogenous factors with the exogenous

[56] The crime-dampening impact on assault might be explained by a lower propensity of this age group to report such cases to the police.

determinates of equation (1) seemingly increases the goodness of fit of the reduced form of the model: The centered R^2s have increased substantially in comparison with the structural form, particularly for the two sexual offenses. Again, estimation results with outliers excluded are given in tables A.8 and A.9 of the Appendix.

Property Crime

Table 5 reports the estimation results for property crime. Direct democracy exerts a crime-reducing impact on burglary, auto theft, and fraud rates. No significant influence can be observed, however, on pickpocketing, robbery, and defalcation rates. Comparing these estimation results for the total institutional effect in the reduced from of the model with those of the structural model reveals that the offense rate lowering impact is present in both forms for burglary and auto theft. With respect to robbery, the significance of direct democracy vanishes in the reduced form, probably because its lowering direct effect is offset by the reporting rate increasing impact of ordinary policemen. As regards fraud rates, the opposite is observed: the direct impact of political institutions appears to be irrelevant, whereas the combined influence significantly lowers the offense rate[57].

For severity of punishment, a crime lowering impact on defalcation is observed that is perfectly in line with the prediction of the economic model of crime but that contradicts the previous results from the structural form of the model; on auto theft, even a (weakly) positive impact can be observed. As regards the remaining economic, sociodemographic, and econogeographic determinants, the discussion will focus on a description of the differences in impact between the reduced and the structural form. In contrast to the structural form, welfare transfers lose their (albeit) weak lowering impact on defalcation rates, but remain significant for the first four categories of property crime. Interestingly, income inequality becomes a statistically decisive determinant of pickpocketing, indicating a (weakly) positive relation between higher income inequality and simple theft rates, contrasting the results of the structural form. The direction of this influence is in line with the economic model of crime. In addition, the coefficients of cantonal levels of national income are rendered insignificant for burglary and pickpocketing, but its fraud lowering influence pertains. The unemployment rate is now strongly positively associated with burglary rates, which supports BECKER's theory.

[57] Excluding outliers, also a dampening impact of direct legislation on defalcation rates is detected, whereas the one on auto theft rates looses its significance. See also section 5.4.

Table 5: Property Crime 1986–2001 Reduced Form

	(1) Burglary	(2) Pickpocketing	(3) Auto Theft	(4) Robbery	(5) Fraud	(6) Defalcation
Severity 139, 140, 146, 138	-0.002	0.004	0.005(*)	0.000	0.002	-0.006*
	(0.94)	(0.85)	(1.74)	(0.46)	(0.73)	(2.52)
Direct democracy	-0.158**	0.088	-0.142*	-0.074	-0.204*	-0.167
	(3.67)	(1.04)	(2.26)	(1.21)	(2.06)	(1.55)
Welfare transfers	0.142*	0.479**	0.176(*)	0.323**	0.141	0.034
	(2.15)	(3.67)	(1.80)	(3.04)	(0.93)	(0.20)
Income inequality	0.079	0.309(*)	0.043	0.154	-0.276	-0.212
	(0.93)	(1.80)	(0.36)	(1.21)	(1.40)	(1.00)
National income	-0.114	0.116	0.249	0.479	-1.233*	-0.146
	(0.49)	(0.25)	(0.70)	(1.44)	(2.27)	(0.25)
Unemployment rate	0.063*	0.022	0.013	-0.057	0.103	-0.013
	(1.97)	(0.34)	(0.30)	(1.23)	(1.40)	(0.16)
Closeness to border	-0.241**	0.167	0.09	-0.161(*)	-0.221	-0.456**
	(3.75)	(1.33)	(0.93)	(1.79)	(1.41)	(2.86)
Interaction b. cantons	-0.006*	0.016**	0.004	0.018**	0.016*	0.024**
	(1.99)	(2.92)	(0.86)	(4.46)	(2.34)	(3.39)
Urbanization	0.004	0.015**	-0.006(*)	0.015**	0.005	0.015*
	(1.64)	(3.05)	(1.68)	(4.15)	(0.80)	(2.31)
Cantonal population	0.200**	0.066	-0.136	-0.065	-0.379*	-0.551**
	(3.21)	(0.54)	(1.46)	(0.74)	(2.54)	(3.55)
Residents 0 – 14	-0.078**	-0.026	-0.200**	0.063	-0.222**	-0.078
	(2.73)	(0.47)	(4.24)	(1.55)	(3.39)	(1.09)
Residents 15 – 24	0.048	0.256**	0.112*	0.142*	-0.025	-0.089
	(1.23)	(3.31)	(2.06)	(2.53)	(0.27)	(0.91)
Residents 25 – 29	0.036	0.097	0.054	0.226**	0.247*	0.205
	(0.70)	(0.94)	(0.68)	(3.03)	(2.06)	(1.57)
Residents over 60	-0.051*	0.125**	-0.092*	0.165**	-0.010	-0.001
	(2.24)	(2.77)	(2.33)	(5.10)	(0.19)	(0.01)
Fiscal decentralization	0.338	-0.382	-0.333	-0.856**	0.755	0.549
	(1.56)	(0.89)	(1.03)	(2.73)	(1.52)	(1.01)
Tax competition	-0.199(*)	-0.565*	0.071	0.004	-1.018**	-0.760**
	(1.71)	(2.47)	(0.42)	(0.03)	(3.82)	(2.60)
Federal transfers	0.045	-0.204	-0.450**	-0.405**	0.413(*)	0.02
	(0.45)	(1.04)	(3.14)	(2.80)	(1.76)	(0.08)
Constitutional constraint	0.02	0.205**	0.02	0.038	0.305**	0.287**
	(0.61)	(3.26)	(0.37)	(0.84)	(4.10)	(3.59)
Conservative ideology	-0.656**	-0.129	-0.262	-0.049	-0.732(*)	0.232
	(3.50)	(0.35)	(0.99)	(0.18)	(1.70)	(0.50)
Size of coalition	0.069(*)	-0.06	-0.096	0.015	-0.125	-0.099
	(1.68)	(0.74)	(1.64)	(0.25)	(1.27)	(0.97)
Romance canton	-0.371*	-0.334	-1.043**	0.014	-1.934**	-0.172
	(2.35)	(1.07)	(4.68)	(0.06)	(5.34)	(0.44)
Constant	5.808**	-6.225	15.559**	-4.642	13.256*	10.499(*)
	(2.68)	(1.46)	(4.47)	(1.51)	(2.55)	(1.95)
Observations	416	416	416	416	416	416
Centered R2	0.81	0.65	0.59	0.67	0.47	0.35
Jarque-Bera χ-value	2.90	50.62***	1424.00***	46.71***	31.38***	56.78***

OLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects and measures of recording behavior are included but not reported.

Table 6: Violent Crime and Sex Crime 1986–2001 Reduced Form

	(1) Homicide	(2) Assault	(3) Hate Crime	(4) Rape	(5) Sex Crime
Severity 111, 122 - 123. combined severity, 187	0.000	0.001	0.001	-0.001	0.001
	(0.27)	(0.39)	(0.72)	(1.07)	(0.84)
Direct democracy	-0.057	0.237**	0.195***	-0.002	0.212**
	(0.92)	(3.82)	(3.44)	(0.04)	(3.19)
Welfare transfers	-0.017	0.499**	0.444***	0.052	0.103
	(0.17)	(5.45)	(5.32)	(0.61)	(1.01)
Income inequality	0.155	0.109	0.113	0.159	-0.102
	(1.23)	(0.94)	(1.07)	(1.35)	(0.74)
National income	0.104	0.509	0.517(*)	0.066	0.756*
	(0.33)	(1.64)	(1.81)	(0.22)	(2.08)
Unemployment rate	-0.04	0.034	0.020	-0.021	-0.074
	(0.89)	(0.78)	(0.50)	(0.49)	(1.49)
Closeness to border	0.235*	-0.535**	-0.468***	-0.201*	-0.294**
	(2.27)	(5.81)	(5.58)	(2.40)	(2.88)
Interaction b. cantons	0.015**	0.013**	0.015***	0.015**	0.000
	(2.81)	(3.02)	(3.73)	(3.84)	(0.06)
Urbanization	0.000	0.005	0.005	0.005	0.006
	(0.12)	(1.38)	(1.55)	(1.60)	(1.40)
Cantonal population	-0.296**	-0.437**	-0.478***	-0.272**	0.356**
	(2.60)	(4.41)	(5.07)	(3.39)	(3.66)
Residents 0 – 14	0.039	-0.003	-0.005	0.035	-0.008
	(0.80)	(0.09)	(0.15)	(0.91)	(0.18)
Residents 15 – 24	0.026	-0.094(*)	-0.067	0.168**	0.089
	(0.42)	(1.75)	(1.35)	(2.92)	(1.29)
Residents 25 – 29	0.125	0.115	0.109	0.255**	-0.027
	(1.57)	(1.55)	(1.60)	(3.60)	(0.32)
Residents over 60	0.076*	0.086**	0.094***	0.175**	0.124**
	(2.05)	(2.80)	(3.28)	(6.09)	(3.57)
Fiscal decentralization	0.008	-0.262	-0.200	0.402	0.371
	(0.03)	(0.88)	(0.74)	(1.40)	(1.08)
Tax competition	-0.558**	-0.513**	-0.487**	-0.306*	0.319(*)
	(2.88)	(2.95)	(3.01)	(2.00)	(1.73)
Federal transfers	-0.13	-0.143	-0.123	0.009	-0.103
	(0.97)	(1.04)	(1.00)	(0.07)	(0.66)
Constitutional constraint	0.034	0.355**	0.321***	0.082*	0.110*
	(0.74)	(7.24)	(7.18)	(1.98)	(2.19)
Conservative ideology	-0.625*	0.197	0.182	-0.569*	-0.202
	(2.46)	(0.79)	(0.80)	(2.30)	(0.68)
Size of coalition	-0.019	-0.078	0.182	0.028	-0.264**
	(0.34)	(1.38)	(1.58)	(0.53)	(4.13)
Romance canton	-0.511*	0.410(*)	0.379(*)	-0.411(*)	0.504(*)
	(2.28)	(1.90)	(1.92)	(1.87)	(1.91)
Constant	0.283	5.700(*)	5.728*	-5.156(*)	-5.909(*)
	(0.08)	(1.90)	(2.11)	(1.88)	(1.78)
Observations	384	416	416	416	416
Centered R2	0.34	0.65	0.57	0.50	0.49
Jarque-Bera χ-value	4.02	40.20***	17.39***	13.12**	39.00***

See table 5.

As regards the remaining econogeographic and sociodemographic determinants, in the reduced form, the closeness of a canton to important border crossings is no longer an important determinant of pickpocketing, but for robbery rates a change in direction of impact is observable, while the crime reducing impact on defalcation and burglary stays the same. Further, compared to the structural form results, an interaction between cantonal populations appears now to be significantly crime dampening for burglary rates but strongly crime increasing for fraud and defalcation, in addition to the already observed crime raising influence on pickpocketing and robbery. Moreover, in contrast to the previous results obtained from the structural form estimation, the degree of urbanization in a canton no longer raises burglary and fraud rates, but weakly decreases auto theft rates. The coefficients of cantonal population now become significant for burglary, fraud, and defalcation, but insignificant for robbery. Most interesting, in this specification, the share of young persons between the age of 15 and 24 is now decisive for robbery rates, but has no impact on burglary and defalcation rates; in contrast, its positive influence on the occurrence of pickpocketing and auto theft remains the same. It is for robbery and fraud offences that a significant crime increasing effect of a higher share of 25 to 29-year-old residents is observed, in contrast to the finding for the reduced form. These offense raising impacts are in line with the underlying economic theory. In terms of the cultural determinant, the (reported) crime rate lowering influence is now also prominent for the occurrence of burglary (besides the already observed effect on auto theft and fraud), but this impact has lost its significance for robbery. In general, contradictions of the economic model of crime may result from the fact that in the reduced form the combined impact for many covariates is estimated, whereas in the previously estimated structural form only the direct crime-related influence is calculated.

In the reduced form, the exogenous variables of the expenditure equation are also included in the crime equation. These additional variables are sociodemographic, fiscal or political. Since these determinants usually do not form part of the traditional economic model of crime, no prediction has been made because their influence occurs indirectly through their impact on police expenditure. In this reduced specification, the share of people aged 60 or older exerts a crime dampening impact on burglary and auto theft rates but a crime increasing impact on pickpocketing and robbery rates[58]. The share of persons below the age of 14 appears to lead to

[58] Based on the social capital theory (PUTNAM 2000), the retired persons positively contribute which should lower crime rates (through, e.g. neighborhood watching). On the other hand, they might also form an important part of crime demand.

less burglary, auto theft, or fraud[59]. Among the fiscal variables, fiscal decentralization is associated with less robbery but is not significant with respect to any other property crime. Further, as shown in columns (1), (2), (5) and (6), tax competition appears to lead to lower mostly non-violent property crime rates. Finally, a stricter debt break causes a more frequent occurrence of pickpocketing, fraud, and defalcation. With respect to the political variables, more conservative governments seem to favor the prevention of burglary and (weakly) of fraud, whereas a larger coalition size is weakly associated with higher burglary rates.

Violent Crime

Table 6 displays the results for violent crime when the total - i.e. the combined direct and indirect - impact of direct democracy is analyzed in the reduced form of the model of crime. Again, the estimation outcomes for violent and sex crimes are reported in columns (1) to (5).

Of highest interest are the estimation results for the degree of direct democracy in Swiss cantons. As already observed in the structural equation specification, a considerable offense increasing influence can be observed on the assault and hate crime rates. However, a strong increasing effect on sex crime stands out that contradicts the estimation results reported for the structural form. Apparently, the combined direct and indirect influence of direct democracy leads to more sex crime, while the direct impact of direct democracy is insignificant. Since the number of ordinary policemen significantly increases (reported) crime in the structural form[60], however, the combined crime raising influence of direct legislation on sex crime is an interesting result that might be explained using the findings for the reduced form.

As already observed for the reduced form, the severity of the punishment variable is not significant for any of the violent and sexual offenses. As regards the remaining determinants of the traditional model of crime, the analysis will again focus on the differences between the outcomes for the reduced and the structural form of the model. Welfare payment exhibits the identical pattern in both forms, as does income inequality and the unemployment rate. The level of national income in cantons, however, exerts different influences in each form: in the reduced form, it is found to be positively associated with hate crime and sex crime, whereas in

[59] In explanation, it should be noted that children in this age group are simply not physically, mentally, or socially capable of committing some types of property crime.

[60] For sex crimes, the positive impact of ordinary policemen appears to offset the quantitatively smaller crime reducing influence of criminal detectives found in the reduced form of the model.

the structural form it appears to significantly decrease almost all offense rates, except homicide rates.

Among the econogeographic variables, the influence from abroad reveals a significantly lowering impact on rates of sexual offenses, an outcome not obtained in the structural form, while for the remaining crime types the observed effect stays unchanged. On the other hand, the coefficient of interaction of cantonal populations is rendered positive and strongly significant for all violent crimes, as previously conjectured, and also for the occurrence of rape. Only the latter impact coincides with the one already observed in the structural model; for other sex crimes, however, where previously an enhancing effect was revealed, no significant influence is found. With respect to the sociodemographic determinants traditionally included in an estimation of the economic model of crime, the degree of urbanization is seen to be unimportant for any type of offense, which contradicts the results obtained for the structural form for assault, hate crime and sex crime. Moreover, in the reduced form, less violent crimes and rape occur in bigger cantons, but more sexual offenses belonging to the category 'other sex crime'. In contrast, the coefficient of cantonal population was almost always rendered insignificant in the structural form, except a lowering impact in the rape and homicide regressions. Further, in the reduced form, the impact of the cantonal share of residents aged 15 to 24 years differs only with respect to other sex crimes, where it no longer appears important. Again, a higher ratio of persons between the age of 25 and 29 are positively associated with rape. In addition to the crime lowering effect on homicide and rape already observed in the structural form, cantonal culture also appears to be an important, but offense rate raising determinant for assault, hate crimes, and other sex crimes in the reduced form.

Again, estimation of a reduced form model reveals the impact of otherwise only indirectly effective determinants of crime; i.e. the exogenous factors exclusively employed in structural equation (1). The share of residents below the age of 14 does not appear at all decisive for any crime, whereas the share of persons aged 60 or older exerts a crime raising influence on all offenses against person or morality and decency. Among the fiscal and political variables, the degree of cantonal fiscal decentralization and the amount of federal transfers are observed to be irrelevant; however, tax competition is found to be crime lowering for homicide, assault, hate crimes, and rape but weakly rate increasing for sex crimes. Moreover, the fiscal constraint appears to lead strongly to more assault, hate crimes, and sexual offenses, but no

such effect is detected for homicide. In addition, a more conservative government has a significantly stronger propensity to fight the commitment of homicide and rape in comparison to the remaining crime types on which no decisive influence is revealed. Finally, the more fragmented the government, the more it is associated with lower levels of other sex crimes.

5.4 Comparison of the Results for the Reduced and Structural Forms

Whereas the reduced form reveals the combined direct and indirect effect of direct democracy on crime (B), the structural form explicitly makes the direct impact observable (A). A comparison of the results for both forms makes it possible to draw conclusions about the unobserved indirect effect (the difference between B and A, B – A)[61]. As shown in section 5.2, the effect of direct democracy significantly dampens police expenditure and reduces police force size; therefore, a crime increasing unobserved indirect impact would be expected. On the other hand, gains in executive efficiency[62] in the provision of the public good 'public safety' are detectable that could (over)compensate for the fewer resources available. Based on the hypotheses of bounded rationality, some debiasing of both police administrators and regular policemen can be conjectured that might explain which crimes efficiency gains at the cantonal police level might be observed for and which not. Table 7 briefly summarizes the different influences of direct legislation detected for both forms of the model.

The conjectured crime increasing indirect influence of direct legislation is strongly corroborated for robbery, sex crime and weakly corroborated for assault and hate crime[63]. In these cases, fewer available financial means for crime prevention and crime protection do lead to higher crime rates through the subfederal budgetary channel. In the case of fraud – and possibly also for burglary and auto theft[64] – the indirect impact through the budget even appears crime reducing, a finding that contradicts expectations. Even though fewer financial means are made available for police issues at the cantonal and communal level, these

[61] This discussion is based on the estimation results of the previous regressions in tables 3 to 6, not the ones listed in the Appendix. The conclusions, however, do not change considerably when the regression results with outliers excluded are taken into account. Affected is the institutional impact on defalcation and auto theft, which in turn, changes the conclusion on efficiency only in the last case. Furthermore, for any crime the difference (B – A) might always be insignificant, which would be interpreted as hinting at efficiency gains.

[62] Efficiency in the production of public safety at the level of the police forces, i.e. executive efficiency, should not be mistaken for an efficient allocation of goods and resources at the societal level.

[63] The indirect effect might also be insignificant.

[64] Additionally, in the case of an insignificant indirect impact on burglary and auto theft, the result would also be interpreted as supporting efficiency gains (see next paragraph).

particular crimes are negatively affected. This is possibly a case of executive super-efficiency in which fewer resources are allocated in such a way that the public good gains in quality, at least with respect to these crimes. In other words, even though the policemen in direct democratic cantons are fewer, they carry out their work in a more efficient way than their peers in more representative democratic cantons[65].

Table 7: Influence of Direct Democracy in the Reduced and Structural Forms

Crime type	Direct Effect (Structural Form)	Combined Direct and Indirect Effect (Reduced Form)	Indirect Effect
	A	B	B – A
Burglary	Negative	Negative	Negative or insignificant
Pickpocketing	Insignificant	Insignificant	Insignificant
Auto theft	Negative	Negative	Negative or insignificant
Robbery	Negative	Insignificant	Positive
Fraud	Insignificant	Negative	Negative
Defalcation	Insignificant	Insignificant	Insignificant
Homicide	Insignificant	Insignificant	Insignificant
Assault	Positive	Positive	Positive or insignificant
Hate crime	Positive	Positive	Positive or insignificant
Rape	Insignificant	Insignificant	Insignificant
Sex crime	Insignificant	Positive	Positive

An unambiguously insignificant indirect influence of direct democracy through the budget is detected not only on the very severe crimes against persons – i.e. homicide and rape – but also on defalcation. It must be concluded that this indirect impact through reduction in police expenditure does not exert a decisive influence, which also runs contrary to expectations. Therefore, it is again suggested that, in more direct democratic cantons, police forces must have increased their efficiency in fighting these crime to offset their lower number.

[65] As underreporting is very low for these crimes for reason explained in footnote 31, the measured effects are most likely to reflect the true effects.

In sum, comparing the results of the reduced form of the model with those of the structural form reveals efficiency gains at the police level for some crimes in more direct democratic cantons. Obviously, the disguised indirect impact of direct legislation is not fully reflected by the estimates obtained for the police force deterrents in the structural form of the economic model of crime[66]. Efficiency gains in execution can be observed for severe crimes against person (rape, homicide) and the either infrequent or not so severe property crimes of fraud, defalcation, and pickpocketing[67]. Most interesting, this group is comprised of those types of offenses for which no direct institutional crime dampening impact can be observed in the structural form; i.e. those crimes that would potentially suffer from a reallocation of available means as preferred by the median voter. The interpretation made here is that practitioners and police administrators try to compensate for the potentially crime increasing redistributive effect of direct democracy on some crimes through efficiency gains achieved in their production process. Such unambiguously compensating efficiency gains are, however, not observable for assault and sex crime. It may be that, since assault and other sex crimes are on average much less severe than homicide or rape, not attempting to achieve efficiency gains in their prevention is rational. Overall, *Hypothesis 4*, which proposes that bureaucrats and practitioners are less subject to optimism bias and the availability heuristic than the common voter, appears to be corroborated by the observed executive efficiency gains for less frequent crimes.

6 Conclusion

This paper has presented an analysis of the relation between a boundedly rational median voter and the allocation of means for crime prevention and crime detection through estimation of an economic model of crime in the tradition of BECKER (1968) and EHRLICH (1973). Given the newest empirical findings in the field of economic psychology, the median voter is conjectured to suffer from an optimism bias when predicting the probability of personally becoming a victim of crime. Moreover, a severe misprediction is also hypothesized regarding the average probability in society, meaning that fewer financial means should be spent on

[66] In the structural form, other aspects like the equipment of the police forces are omitted.

[67] The number of frauds is one candidate for being seriously affected by cantonal heterogeneity in data collection. Recording the number of victims or even sent letters instead of reported cases increases the number over 100 times. Additionally, the variation appears quite strong. Finally, fraud rates have risen recently through the use of the Internet. These facts might explain why no crime rate decreasing impact of direct democracy is found in the structural model of crime.

police issues in more direct democratic cantons than otherwise. When such bias is combined with availability heuristic, the boundedly rational median voter should mispredict the likelihood of occurrence to a greater extent for less frequent crimes than for more frequent felonies. Given the actual crime rates in Switzerland, a preference for fighting property crimes compared to preventing violent crimes is predicted.

Using a synthetic panel of Swiss cantonal crime rates from 1986 to 2001 and a set of determinants, a structural and a reduced form of the model is estimated. In general, the empirical evidence corroborates the hypotheses. First, estimation of the structural form reveals an expenditure dampening and police force reducing impact of direct democracy. In addition, once the availability of financial means is controlled for, direct democracy is found to significantly decrease burglary, auto theft, and robbery rates but also to increase assault rates. Estimating the reduced form and comparing it with the results of the structural form reveals executive efficiency gains in the provision of public safety for most crimes that do not benefit from a reallocation of given means induced by the median voter. This finding is in line with the hypothesis that the optimism bias and availability heuristic are less prominent for practitioners and police administrators.

In sum, it is again shown that in direct democracies there exists an allocation of goods and resources that appears to be consistent with the median voter's preferences, independent of whether the median voter preference is objectively and societally the best allocation or not. Hence, this result is in line with the traditional public choice literature on the impact of institutions on political decision making and political outcomes. In this study, it is also shown that administrators, who in the case of crime prevention can be considered less subject to human misjudgments, prefer an allocation closer to the objectively and economically best allocation. In particular, the additional resources devoted to meet the median voter's preferences appear to be obtained through executive efficiency gains in fighting those crimes that are less important to the median voter.

For future research, it would appear valuable to combine approaches from the fields of public choice and economic psychology and relax the perfect rationality assumption to make economic models more suitable for explaining real world events.

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Appendix

Table A.1: Crime Categories as Codified in the Swiss Criminal Code (StGB)

Crime in estimation output	Articles in StGB	Description of article
Homicide	111 – 116	111: killing 112: murder 113: manslaughter 114: euthanasia 115: assisting suicide 116: infanticide
Assault	122 – 123	122: mayhem 123: malicious injury
Defalcation	138	138: defalcation
Pickpocketing	139	139: theft
Burglary	139	139: theft
Auto theft	139	139: theft
Robbery	140	140: robbery
Fraud	146	146: fraud
Rape	190	190: rape of a female person
Sex crime	187 – 189, 191 – 194, 198	187: sexual abuse of children 188: sexual abuse of minor adult dependants 189: sexual assault 191: rape of defenseless persons 192: sexual abuse of dependants in institutions of correction 193: sexual abuse of dependants 194: exhibitionism 198: sexual harassment

Table A.2: Summary Statistics of Explanatory Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Direct democracy	416	4.261	1.211	1.583	5.833
Real welfare transfers (no log)	416	0.255	0.147	0.0488	0.866
Income inequality	416	1.214	0.253	0.746	1.898
National income (no log)	416	27.009	6.049	18.608	53.997
Unemployment rate	416	2.243	1.907	0	7.800
Closeness to border	416	0.269	0.444	0	1
Interaction b. cantons	416	16.505	17.157	0.901	81.450
Urbanization	416	59.142	24.041	14.063	100
Population (no log)	416	266505.9	276036.3	13137	1228628
Residents 0 – 14	416	18.291	2.210	11.268	23.172
Residents 15 – 24	416	13.127	1.738	10.073	17.874
Residents 25 – 29	416	7.533	0.861	5.161	9.495
Residents over 60	416	18.366	2.888	11.584	27.073
Fiscal decentralization	416	0.394	0.176	0.004	0.978
Tax competition (no log)	416	0.233	0.078	0.096	0.419
Federal transfers (no log)	416	302.022	115.906	150.452	914.377
Constitutional constraint	416	0.339	0.863	0	3
Conservative ideology	416	-0.098	0.184	-0.6	0.4
Size of coalition	416	3.310	0.871	1	5
Romance canton	416	0.269	0.444	0	1
Severity art. 111	384[68]	73.309	30.23066	0	100
Severity art. 122/123	416	17.444	13.91414	0	100
Severity art. 187	416	19.040	18.46005	0	100
Severity art. 139	416	25.514	9.470814	0	66.7
Severity art. 140	416	42.141	24.84547	0	100
Severity art. 146	416	23.711	14.37432	0	100
Severity art. 138	416	19.065	17.89831	0	100
Criminal detectives per capita (no log)	416	0.0003689	0.0001769	0.0000484	0.0010211
Ordinary policemen per capita (no log)	416	0.0015139	0.0005898	0.0005924	0.0039329

[68] In two cantons, the severity of punishment variable is missing. For this reason, in the homicide regressions only 384 observations are used.

Table A.3: Security Expenditure 1986 – 2001

	(5) Security	(6) National defense	(7) Judicial system
Direct democracy	-0.068**	0.033	-0.061*
	(3.09)	(0.96)	(2.30)
Fiscal decentralization	-0.407**	0.449*	-0.361(*)
	(2.70)	(2.54)	(1.82)
Tax competition	-0.194**	0.069	-0.207**
	(3.47)	(0.59)	(2.90)
Federal transfers	0.050	0.042	0.011
	(1.11)	(0.54)	(0.19)
Constitutional constraint	0.006	0.018	0.039**
	(0.57)	(0.81)	(2.65)
Conservative ideology	0.003	0.139	-0.028
	(0.03)	(1.10)	(0.24)
Size of coalition	0.004	-0.046	0.045(*)
	(0.18)	(1.14)	(1.68)
Romance canton	-0.152*	0.215	-0.193*
	(2.10)	(1.48)	(2.19)
Urbanization	-0.001	-0.010**	0.004*
	(0.51)	(3.61)	(2.16)
National income	0.697**	0.539**	0.453**
	(5.61)	(2.63)	(2.79)
Cantonal population	0.039(*)	-0.034	0.088**
	(1.69)	(1.06)	(3.13)
Residents 0 – 14	-0.011	-0.016	-0.012
	(0.72)	(0.62)	(0.74)
Residents 15 – 24	0.010	-0.129**	0.049*
	(0.49)	(3.78)	(2.03)
Residents over 60	0.034**	-0.031(*)	0.045**
	(3.22)	(1.91)	(3.96)
Constant	-4.176**	-0.568	-6.192**
	(3.89)	(0.35)	(5.34)
Observations	416	416	416
Centered R^2	0.77	0.68	0.80
Jarque-Bera χ-value	0.80	210.00***	7.03*

2SLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. Endogenous variable: fiscal decentralization. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects are included but not reported.

Table A.4: Security Expenditure 1986 – 2001 with Lagged Crime Rates

	(1) Police expenditure	(2) Police force	(3) Ordinary police	(4) Criminal detectives	(5) Security	(6) Defense	(7) Judicial system
Direct democracy	-0.125**	-0.102**	-0.075**	-0.228**	-0.078**	0.027	-0.075**
	(5.61)	(5.02)	(3.34)	(5.40)	(5.69)	(0.81)	(4.34)
Assault crime rate	0.085**	0.064**	0.038*	0.144**	0.080**	0.064(*)	0.109**
	(3.77)	(3.69)	(2.13)	(3.22)	(5.66)	(1.89)	(5.40)
Theft crime rate	0.160**	0.215**	0.226**	0.141	0.150**	-0.05	0.156**
	(3.50)	(5.58)	(4.60)	(1.56)	(4.04)	(0.50)	(2.67)
Fiscal decentralization	-0.328(*)	-0.056	-0.094	-0.017	-0.232*	0.499**	-0.145
	(1.96)	(0.36)	(0.65)	(0.05)	(2.48)	(2.61)	(1.16)
Tax competition	-0.226**	-0.004	-0.047	0.163	-0.151**	0.065	-0.159**
	(3.86)	(0.07)	(0.80)	(1.35)	(3.87)	(0.54)	(2.86)
Federal transfers	0.172**	0.199**	0.138**	0.434**	0.073(*)	0.05	0.043
	(2.79)	(3.71)	(2.77)	(3.67)	(1.96)	(0.66)	(0.84)
Constitutional constraint	-0.025*	-0.005	0.006	-0.031	0.004	0.023	0.039**
	(1.99)	(0.34)	(0.41)	(1.08)	(0.62)	(1.01)	(3.49)
Conservative ideology	0.028	0.039	-0.093	0.541*	0.011	0.115	-0.026
	(0.25)	(0.37)	(0.87)	(2.41)	(0.16)	(0.93)	(0.33)
Size of coalition	0.01	-0.029	-0.035(*)	-0.033	0.026(*)	-0.038	0.072**
	(0.42)	(1.41)	(1.75)	(0.60)	(1.82)	(0.99)	(3.63)
Romance canton	-0.302**	-0.127	-0.093	-0.245	-0.196**	0.189	-0.251**
	(3.22)	(1.59)	(1.20)	(1.43)	(3.76)	(1.37)	(3.70)
Urbanization	0.000	-0.002(*)	-0.004**	0.005*	0.000	-0.009**	0.004**
	(0.06)	(1.75)	(3.02)	(2.29)	(0.16)	(3.27)	(3.05)
National income	0.483**	0.339**	0.311*	0.543*	0.474**	0.470*	0.181
	(3.31)	(2.88)	(2.56)	(2.09)	(5.91)	(2.24)	(1.39)
Cantonal population	-0.032	-0.056*	-0.046(*)	-0.071(*)	-0.009	-0.035	0.033(*)
	(1.24)	(2.54)	(1.95)	(1.77)	(0.62)	(1.08)	(1.66)
Residents 0 – 14	-0.033(*)	-0.066**	-0.084**	0.011	-0.001	-0.022	-0.003
	(1.71)	(3.83)	(4.23)	(0.42)	(0.10)	(0.82)	(0.20)
Residents 15 – 24	0.037(*)	0.029	0.006	0.090**	-0.001	-0.124**	0.038(*)
	(1.96)	(1.58)	(0.29)	(2.71)	(0.07)	(3.32)	(1.93)
Residents over 60	0.024(*)	0.035**	0.031*	0.050**	0.022*	-0.037*	0.029**
	(1.96)	(2.90)	(2.15)	(2.87)	(2.55)	(2.23)	(3.12)
Constant	-5.303**	-8.963**	-8.156**	-14.258**	-4.284**	-0.139	-6.193**
	(4.20)	(8.20)	(6.35)	(8.72)	(5.61)	(0.09)	(7.40)
Observations	416	416	416	416	416	416	416
Centered R^2	0.82	0.83	0.82	0.51	0.86	0.68	0.87

2SLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. Endogenous variable: fiscal decentralization. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects are included but not reported. Crime rates are lagged by two periods.

Table A.5: Security Expenditure 1986 – 2001, Outliers Excluded

	(1) Police expenditure	(4) Criminal detectives	(6) National Defense	(7) Judicial system
Direct democracy	-0.117**	-0.203**	0.044(*)	-0.057*
	(4.25)	(5.53)	(1.88)	(2.22)
Fiscal decentralization	-0.437*	-0.512	0.650**	-0.445*
	(2.48)	(1.56)	(4.65)	(2.36)
Tax competition	-0.269**	0.122	0.178**	-0.218**
	(3.81)	(1.18)	(2.79)	(3.21)
Federal transfers	0.140*	0.332**	0.036	-0.009
	(2.26)	(3.31)	(0.73)	(0.15)
Constitutional constraint	-0.022	-0.018	-0.011	0.041**
	(1.64)	(0.79)	(0.89)	(2.94)
Conservative ideology	0.042	0.437*	0.082	-0.015
	(0.31)	(2.45)	(0.84)	(0.14)
Size of coalition	-0.013	-0.152**	-0.084**	0.041
	(0.47)	(3.77)	(3.10)	(1.62)
Romance canton	-0.244*	-0.049	0.374**	-0.175*
	(2.53)	(0.38)	(4.28)	(2.14)
Urbanization	0.000	0.001	-0.015**	0.003
	(0.21)	(0.62)	(10.39)	(1.50)
National income	0.732**	0.939**	0.700**	0.560**
	(4.46)	(4.32)	(4.63)	(3.52)
Cantonal population	0.014	-0.025	0.003	0.088**
	(0.44)	(0.71)	(0.14)	(3.29)
Residents 0 – 14	-0.046*	-0.006	-0.052**	-0.009
	(2.10)	(0.22)	(3.14)	(0.55)
Residents 15 – 24	0.047*	0.055	-0.143**	0.035
	(2.08)	(1.46)	(6.94)	(1.47)
Residents over 60	0.037**	0.055**	-0.034**	0.046**
	(2.88)	(2.99)	(3.10)	(4.29)
Constant	-5.095**	-12.740**	-0.072	-6.252**
	(3.53)	(7.34)	(0.06)	(5.61)
Observations	412	396	389	410
Centered R^2	0.78	0.60	0.83	0.82
Jarque-Bera χ-value	3.72	3.04	3.95	4.17

2SLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. Endogenous variable: fiscal decentralization. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects are included but not reported.

Excluded outliers are: in regression (1): Uri (1989, 1990), and Glarus (1991) and Tessin (1988) in regression (4): Zürich (1986 – 1996), Uri (1986 – 1990), Schwyz (2001), Graubünden (1986), Thurgau (2000) and Jura (1998); in regression (6): Luzern (1999), Uri (2000), Obwalden (1988), Nidwalden (1986 – 1988, 1999, 2000, 2001), Glarus (1994), Freiburg (1989, 1990), Solothurn (1992 – 1995), Appenzell Innerrhoden (1994, 1996, 1997), Tessin (1986), Jura (1986, 1987, 1990, 1998 – 2001), and, finally, in regression (7): Glarus (1988 – 1992) and Appenzell Innerrhoden (2001).

Table A.6: Property Crime, Outliers Excluded, Structural Form

	(2) Pickpocketing	(3) Auto Theft	(4) Robbery	(5) Fraud	(6) Defalcation
Criminal Detectives	0.129	-0.372*	-0.898**	0.620	1.521**
	(0.42)	(2.02)	(2.67)	(1.16)	(2.96)
Ordinary Policemen	1.052**	0.427**	1.274**	1.322**	0.384
	(4.78)	(3.05)	(4.77)	(4.09)	(1.23)
Severity 139	0.01	0.003			
	(1.40)	(1.00)			
Severity 140			0.000		
			(0.02)		
Severity 146				-.001	
				(0.35)	
Severity 138					-0.003
					(1.13)
Direct democracy	0.053	-0.107(*)	-0.218*	-0.014	-0.218*
	(0.57)	(1.78)	(2.50)	(0.10)	(2.02)
Welfare transfers	0.261*	0.155	0.457**	-0.077	-0.279(*)
	(2.12)	(1.50)	(3.30)	(0.44)	(1.89)
Income inequality	0.105	0.046	-0.026	-0.16	-0.004
	(0.64)	(0.51)	(0.17)	(0.76)	(0.02)
National income	-0.455	0.547**	-0.051	-1.537**	-1.526**
	(1.11)	(2.73)	(0.14)	(3.67)	(3.15)
Unemployment rate	0.026	0.033	-0.013	0.02	-0.059
	(0.44)	(0.90)	(0.26)	(0.27)	(0.78)
Closeness to border	0.408**	0.053	0.147	0.031	-0.399**
	(4.49)	(0.69)	(1.50)	(0.18)	(3.26)
Interaction between cantons	0.010(*)	0.002	0.038**	-0.007	-0.016
	(1.71)	(0.44)	(4.98)	(0.70)	(1.55)
Urbanization	0.013**	0.005*	0.013**	0.009*	0.012**
	(4.24)	(2.40)	(4.30)	(2.23)	(3.25)
Cantonal population	0.218(*)	-0.034	-0.482**	0.2	0.088
	(1.84)	(0.42)	(3.25)	(0.95)	(0.46)
Residents 15 – 24	0.191**	0.151**	0.087	0.095	-0.096
	(3.25)	(3.93)	(1.38)	(1.33)	(1.40)
Residents 25 – 29	-0.021	0.155**	0.171(*)	0.061	-0.016)
	(0.27)	(3.07)	(1.88)	(0.47)	(0.15)
Romance canton	-0.395*	-0.937**	-0.360*	-1.164**	-0.471(*)
	(2.25)	(8.19)	(2.02)	(3.81)	(1.87)
Constant	5.269*	2.496*	7.327**	18.601**	23.583**
	(2.52)	(2.26)	(3.48)	(4.82)	(6.61)
Observations	404	400	411	415	394
Centered R^2	0.73	0.64	0.53	0.44	0.29
Jarque-Bera χ-value	3.75	3.90	3.94	2.85	3.98

2SLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. Endogenous variables: Criminal detectives and ordinary policemen. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects and measures of recording behavior are included but not reported. Excluded outliers are displayed in table A.10.

Table A.7: Violent Crime and Sex Crime, Outliers Excluded, Structural Form

	(2) Assault	(3) Hate Crime	(4) Rape	(5) Sex Crime
Criminal Detectives	0.432*	0.430*	-0.487(*)	-0.899*
	(2.58)	(2.57)	(1.95)	(2.31)
Ordinary Policemen	0.849**	0.834**	1.275**	1.715**
	(5.60)	(4.96)	(4.70)	(4.13)
Severity 122 123	0.001			
	(0.69)			
Severity		0.000		
		(0.32)		
Severity 187			-0.002	0.001
			(1.40)	(0.37)
Direct democracy	0.137*	0.111(*)	0.052	0.086
	(2.42)	(1.93)	(0.78)	(0.90)
Welfare transfers	0.360**	0.336**	0.102	0.111
	(3.78)	(3.95)	(1.15)	(0.87)
Income inequality	-0.129	-0.121	-0.058	-0.122
	(1.11)	(1.12)	(0.52)	(0.81)
National income	-0.691**	-0.739**	-0.111	-0.643*
	(2.77)	(3.14)	(0.48)	(2.05)
Unemployment rate	-0.025	-0.022	0.005	-0.071
	(0.67)	(0.63)	(0.11)	(1.33)
Closeness to border	-0.353**	-0.306**	0.204*	0.053
	(4.24)	(4.00)	(2.47)	(0.47)
Interaction between cantons	-0.004	-0.003	0.028**	0.022**
	(0.96)	(0.47)	(4.48)	(2.67)
Urbanization	-0.003	-0.003	0.004*	0.012**
	(1.45)	(1.50)	(2.01)	(4.07)
Cantonal population	0.081	0.045	-0.480**	-0.139
	(0.89)	(0.36)	(4.32)	(0.93)
Residents 15 – 24	-0.06	-0.045	0.157*	0.269**
	(1.51)	(1.16)	(2.53)	(2.91)
Residents 25 – 29	-0.098	-0.088	0.09	0.025
	(1.37)	(1.30)	(1.32)	(0.27)
Romance canton	0.037	-0.013	-0.154	-0.189
	(0.24)	(0.09)	(0.97)	(0.94)
Constant	16.014**	16.281**	8.500**	5.915**
	(9.60)	(8.90)	(5.39)	(2.72)
Observations	406	406	401	407
Centered R^2	0.62	0.63	0.44	0.32
Jarque-Bera χ-value	2.21	2.56	2.78	3.87

See table A.6.

Table A.8: Property Crime, Outliers Excluded, Reduced Form

	(2) Pickpocketing	(3) Auto Theft	(4) Robbery	(5) Fraud	(6) Defalcation
Severity 139, 140, 146	0.004	0.001	0.002(*)	0.001	-0.006**
	(1.09)	(0.45)	(1.70)	(0.38)	(3.40)
Direct democracy	0.042	-0.017	-0.035	-0.192*	-0.300**
	(0.61)	(0.47)	(0.66)	(1.97)	(3.28)
Welfare transfers	0.441**	0.130*	0.385**	0.16	0.171
	(4.01)	(2.30)	(4.56)	(1.07)	(1.25)
Income inequality	0.275(*)	0.059	0.108	-0.228	-0.023
	(1.92)	(0.89)	(0.98)	(1.18)	(0.13)
National income	0.161	0.197	0.174	-1.176*	-0.396
	(0.42)	(0.99)	(0.60)	(2.21)	(0.83)
Unemployment rate	-0.018	0.091**	-0.036	0.113	-0.03
	(0.34)	(3.57)	(0.92)	(1.56)	(0.46)
Closeness to border	0.088	0.017	-0.127	-0.212	-0.575**
	(0.84)	(0.33)	(1.62)	(1.38)	(4.32)
interaction b. cantons	0.012**	0.000	0.015**	0.015*	0.016**
	(2.70)	(0.17)	(4.49)	(2.31)	(2.76)
Urbanization	0.016**	-0.005*	0.019**	0.004	0.021**
	(3.89)	(2.36)	(5.86)	(0.70)	(4.08)
Cantonal population	0.141	0.05	-0.024	-0.344*	-0.553**
	(1.38)	(0.95)	(0.32)	(2.34)	(4.32)
Residents 0 – 14	0.012	-0.118**	0.116**	-0.207**	-0.033
	(0.25)	(4.52)	(3.29)	(3.22)	(0.56)
Residents 15 – 24	0.241**	0.005	0.118*	-0.005	-0.017
	(3.77)	(0.17)	(2.38)	(0.05)	(0.21)
Residents 25 – 29	0.164(*)	0.111*	0.237**	0.241*	0.238*
	(1.93)	(2.56)	(3.67)	(2.05)	(2.21)
Residents over 60	0.141**	-0.091**	0.180**	0.002	0.087(*)
	(3.75)	(4.18)	(6.51)	(0.03)	(1.82)
Fiscal decentralization	-0.468	-0.562**	-0.682*	0.792	0.701
	(1.32)	(3.15)	(2.51)	(1.62)	(1.56)
Tax competition	-0.656**	-0.219*	0.079	-1.084**	-0.617*
	(3.46)	(2.31)	(0.55)	(4.12)	(2.55)
Federal transfers	-0.200	0.075	-0.175	0.414(*)	0.301
	(1.23)	(0.89)	(1.38)	(1.81)	(1.47)
Constitutional constraint	0.169**	0.028	0.033	0.304**	0.347**
	(3.25)	(0.98)	(0.84)	(4.15)	(5.23)
Conservative ideology	-0.387	-0.471**	-0.01	-0.843*	0.646(*)
	(1.26)	(3.24)	(0.04)	(1.99)	(1.67)
Size of coalition	-0.027	-0.132**	0.093(*)	-0.105	-0.087
	(0.41)	(4.03)	(1.79)	(1.09)	(1.03)
Romance canton	-0.435(*)	-1.077**	-0.022	-1.982**	-0.326
	(1.65)	(8.80)	(0.11)	(5.57)	(1.00)
Constant	-8.449*	9.602**	-6.770*	11.710*	6.422
	(2.38)	(4.94)	(2.56)	(2.29)	(1.44)
Observations	401	389	404	415	402
Centered R^2	0.73	0.79	0.73	0.49	0.49
Jarque-Bera χ-value	4.36	3.39	4.05	2.71	0.55

OLS with heteroscedasticity and autocorrelation consistent standard errors for two lags. Absolute values of t-statistics are in parentheses. (*) indicates significance at the 10%, * at the 5%, and ** at the 1% level. Year fixed effects and measures of recording behavior are included but not reported. Excluded outliers are displayed in table A.10.

Table A.9: Violent and Hate Crime, Outliers Excluded, Reduced Form

	(2) Assault	(3) Hate Crime	(4) Rape	(5) Sex Crime
Severity 122-123, (111, 122, 123 combined), 187	0.001	0.001	-0.001	0.001
	(0.38)	(0.69)	(0.91)	(0.94)
Direct democracy	0.193**	0.169**	-0.001	0.193**
	(3.33)	(3.18)	(0.02)	(3.17)
Welfare transfers	0.489**	0.467**	0.049	0.058
	(5.84)	(6.10)	(0.61)	(0.62)
Income inequality	0.086	0.098	0.147	-0.168
	(0.81)	(1.02)	(1.33)	(1.34)
National income	0.444	0.409	0.131	0.886**
	(1.52)	(1.55)	(0.46)	(2.64)
Unemployment rate	0.017	0.005	-0.03	-0.042
	(0.42)	(0.14)	(0.77)	(0.92)
Closeness to border	-0.517**	-0.465**	-0.192*	-0.286**
	(6.11)	(6.08)	(2.43)	(3.03)
Interaction between cantons	0.013**	0.013**	0.013**	(0.000)
	(3.12)	(3.56)	(3.59)	(0.00)
Urbanization	0.004	0.004	0.006(*)	0.004
	(1.25)	(1.18)	(1.95)	(1.03)
Cantonal population	-0.439**	-0.434**	-0.236**	0.323**
	(4.86)	(5.03)	(3.14)	(3.62)
Residents 0 - 14	-0.03	-0.035	0.048	-0.015
	(0.81)	(1.04)	(1.31)	(0.34)
Residents 15 - 24	-0.081	-0.066	0.176**	0.049
	(1.64)	(1.45)	(3.26)	(0.77)
Residents 25 - 29	0.058	0.045	0.224**	0.016
	(0.82)	(0.71)	(3.36)	(0.20)
Residents over 60	0.073*	0.071**	0.174**	0.122**
	(2.57)	(2.68)	(6.46)	(3.80)
Fiscal decentralization	-0.104	-0.164	0.264	0.568(*)
	(0.38)	(0.67)	(0.97)	(1.80)
Tax competition	-0.497**	-0.478**	-0.282*	0.428*
	(3.13)	(3.23)	(1.97)	(2.53)
Federal transfers	(0.156	-0.139	-0.003	-0.132
	(1.23)	(1.21)	(0.03)	(0.92)
Constitutional constraint	0.334**	0.304**	0.062	0.116*
	(7.44)	(7.45)	(1.59)	(2.51)
Conservative ideology	0.139	0.096	-0.581*	-0.115
	(0.61)	(0.46)	(2.50)	(0.43)
Size of coalition	-0.088(*)	-0.094*	0.044	-0.288**
	(1.68)	(1.99)	(0.87)	(4.91)
Romance canton	0.363(*)	0.322(*)	-0.399(*)	0.549*
	(1.81)	(1.77)	(1.93)	(2.28)
Constant	7.349**	7.494**	-5.820*	-4.951
	(2.67)	(3.01)	(2.26)	(1.63)
Observations	410	409	413	408
Centered R^2	0.68	0.70	0.52	0.54
Jarque-Bera χ-value	3.17	0.19	3.49	0.42

See table A.8.

Table A.10: Deleted Observations as Outliers in the Crime Regressions

	Structural Form	Reduced Form
Property Crime		
Pickpocketing	Schwyz (1990, 1992, 2000), Obwalden (1996), Zug (1995 – 1998), Solothurn (1995), Basel-Land (2000), Waadt (1989, 1990).	Schwyz (1989, 1990, 1992, 2000), Obwalden (1996), Nidwalden (1990), Zug (1997), Solothurn (1995), Basel-Land (2000), Schaffhausen (1989), Aargau (1988), Waadt (1986, 1989, 1990, 1998).
Auto Theft	Uri (1988), Obwalden (1998), Zug (1996 – 1999), Wallis (1995 – 2001).	Schwyz (1986, 1987, 1999 – 2001), Obwalden (1998), Glarus (1986 – 1988), Zug (1996, 1997, 1998, 1999), Solothurn (1990, 1991, 1994), Appenzell Ausserrhoden (1993, 1996, 1997), Wallis (1995 – 2001).
Robbery	Uri (1998), Schwyz (1986), Zug (1995, 1996), Graubünden (1986).	Uri (1992), Schwyz (1986, 1989), Obwalden (1996), Glarus (1987, 1997), Zug (1988, 2000), Appenzell Ausserrhoden (1989, 1990, 1995, 2000).
Fraud	Nidwalden (1996).	Nidwalden (1996).
Defalcation	Uri (1989 – 1991), Nidwalden (2000), Schaffhausen (1990, 1996), Aargau (1986 – 1999), Thurgau (2000), Genf (1999).	Nidwalden (2000), Schaffhausen (1996), Graubünden (2001), Aargau (1989 – 1999).
Violent Crime		
Assault	Obwalden (1988), Nidwalden (1996), Zug (1993), Freiburg (1993), Basel-Land (1992), Schaffhausen (1990), Tessin (1986, 1987, 1988), Jura (1986).	Schwyz (1987), Nidwalden (1996), Appenzell Innerrhoden (1999), Tessin (1986, 1988), Jura (1986).
Hate Crime	Uri (1990), Obwalden (1988), Nidwalden (1996), Zug (1993), Freiburg (1993), Schaffhausen (1990), Tessin (1986 – 1988), Jura (1986).	Schwyz (1987), Obwalden (1988), Nidwalden (1996), Aargau (2001), Tessin (1986, 1988), Jura (1986).
Rape	Nidwalden (2001), Zug (1993, 1995, 1998, 1999) Basel-Land (1990, 1993 - 1996), Aargau (2001), Thurgau (2001), Waadt (2000), and Jura (1992).	Zug (1999), Basel-Land (1995), Thurgau (2001).
Sex Crime	Uri (1994), Nidwalden (1994), Appenzell Innerrhoden (1990, 1992, 1999), Aargau (1992), Thurgau (2000), Tessin (1989), Jura (1998).	Nidwalden (1994), Freiburg (1993), Appenzell Ausserrhoden (1990), Appenzell Innerrhoden (1993, 1996, 1999), Aargau (1992, 1997).

Table A.11: Description of Variables

Variable	Formula	Type of variable	Source
Deterrents			
Criminal detectives	Log (criminal detectives / population)	continuous	BAP, full time equivalents
Ordinary policemen	Log(ordinary policemen / population)	continuous	BAP, full time equivalents
Severity of punishment (art. 111, 122/123, 138, 139, 140, 146, 178 of Swiss criminal code)	Unsuspended sentences / total sentences	continuous	BFS
Institutional determinant			
Direct democracy	Index from 1 (minimum) to 6 (maximum)	continuous	Own calculations / STUTZER (1999)
Economic variables			
Welfare transfers	Log(deflated welfare payments / population)	continuous	BFS, SECO (deflator)
Income inequality	Mean household income / median household income	continuous	FTA (1986 - 1998; biannually); SHP (1999 - 2001; annually)
National income	Log(deflated national income in 1000 Sfr/ population)	continuous	BFS;
Unemployment rate	Officially recorded unemployed / labor force	continuous	SECO, BFS (labor force)
Federal transfers	Log (deflated federal transfers / population)		BFS, SECO (deflator)
Fiscal variables			
Fiscal decentralization	1-(cantonal total expenditure /cantonal + local expenditure)	continuous	Own calculations, BFS
Tax competition	Tax competition for canton i = [Sum (tax(j)* inverse distance (ij))]/ 25	continuous	Own calculations, FTA
Constitutional constraint	Index from 1 to 3 (strictest)	categorical	G. KIRCHGÄSSNER
Conservative ideology	Share of rightist parties in executive – share of leftist parties	continuous	Own calculations based on issues of Année Politique Suisse

Table A.11: Description of Variables (cont.)

Variable	Formula	Type of variable	Source
Size of coalition	Number of parties / independent members in government	continuous	Own calculations based on issues of Année Politique Suisse
Econogeographic variables			
Closeness to border	At least one of the ten most important border crossings is closely located to the canton; importance is given if > 6,000 cars per day in 2001	dichotomous	Federal Office of Spatial Development;
Interaction between cantons	$I(ij) = (Pop_i * Pop_j)/absolute\ distance_{ij}$;	continuous	Own calculations, BFS (population), www.michelin.de (distances)
Sociodemographic variables			
Urbanization	Residents in urbanized areas (>10,000 inhabitants)/ population	continuous	BFS
Cantonal population	Log(permanent residential population at the end of the year[69])	continuous	BFS
Residents 0 – 14 years	Residents aged 0 – 14 years / residential population	continuous	BFS
Residents 15 – 24 years	Residents aged 15 – 24 years / residential population	continuous	BFS
Residents 25 – 29 years	Residents aged 24 – 29 years / residential population	continuous	BFS
Residents over 60 years	Residents aged over 60 years / residential population	continuous	BFS
Cultural factor			
Romance canton	Canton with either Italian or French language	dichotomous	Own calculation
Dependent variable			
Crime rate	Log((number of delicts +1)/population*1000)	continuous	BAP, BFS (population)

[69] The BFS defines permanent residents as Swiss people and foreigners holding a C- or B-permit. Seasonally admitted residents are excluded.